The 1998 Canadian Bank Merger Decision
and the 2008 Financial Crisis:
Factual and Counterfactual Investigations

by

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Abstract

The observed stability of large Canadian banks during the 2008 financial crisis, in contrast with several American and European counterparts, poses a puzzle. This puzzle is explored through three essays, each pursuing a question with a different method. Yet all three are linked to the historic interlude marked by the 1998 government rejection of proposed mergers of four large Canadian banks and by the 2008 crisis when the banks remained stable. Essay One is a historical essay that asks if the behavior of the Canadian banks themselves, above and beyond that required by regulation, played an important role in avoiding instability. A political economy framework is used to trace out the evolution of the Canadian banking order and describe the structural context in which Canadian banks behaved leading up to and during the crisis. An expectation-based relationship between the banks and the prudential regulator is found at the centre of this banking order, making it difficult to disentangle autonomous bank behavior from the regulatory relationship. This renders the essay's question indeterminate. Essay Two uses econometrics to analyze the financial characteristics of large banks and evaluate whether mergers of equals (the sort proposed by the Canadian banks in 1998) contribute to riskier behavior by the consolidated banks. While the evidence is ambiguous in its support of this hypothesis, it does show that both a bank's funding behavior and risk appetite are significant predictors of bank performance during the crisis. Essay Three tests a counterfactual hypothesis: if these four Canadian banks had merged in 1998, the resulting merged banks would have faced a greater risk of failure in

2008. The counterfactual framework applies synthetic data of two fictive merged banks in a stress test model simulating the 2008 crisis. The simulations describe conditions where the imagined merged banks would face greater insolvency risk. But when considering the conclusions of Essay One, these conditions would have been precluded by the regulatory relationship, suggesting the merged banks would not have faced a greater risk of failure in 2008.

Acknowledgements

The genesis of this dissertation reaches back to the completion of my bachelor's degree at Dalhousie University in 1996, when outstanding questions about economics led me to later study the methodology of economics at the University of Ottawa through a master's degree between 2000 and 2003. Along the way, I recall the announcement of proposed bank mergers in 1998. While a prominent question at the time was whether consolidation would lead to the greater concentration in the Canadian banking industry, there was less thought to the consequences for bank stability.

The years at Ottawa involved not only the study of methodology and heterodox economics under the supervision of Dr. Mario Seccareccia but also working with Mario as his teaching assistant for Canadian economic history. It was there where we began a discussion about the merits of the counterfactual method. It was also during these years when I decided that I would only undertake a doctorate if a question of sufficient interest revealed itself to me. The fall 2007 was pivotal: I married Brenna MacNeil and began working at the federal Department of Finance, all the while an international financial crisis began to gather. The Department was a good vantage point from which to observe the unfolding crisis and the public responses to it. It was here where I became interested in the puzzle of Canadian bank stability and wondered about the role of the 1998 bank merger decision. With our second daughter having just been born, Brenna supported me taking a leave of absence from the public service to begin this doctorate in September 2011.

This set of three essays took time to shape, but ultimately came together through the committed supervision of my three-person committee. Early in the journey, Dr. Saul Schwartz expressed intrigue (rather than fear) with the challenge of a counterfactual exercise. Saul offered to be part of committee, and ultimately became my project's overall coordinator as well as supervisor for Essay Two and coach in matters academic and intellectual. One of my regrets of finishing this doctorate is that I will no longer benefit from our regular meetings. Dr. Seccareccia accepted my invitation to extend our early discussions about Canadian economic history and the counterfactual method by acting as supervisor of Essay Three. I am fortunate to have had Mario as a teacher for close to twenty years. Finally, it was a chance glance at Dr. Randall Germain's 2010 book on financial governance that led me to his office in Carleton's political science department. Through supervising Essay One, Randall introduced me to the thought of Robert Cox, notably his "method of historical structures". In hindsight, this introduction was a watershed moment in the evolution of my dissertation's overall framework, and more generally my intellectual orientation, given the links between Cox's framework and my early exploration of economic methodology. I have been blessed to have had these three scholars provide the necessary guidance and nudges to move me along my journey.

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Introduction to Dissertation

The purpose of this dissertation is to answer three questions about the Canadian banking system, all related to the historic interlude marked by a public policy action in 1998, when the proposed mergers of four large banks were rejected by the federal government, to 2008, when the Canadian banks stood steadfast during the financial crisis that engulfed the world economy. Each question is answered in one of three inter-related essays that compose the dissertation.

- Essay One is a historical essay, where a political economy framework is used trace out the evolution of the Canadian banking order right up to the 2008 financial crisis. The essay makes the argument that to understand the puzzle of Canadian bank stability in 2008, one must take a long historical view to grasp the current context in which Canadian banks act. The insights gained through this approach provide an answer to the question: *among the factors responsible for the observed stability of the large Canadian banks in 2008, was it the behavior of the banks themselves, above and beyond that required by public regulation, which played an important role in avoiding instability?*
- Essay Two employs econometric analysis of the financial characteristics of large banks sampled from several developed economies on the eve of the crisis. The sample includes the Canadian Big Six banks. The analysis tests the hypothesis: *do “mergers of equals” contribute to riskier behavior by the consolidated banks?* The test framework examines bank behavior

proxied through accounting indicators and compares these indicators by performance status (bailed out or not bailed out) during the financial crisis. Among the explanatory variables included in the econometric model is an indicator for having had a merger of equals within the last twenty-five years. The aim of this essay is to identify any generalizable relationship between past mergers of equals and riskier bank behavior.

- Essay Three combines the insights of the first two essays in a counterfactual simulation that tests the consequences of a policy decision: *if these four Canadian banks had been permitted by the government to merge in 1998, would the resulting merged banks have faced a greater risk of failure in 2008?* The simulation framework features the construction of synthetic data for two fictive merged banks, data which is then applied in stress test specified to simulate actual financial conditions in the 2008 financial crisis.

Motivation

In tracing the history of the Canadian financial system (mainly a 19th and 20th century story), the Canadian state as an actor is always present, existing in the background if not occupying the centre stage. Numerous public policy events have transformed the Canadian financial system. Consider the example of the 1934 Bank of Canada Act, which established the central bank and gave it a monopoly over the issuance of money. In a more recent episode in the financial system's history, the observed stability of Canadian banks during the 2008

financial crisis has attracted the interest of governments across the world seeking policies to regulate banks deemed “too big to fail.” Causal factors proposed to explain the stability of the Canadian banks include regulatory policies as well as the behavior of the banks themselves. Rather than take these factors on the eve of the crisis as a given, this dissertation takes the position that there are advantages to viewing these factors as historical products of intentional and unintentional actions and processes in the past. This allows one to examine the co-evolution of bank behavior and the regulatory framework and explore how past policy events related to the banking regulatory framework have enabled, or hindered, bank stability. Among the array of past public policies that contributed to regulatory framework in place in 2008, this dissertation focuses on the decision by the Government of Canada in 1998 to block proposed mergers by four large Canadian banks. This decision was itself the conclusion of a significant policy debate regarding the role of government in supporting Canadian banks in the global marketplace, while protecting the welfare of Canadian consumers. In the current context, this issue can be explored to respond to the question of whether this 1998 decision helped avoid the pitfalls of a banking system in which banks are deemed “too big to fail” as seen in the United States. Also, pursuing these questions will offer a more general comment on the role of public policy in the creation of institutional structures that guide outcomes in the Canadian financial system.

General research design

The general methodological orientation of this project is historical given that all three questions concern themselves with this historical interlude in Canadian financial history marked from 1998 to 2008. This is true even of Essay Two, which performs a hypothesis test using data sampled from the eve of the crisis. The dissertation concerns itself both with what happened and what could have happened. Various histories are invoked – public policy history and bank history – and are treated as interwoven.

Yet, the conclusions of these three separate essays are intended to stand on their own. The dissertation as it is designed may be regarded as multidisciplinary, with each essay drawing on knowledge from different disciplines but staying within their boundaries (Choi & Pak, 2006, p. 1). Further, these three questions are engaged using different methods.

- Essay One is a historical narrative organized with a political economy framework developed from Robert Cox's (1981) method of historical structures. As a qualitative factual investigation, audiences from history and political science will find this treatment of the subject matter familiar. The answer to the essay's principal question turns on the interpretation of the historical context in which the Canadian banks acted during the crisis. Essay One provides an historical context for the two essays that follow.
- Essay Two is also a factual investigation albeit an quantitative one. It answers its question (or hypothesis) using statistical analysis, including the estimation of an econometric model. The hypothesis test explicitly

measures the impact of a merger of equals event on consequent bank behavior, using information about bank behavior from the period leading up to the 2008 financial crisis. While Essay One follows a historicist methodology, Essay Two follows a positive methodology. This essay situates itself in the economics discipline, specifically that of money, banking and finance.

- Essay Three tests a counterfactual hypothesis using a quantitative simulation which involves developing synthetic accounting data for the two hypothetical merged banks and then subjecting these two fictive banks (using their data) to a stress test that intends to replicate financial conditions observed during the 2008 crisis. Some of the statistical generalizations of Essay Two are used in constructing both the synthetic data and the parameters in the stress test. The counterfactual results of the stress test are then compared against factual insights gathered from Essay One with respect to the Canadian banking order. While relying primarily on quantitative methods in the simulation, this argument also uses qualitative historical insights in its reasoning. In a sense, Essay Three integrates the qualitative insights of an Essay One and the quantitative ones of Essay Two. Given the subject matter, Essay Three may find an audience within the history discipline, economics (given the focus on banking, as well as the tradition of using counterfactual methods in economic history) and political science (as the counterfactual “what if” involving a public policy decision).

Beyond these three separate essays, there is the temptation to find unity among them through synthesis of their findings. This would transform the multidisciplinary nature of this dissertation's overall design into something more interdisciplinary where conclusions transcend the disciplinary boundaries in which each essay is (nominally) situated. Such an attempt comes with some risk of incoherency, especially given the diverse methods employed among the essays. This attempt at synthesis is left to the dissertation's general conclusion.

To insure consistency across the three essays, two common definitions are employed.

- The 2008 financial crisis. The crisis is generally associated with this year as it features the episode of peak stress in September 2008 when several American and European banks experienced significant distress following the bankruptcy of Lehman Brothers on September 15.. However, the crisis arguably began in August 2007 when international credit markets began to freeze up, triggered by fear of exposure to the faltering U.S. subprime mortgage market. The threat of bank instability would begin to subside in 2009, at least in the U.S., while in Europe, the banking crisis would be displaced by a fiscal crisis by 2010.
- The Big Six Canadian banks. These six banks are the largest banks in Canada by several measures (e.g., total assets, profits, market capitalization). They include Royal Bank of Canada (RBC), Toronto

Dominion (TD), Bank of Montreal (BMO), Bank of Nova Scotia (BNS), Canadian Imperial Bank of Commerce (CIBC) and National Bank of Canada (NBC).¹ This group excludes smaller regional banks such as Laurentian Bank and Canadian Western Bank as well as the subsidiaries of foreign banks such HSBC Bank Canada.

The empirical aspects of all three essays made use of information in the public domain such secondary sources for historic detail and publicly available financial data. One disadvantage faced in this research is that it did not benefit from having access to “insider” proprietary financial data that a regulator may be privy to. Further, no interviews with representatives from the large banks or the regulators were conducted. Although I worked in the federal Department of Finance from 2007 to 2013, I did not work close enough to the issues of large bank stability to qualify as having the perspective of an “inside” observing participant. In an ideal research situation, this additional information may have afforded greater insights into the motives, behaviors and performance of banks and regulators.

¹ Other writers reference the Big Five Canadian banks and exclude National Bank of Canada (NBC), citing its relative smaller size and that its business operations are concentrated in the Province of Quebec. I choose to include NBC among the large Canadian banks for the following three reasons: 1) NBC’s acquisition of independent securities brokerages in the 1980s and 1990s indicate that NBC was becoming a more complex universal-style bank leading up to the crisis, much like the Big Five, 2) NBC was a significant actor in the Canadian non-bank asset-backed commercial paper (ABCP) market malfunction early in the crisis in August 2007 (see Textbox 1 in Essay One), and 3) it joined the other five large banks to be designated domestic systemically important banks (D-SIBs) by Canada’s Office of the Superintendent of Financial Institutions in 2013.

Findings and wider contributions

Essay One's adaptation of Cox's framework to national finance is an innovation, as Cox had developed his framework for international relations. The result is an original "reading" or interpretation of Canadian banking history. Also, Essay One goes further in its explanation of the Canadian bank stability puzzle than the efforts of Calomiris and Haber (2014), who employ a rational choice institutionalist framework, and Bell and Hindmoor (2015), who use a historical institutionalist framework.

The application of this Coxian political economy framework reveals the character of the Canadian finance order leading up to and during the 2008 crisis. National financial order is the configuration of structural forces that define the combination of state and private economic actors in the supply of financial services. By the onset of the financial crisis, a new regulatory relationship had emerged at the centre of the order, a relationship one may describe as an expectation-based relationship between bank and prudential regulator. Aspects of Ayers and Braithwaite's (1992) theory of responsive regulation describe this expectation-based relationship. One implication of this relationship is that it is difficult to disentangle autonomous bank behavior from the relationship banks have with the regulatory state. Therefore, bank behavior, above and beyond that required by public regulation, cannot be isolated to judge whether it played an important role in avoiding instability during the crisis.

In seeking to understand the causal factors that explain the Canadian puzzle, Essay Two examines the assertion that the prohibition of two mergers of

equals involving four large banks in 1998 contributed to the stability of the Canadian banks. It does this by asking whether there is a general empirical relationship for banks having had a past merger of equals and displaying subsequent riskier behavior that is associated with bank insolvency. Essay Two contributes to the economics literature through its attempts to measure the possible impact of a merger of equals (a relatively rare form of corporate consolidation) on consequent bank behavior. The test evidence is ambiguous in showing whether to reject the hypothesis that a past merger of equals has any statistical significance in explaining performance during the 2007-2009 financial crisis. While the test as it is constructed here is inconclusive, the empirical analysis does reproduce the earlier finding by Arjani and Paulin (2013) that a bank's liability funding model is a statistically significant explanatory variable of bank performance. Further, a measure of a bank's risk appetite is also found to be a significant predictor of bank performance.

Essay Three is the first attempt in scholarship to provide an organized, rigorous analysis of the counterfactual question "if these four Canadian banks had merged in 1998, would the resulting merged banks have faced a greater risk of failure in 2008?" A review of both the economics and public policy literatures suggests that counterfactual analysis is an exceptional method choice. So, in addition to probing the Canadian puzzle counterfactually, the essay also demonstrates an application of this method to the larger discipline of policy analysis.

The counterfactual simulations provide information on the conditions where the imagined merged banks would face greater risk of insolvency. These conditions include experiencing asset value write-downs at levels observed among U.S. banks during the crisis (actual Canadian banks had lower write-downs), the regulatory relationship becoming ineffective (the banks cease cooperating with regulatory authorities) and having all write-downs declared in the quarter leading up to the moment of peak stress in September 2008. However, when considered in light of the explanation of national financial order developed in Essay One, these conditions would have been precluded by the expectation-based regulatory relationship. The balance of the argument supports the conclusion that the merged banks would have not faced a greater risk of failure in 2008.

ESSAY ONE: Did bank behavior play an important role in the stability of large Canadian banks in 2008?

Introduction

In August 2007, short-term credit markets in several nations began to freeze, channeling the growing unease of financial actors as their exposure to the faltering U.S. subprime mortgage market became increasingly clear. By September 2008, this stress in credit markets would develop in a conflagration of the US financial landscape with several institutions failing. The instability of financial firms was not limited to the US as firms in the United Kingdom, France, Germany and other European countries were ultimately pulled away from insolvency through interventions by their governments to recapitalize their balance sheets and return them to firmer ground. However, there were exceptions to this pattern. Other Western countries, including Canada, Australia, Sweden and Spain, displayed banking sectors that were relatively resilient over this period and did not need to be recapitalized by their government. Of note is the surprising contrast between the United States and Canada, two countries with a shared geography, history, language and culture. This puzzle of Canada's resiliency, of why the Canadian banking system fared better during the 2008 crisis than other national systems is explored in this essay. Since the crisis, there has been debate over which factors were responsible for Canada's resiliency, with participants arguing that the relatively strong performance of Canada's large universal-style banks, the Big Six, was attributable either to superior prudential supervision, better management of these financial firms or a

combination of both (Harris, 2011, p. 69). I seek to contribute to the debate by attempting to answer the following question:

Among the factors responsible for the observed stability of the large Canadian banks in 2008, did the behavior of the banks themselves, above and beyond that required by public regulation, play an important role in avoiding instability?

To answer this question, I draw on Robert Cox's "method of historic structures", modifying it to be amenable to analyzing the evolution transformation of Canada's national financial order, a social configuration that features both the state and the banking sector. The national financial order that existed on the eve of the 2007 financial crisis, as revealed using this modified method of historical structures will provide evidence that answers the principal question above. In addition to furthering our understanding of the causes behind Canadian bank resiliency, I also demonstrate an innovative approach to giving an explanation, a reading if you will, of Canadian banking history.

Motivation

While I focus this essay on a recent episode in the history of the Canadian banking system, this does not imply that my investigation of causal factors behind Canadian resiliency is constrained to this recent segment of history. In fact, I take the opposite view, arguing that there are advantages to viewing these factors as historical products of intentional and unintentional actions and

processes in the past. Thus, to explain what happened in 2008, it is necessary to trace out the history of the Canadian financial system from its late 18th origins. Furthermore, I suggest that the principal driver of transformation of the Canadian financial order has been public policy. The Canadian state as an actor has always been present, existing in the background if not occupying centre stage.

So, this essay is foremost a history essay, employing a historico-interpretivist (rather than a positivist) framework to marshal the evidence and tell a story. As it is the first of three essays in an overall dissertation, it serves to provide the historic context or tapestry within which to situate Essay Two, with its positivist empirical investigation into bank behavior toward risk, and Essay Three, with its counterfactual simulation of the consequences of a public policy action (the block bank mergers in 1998) on Canadian bank resiliency.

Methodological framework

To guide historical description and analysis in this essay, Robert Cox's "method of historical structures" (1981), a political economy framework he developed for the study of international relations, is modified for application to the area of national finance. Cox offers a conceptual device, a "historical structure", which is a configuration of three structural categories (institutions, ideas, material capabilities) that he argues can assist in understanding aspects of social reality at moment in time. Cox applies this configuration to three levels or spheres of social activity (world order, forms of state, social relations) that he sees as the primary constituents of the broader

totality that is the international political economy. I argue here that the “method of historical structures” can be generalized and applied to other subject matter in political economy. In this case, the subject matter is the problematic of national finance; that is, how state actors and private economic actors combine to supply financial services. Following Cox, this new method of historical structures (hereafter neoMHS) may be used not only statically to understand a specific configuration or order at a moment in time, but dynamically to explain how these orders transform over historical time.

Literature review

Equipped with the neoMHS, I give an assessment of the existing literature on the puzzle of why the Canadian banking system fared better during the 2008 crisis than other national systems. One observation upfront is that the literature is relatively recent, appearing in the aftermath of the crisis. Prior to 2008, scholars and journalists tended to focus on the competitive conditions in the Canadian banking sector rather than on its enduring stability. Within this post-crisis literature, most writers point to structural factors, such as the industrial organization of banking, the regulatory apparatus and the mortgage market, as the chief contributors to banking system stability. A few contributors (Calomiris and Haber, 2014; Bell and Hindmoor, 2015) do elaborate on the historic roots of these structural factors, demonstrating the need to thinking historically to understand the Canadian financial order leading up the financial crisis.

The Canadian financial orders, 1608 to 1986

With this assessment of the literature on Canadian resiliency before me and the neoMHS in hand, I trace out the evolution of the Canadian financial order from its 17th century origins to 1986 when the failure of two regional banks precipitated a public inquiry into banking system stability. Throughout this historical sketch, efforts are made to describe the changing relationship between bank and regulator. This swath of history is organized into four periods: 1608 to 1791 (early European colonialism); 1791 to 1867 (early colonial financial order); 1867 to 1964 (rise of the financial nation-state) and 1964 to 1986 (turn toward liberalization). These periods are marked by events which I argue signify the emergence of new configurations of structural forces. In each period, I attempt to answer three questions:

- what is the dominant national financial order (NFO) characterizing this period?
- how did banks behave under this NFO?
- what causes change in the NFO?

Three general findings emerge from this historical sketch. First, this is not a story of dramatic breaks and radical reversals, but rather one of continuities with a shifting emphasis between the interests of the state and private interests.

Second, the cumulative effect of these successive NFOs is the creation of institutional mechanisms, which when combined with market processes, have selected chartered banks as the dominant organizational form of private finance in the Canadian system. Third, the key events that shape the evolving Canadian

NFO tend to lead or lag similar events in other national jurisdictions, such as in the US or UK.

The Canadian financial order, 1986 to 2007

The national financial order that formed during the period leading up to the 2007 financial crisis was marked by two parallel developments. First, a commission of inquiry into the failure of two regional banks in 1985 found weaknesses in the bank regulation system, weaknesses which were remedied through the creation of a new bank supervisor with enhanced powers of intervention as well as through an overhaul of the larger multi-agency system of financial regulation. Second, growing momentum toward an increased scope of bank activities alongside increased industry concentration was halted through a public policy decision in 1998 preventing the mergers of four large banks. By the turn of the millennium, a stable national financial order had formed, lasting right up to the outbreak of the 2007 crisis. With this order as a backdrop, the behavior of banks leading up to the crisis is described.

2007 financial crisis and the essay's principal question

Awareness of the national financial order on the eve of the financial crisis assists in situating and assessing the responses by both the Canadian government and its regulatory agencies and the banks themselves during the crisis period, which began in August 2007, peaked in September 2008 and tapered off in 2009. Of interest is how the Canadian banks performed during this

period in comparison to their international peers. This is the basis of the Canadian resiliency puzzle.

Interpreting the performance of the large Canadian banks during the 2007 crisis within the context of the specific national financial order in place at that time prepares me to offer an answer to the principal question of this essay: did the behavior of the banks themselves, above and beyond that required by public regulations, play an important role in avoiding instability?

The following will begin with a description of the methodological framework, giving way to a review of the literature. The history of the Canadian financial order is traced out from the 17th century to the mid-1980s. The core section of the essay examines the transformation of the national financial order during the 1986 - 2007 period, setting the stage for a discussion of bank and state behavior during the crisis. It concludes with consideration of the essay's principal question.

1. Methodological Framework

To guide historical description and analysis in this essay, a political economy framework is developed by augmenting Robert Cox's "method of historical structures" (1981), a framework he developed for the study of international relations. It is generalized here for application to a national system of finance.

The interdisciplinary field of political economy features a smorgasbord of subdisciplines (for example, domestic political economy, international political economy) and approaches (or "schools"). According to one textbook, Canadian political economy features at least three schools – staples, liberal and socialist (Howlett and Ramesh, 1992), each distinguished by their core organizing concepts and normative assumptions about social reality. These three schools trace roots deep in Canadian scholarship, straddling economics, political science, history and other disciplines. The field of international political economy (IPE), itself an amalgam of international economics and international relations, also features at least two streams or factions, the more positivist-oriented American IPE and the more historicist-oriented British IPE (Cohen, 2007).

As one of the pioneers of British IPE, Cox proposes a framework that provides a concrete model for organizing and analyzing evidence, and thought in general. I will argue here that while Cox's framework emphasizes a historicist approach to research, it is also capable of having more positivist research approaches nested within it, such as the methods that tend to characterize American IPE. Further, I will show that Cox's framework is capable of being

generalized and applied to different levels of political economy, in this case national finance. Other scholars have recognized this potential in Cox's method of historical structures. For Sinclair (1996), Cox's "unique method for understanding the structures of world order has not been matched elsewhere ... for its flexibility and adaptability to research problems. Unlike other methods, [it is] designed to incorporate both static and dynamic aspects of structures, and thus the use of historicist and positivist epistemologies is conceivable within the parameters of his method, in different instances" (p. 8).

The following describes Cox's method of historical structures (MHS) and compares it with other approaches in political economy. It begins with a description of the three structural categories that compose a historical structure, followed by an explanation of how this configuration of three structures is then applied to three levels or spheres of social activity that Cox sees as the primary constituents of the broader totality that is the international political economy. It is on this latter point, that on the application of the tri-categorical structural complex to three inter-related spheres of social activity, where I argue the MHS can be generalized and applied to other subject matter in political economy. The second half of this section compares the MHS to two major schools in political economy, rational choice institutionalism (RCI) and historical institutionalism (HI). In exploring the similarities and differences between these three schools, an argument is made for modifying Cox's original MHS, drawing on the complementarities offered by RCI and HI. To conclude, a neo-Coxian method of historical structure is re-stated.

1.1. The general method of Robert Cox

Robert Cox's distinction between two types of theory, problem-solving theory and critical theory, is premised on the twin assumptions of a mutable social reality capable of change and of the fallibility of human knowledge claims about this reality (Cox, 1992, pp. 144-145). Theories are not inherently time consistent. Over time, there can be a rupture in the correspondence between a theory and the observed (limited) reality the theory intends to explain. The resulting anomaly creates pressure to ask whether there is an aspect of the reality that was previously unaccounted for or if the nature of reality has changed and the previously held theory no longer explains it. These moments of rupture in the order of things motivate Cox to distinguish between the synchronic and diachronic modes of thought (1976, p. 196). Cox uses the term synchronic to describe the time dimension where the constituent factors of reality are fixed. In contrast, the diachronic time dimension is where some or all of these constituent factors are in flux. Where the former mode of thought gives a mental representation of reality like a static photograph, capturing a moment in time, the latter mode gives a dynamic motion picture.

For Cox, problem-solving theory (PST) is synchronic in nature, taking the "world as it finds it" (1981, p. 128), with the prevailing social structures underpinning the object of inquiry taken as given. Positivist science is an appropriate methodology in this mode where the object, or problematic, is framed as fixed at that moment in time and space. One advantage of PST is that in using analytic devices that hold constant factors outside the problematic's frame,

the investigator may discover regularities in the activities under examination. Successful discoveries are useful in the practical sense, and thus an advantage of the approach. A drawback is the difficulty encountered by the PST approach when a rupture in the order of things is experienced and existing theory is at a loss to explain the anomaly. Here, the critical theory (CT) approach seeks to overcome this shortcoming by focusing on the detection of such ruptures or shifts in the order of things as they occur in history. Whereas the positivist mode of thought seeks to reveal the regularities of a certain period of stability, the historicist mode of thought seeks to uncover the structural breaks between periods of stability and explain the transformation from one structural configuration to another (1985, p. 53).

Cox regards PST and CT as complementary.² While each begins with the same problem or puzzle, PST narrows analytically, holding some aspects of reality constant in the synchronic mode, while CR expands to explore the continuing process of historical change in the diachronic mode. Seeing the strength of one approach being the weakness of the other, Cox proposes that “critical theory contains problem-solving theories within itself” (1981, p. 130). Cox describes his approach to international relations as critical theory, contrasting it with the predominant realist paradigm, which he sees as organized around the problem-solving theory approach.

² One may find this positivist-historicist distinction throughout scholarship. The 1971 debate *Human nature: justice versus power*, finds Noam Chomsky wearing the positivist hat and Michel Foucault the historicist hat as they examine the question of whether there is a common human nature.

1.2. The method of historical structures

In taking a critical theory direction to theorizing about international relations, Cox develops a novel method, the method of historical structures. The development of theory takes place within a historical context in which an actor acts, or what Cox calls a “framework of action”. Cox asserts that the “the framework has the form of a historical structure” (Cox, 1981, p.135), qualifying that the framework of action does not act in a mechanical or deterministic way on the subject, but rather provides the context or the environment in which the subject acts. The subject can exercise free will, but within the confines of the framework of action.³ As a historical structure can change over time, a task of the critical theorist is to find out why. Here the theorist employs both the synchronic and diachronic modes of thought in the interest of identifying historic structures and the breaks (or conjunctures) that separate them.

The three forces of the historical structure

Cox proposes that there are three primary structural forces interacting in a historical structure in which the subject acts. Its epistemological counterpart, a mental representation, also features these three categories of forces (or potentials): 1) material capabilities, 2) ideas and 3) institutions (Cox, 1981, p. 136). Ideas are understood as thought patterns either as broadly held

³ Here, one draws a parallel to Marx’s famous aphorism: “men make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past” (1852, p. 595).

intersubjective meanings or as diverse collective images held by different social groups (p. 136). Human institutions, both formal (including formal rules, laws and regulations) and informal (including customs, mores, and habits) are understood by Cox as a “means of stabilizing and perpetuating a particular order” (p. 136). Material capabilities describe existing forces of production. See Figure 1 below.

In the writings of Cox and his students, we can find several operational guidelines associated with the handling of historical structures. There is no a priori determined relationship, hierarchically or unilaterally, among these three categories of social forces. The causal directions among the forces may only be ascertained in the particular history-bound issue in question (p. 136). Another point is that the articulation of a historical structure is a synchronic act. The structure represents a snapshot, capturing forces at a moment in time. They may be understood as Weberian “ideal types” or essential reconstructions (although not reductions) representing “persistent patterns” among the three categories of forces (Sinclair, 1996, p. 9).

Once the investigator has identified and articulated the historical structures for a particular (limited) sphere of human activity for at least two distinct historic periods, she is then able to juxtapose and compare these two historical structures (Cox, 1981, p. 137). This allows comparison across time without the reliance on the *ceteris paribus* device (where non-focal factors are held constant) used in comparative statics methods and other problem-solving strategies. Tracing the movement from one structure to another involves a shift in

analysis to the diachronic mode. This facilitates our understanding of the nature of the transformation of the historical structures.

Figure 1. The three forces of the historical structure

The three spheres of social activity

Having introduced the three categories of structural forces, the next step in Cox's method of historic structures is to employ these three forces in the exploration of three levels, or spheres, of social activity: 1) social forces (in the organization of production), 2) forms of state (various state-society configurations), and 3) world orders, or the "configurations of forces which successfully define the problematic of war or peace for the ensemble of states" (p. 137). While the three levels are interrelated, Cox qualifies that "the relationship among the three levels is not, however, simply unilinear" (Cox, 1981,

p. 138). The term sphere, rather than level, thus helps avoid confusion in this regard. See Figure 2 below.

Figure 2. The three spheres of social activity

With three categories of forces applied to three spheres of activity in the synchronic dimension, we can visualize a three-by-three matrix. Cox suggests a two-step procedure to describe the historic structure. The first step is to describe, using the three categories, each of the three spheres separately. This is a “preliminary approximation” of “particular configurations of material capabilities, ideas and institutions” (p.138). On their own, “each of three levels can be studied as a succession of dominant and emergent rival structures” (p.137). This may be a valuable research activity in its own right, partial though it may be. Going further, the second step seeks to consider these approximate configurations of the three spheres in relation to each other and move “towards a

fuller representation of historical process” where “each will be seen as containing, as well as bearing the impact of, the others” (p. 138). In other words, the second step involves the integration of the three approximations of the first step for that moment in time.

Here lies an advantage of the method of historic structures. In confronting a complex reality, whether framed as a moment or over an expanse of time, problem-solving theory employs a research strategy that involves single lines of inquiry buttressed by simplifying assumptions to yield tractable analytic results. As an example of historicist critical theory, the method of historical structures avoids the weaknesses of this precise yet narrow approach to inquiry, especially the challenge of reconstituting larger representations of reality using insights gained from positivist analysis. It does this by attempting to capture a total representation, albeit limited, of the object under inquiry, the historic structure, noting that this total representation is an essential ideal type.

The method of historical structures may not only be used to explain the past but also explore feasible alternatives to contemporary historic structures, the ones we live in. Here we see the normative content of critical theory. By exposing or laying bare the conflicts and contradictions of current historical structures, we are locating the weaknesses or fault lines from which new structures may emerge, including new structures that may emerge through the conscious, purposeful actions of social beings. In Cox’s words, “to identify such points and then to consider what paths of change are imaginable in the light of

the power relations bearing upon these crises would be a valid method of thinking toward the future” (Cox, 1976 p. 196).

1.3. Generalizing the method of historical structures

Cox applies his method to the problems of world politics. Is it possible that Cox’s method be generalized and applied to a different set of problems, outside of international political economy? An answer may be found through two separate critiques of Cox’s work. The first issue is over whether one category of force is preeminent among others when wielding the method of historic structures. Despite Cox’s emphasis in his 1981 article that there this no a priori hierarchical or unilateral relationships among the three structures, critics have observed that Cox nonetheless tends to place primacy on production in his research (Schechter, 2002). Cox (1992) does address this question, writing that he does not assume the primacy of production, but instead sees the choice to emphasize one over others as a matter of preference and the question asked (pp. 179-183). While Cox’s focus on production may in part be attributed to personal choice, this does not confine where emphasis may be placed on subject matter.

The second issue is about how Cox categorizes and abstracts in his analysis. Burnham’s (1999) critique of Cox’s apparent fetishizing of labour markets “as discrete, technical, economic arenas” (p. 38), a symptom of a deeper tendency shared by both critical and problem-solving theorists alike, who “separate social reality into rigid categories and look for external links between artificially disaggregated phenomena” (p. 39). The risk is that the theorist “fail(s)

to grasp the complex organic set of social relations which is the global economy” (p. 40), impairing his or her efforts to accurately represent the limited totality under examination. Burnham fails to see that separation and abstraction is an unavoidable and indispensable mental activity for all thinking subjects confronting a complex reality. Refraining from abstraction, however artificial and provisional it is, would make the task of understanding impossible. Cox’s method of historical structures is an exercise in abstraction to understand historical change, a manifestation of a complex reality. As the researcher is limited or bounded in cognitive ability, she or he must rely on abstraction to make sense of external reality. The resulting representation of the world in its entirety or totality is unavoidably partial and fragmented. However, an effective critical thinker who is agile with conceptual categories and when moving between levels of abstraction (including between synchronic and diachronic time dimensions) should be able to overcome some of this partiality through iterative correction and adjustment. There is no evidence that suggests Cox would oppose wielding the method of historical structures in this flexible manner.

These two arguments above give confidence that the MHS can be generalized and applied to spheres of social activity other than those used in Cox’s study of world order. This essay proposes that one sphere of activity shift from world order to national order and that emphasis be placed on one aspect of production, that of finance.

1.4. Situating the method of historical structures

As the method of historical structures features institutions as one of its three structural categories, the following will compare Cox's method with two other schools in social science which emphasize institutions, rational choice institutionalism and historical institutionalism. The usefulness of this comparison will become apparent later in the literature review when I examine two works using these approaches to examine Canada's experiences in the 2008 financial crisis.⁴ In his 1997 survey of comparative political economy, Hall sees three general approaches that use interests, ideas and institutions. Noting the possibility of incorporating insights from the approaches of interests, ideas and institutions into a single analysis, Hall observes that "some of the most exciting conceptual developments in the field are those taking place at the margins of each approach where it interfaces with the others" (Hall, 1997, p. 189). The MHS integrates ideas and institutions. But how does the MHS compare with other prominent schools in social science that take institutions seriously, in an age where "we are all institutionalists now" (Pierson & Skocpol, 2002)? I will briefly sketch two dominant approaches actively used in political economy research, rational choice institutionalism (RCI) and historical institutionalism (HI), noting the

⁴ Apart from its relationship with rational choice institutionalism and historic institutionalism, Cox's method of historic structures also appears to be part of a family of social theories organized around the structure-agency relationship where primacy is given to neither. Two examples of such social theories are the transformative model of social action (TMSA) developed by Roy Bhaskar as part of his critical realism project (Bhaskar, 1979; Lawson 1994) and Anthony Giddens's structuration theory (Giddens, 1984; Elliot, 2014). The TMSA and structuration theory share several first principles with Cox's MHS.

variation between them in terms of underlying philosophical premises and core organizing principles.⁵

Rational choice institutionalism

Rational choice institutionalism's (RCI) approach to the study of behavior in an institution-mediated environment harnesses the behavioral definition of rational choice (where actors, befitted with exogenous preferences, seek optimal outcomes) and the method of neoclassical economics. The paradigm features theoretical microfoundations, an equilibrium orientation, and a deductive line of analysis from basic axioms to testable hypotheses to empirical implications (Shepsle, 2006, pp. 23, 32). RCI see politics as a series of collective action quandaries (such as the prisoners' dilemmas and the tragedy of the commons) where institutions provide the rules of the game allowing stable outcomes (or equilibria) of these processes of strategic interaction among actors (Hall and Taylor, 1996, p. 945).

Early research along the RCI line began with legislative voting behavior, later to be applied to other situations of strategic interaction among actors, often in a structured institutional space such as a formal organization where there are clear rules of interaction and the actors are endowed with equal power resources (Shepsle, 2006, p. 28; Hall and Taylor, 1996, p. 943). It is in the structured institutional space where RCI has enjoyed the most predictive success, although

⁵ Hall and Taylor assert that rational choice institutionalism and historical institutionalism, along with sociological institutionalism, all "developed in reaction to the behavioural perspectives that were influential during the 1960s and 1970s and all seek to elucidate the role that institutions play in the determination of social and political outcomes" (1996, p. 936).

the approach has also made in-roads into the study of unstructured institutional situations, such as the problem of cooperation and repeated prisoners' dilemma games (Shepsle, 2006, p. 30). RCI is the exemplar of the "calculus" approach to institutions (Hall and Taylor 1996, p. 945), offering elegant, parsimonious explanations of social behavior in an institutional setting built on defined behavioral microfoundations, explanations that accumulate in wider systems of theory. RCI research draws our attention to social situations of strategic interaction driven by actor expectations, and how institutions provide greater certainty through flows of information to actors in otherwise uncertain environments. Finally, RCI provides an explanation for why certain institutions emerge and persist. The greater benefits conferred on the actors participating in the game, versus those in alternative institutional arrangements, incentivize the maintenance of the status quo (p. 945).

Some of the features that have contributed to RCI's relative success are also its weaknesses. These include the narrow definition of agency behavior (that of the hyper rationalist homo economicus), the assumption of frictionless exchange between actors in social processes, and the discounting of the role of the past in shaping the problem under consideration (Shepsle, 2006, p. 34). While such assumptions are perhaps necessary to allow feasible analysis, research success tends to be associated more with narrow predictive successes than realistic explanation. Important dimensions of social interaction other than ones characterized as strategic games between individuals, are missed or downplayed. Further, the search for equilibrium while ignoring the processes

leading to equilibrium, introduces a paradox: how did the origins, the initial conditions of the problem, come about? Were they also conditions of equilibrium? If so, what factor perturbed the problem or system that led to change? Furthermore, did the power resources among the actors remain symmetric and constant throughout the process (Hall and Taylor, 1996, p. 951)?

Historical institutionalism

The questions that arise when RCI treats history with its equilibrist methodology are in part avoided by the historical institutionalist (HI) school. In seeking answers to the general question of how do institutions affect the behavior of individuals, HI utilizes a broader definition of institutions and individual behavior than RCI. Hall and Taylor (1996) find that HI scholars can adopt both the calculus approach of RCI and the “cultural” approach characterized by sociological institutionalists, with the emphasis on the bounded worldviews of actors, their use of routines, heuristics and templates (both moral and cognitive), as well as the role of interpretation when agents apprehend social situations (p. 940).

HI is also distinguished by the seriousness with which it handles history. Rather than seeing history as solely a data mine or as a source of illustration, HI researchers pay careful attention to the historical tapestry in making causal claims about why things happen in certain way. This stance necessitates taking a long view of time in a bid to understand the slow-changing social processes that could otherwise be undetected when taking a short view. This stance also involves care in identifying the sequence of events relevant to unpacking the

causal mechanisms at play, as well as recognizing conjunctures, those critical moments or periods in history when there are fundamental shifts in the established order of things (Pierson and Skocpol, 1996, p. 693; Hall and Taylor, 1996, p. 942).

HI scholars ask how institutions originate and develop over time, giving such institutional effects as path dependence, which is a self-reinforcing historical process induced by positive feed-back triggered by a particular institutional configuration (Pierson and Skocpol, 1996, p. 699). Here, we see the importance of understanding how such institutional configurations define the temporal process under analysis, which may feature a gap between actions and long-term, possibly unintended, outcomes (pp. 708-9). Unlike RCI in its ideal form, HI does not assume symmetry of power between the actors involved in an institution's genesis, like in Hobbes' state of nature. Further, there is interest in how institutions are reproduced by social actors and how they co-evolve with one another, including in situations of institutional layering. The HI method has been applied to understand such large historical questions as the nature of social revolutions (Skocpol, 1979), the emergence of the nation state (Tilly, 1992) and the rise of market society in the United Kingdom over the 19th and early 20th century (Polanyi, 1944).

In entertaining the premise of a reciprocal relationship between institutions and actors, HI theorists can ask how institutions affect the underlying preferences or identities of actors. This may demonstrate "how even highly instrumental actors choose strategies from a culturally-specific repertoire" (Hall and Taylor,

1996, p. 951), a synthesis of the calculus-approach of RCI and the cultural-approach of the sociology of institutions. This allows explanations of institutional persistence for reasons not only of efficiency but also of social legitimacy. Further, the openness displayed in HI research to factors other than institutions (say, ideas) that may also be causally responsible for social continuity and change underscores the ability of the HI tradition to integrate more than one line of inquiry.

While HI researchers are eclectic in their choice of methods (Pierson and Skocpol, 2002, p. 694), they tend to share the characteristic of scouring the historical record to make inductive arguments (Hall and Taylor, 1996, p. 954). While this may enhance the realism of such analyses, it does create a challenge for determining the basis of judging competing explanations. A consequence of this is that HI is relatively slow, compared to RCI, at building a system of generalized theory. A further weakness is a relative lack of rigor in explaining actor behavior, creating a tendency to be “so focused on the macro-level processes that the actors involved in these processes drop out of sight and the result begins to look like ‘action without agents’ ” (p. 954). One explanation for this criticism may be the hesitancy of HI researchers to adopt the behavioral assumptions of rational choice theorists, and instead proceed without clearly defined microfoundations.

MHS, RCI and HI in comparison

Returning to Cox's distinction between two types of theory, it should be clear from these descriptions of RCI and HI that RCI, with its ahistorical, deductivist methodology, aligns with positivist problem-solving theory, while HI is more historicist and critical in orientation, sharing much with the method of historical structures (MHS). See Table 1 below for a comparative summary of the three schools. Both HI and MHS maintain broad definitions of institutions, both formal and informal. While focusing on institutions, scholars who identify with HI show a willingness to integrate other lines of structural inquiry into their research, lines that figure in the MHS, such as the role of ideas. Both schools go beyond the efficiency argument for explaining the origin and persistence of institutions, seeing social legitimacy and perpetuating social order as alternative explanations. With respect to history, HI and the MHS show deference to the idea of a real, existing continuity of social processes, punctuated by events, which can be represented as a narrative. Thus, the MHS and HI are both committed to diachronic analysis, where structures are assumed not to be fixed but in flux. Researchers approach the historical record as historians. The record is more than just a data mine for testing hypotheses. Further, HI and MHS researchers are interested in conjunctures, those periods of institutional change. For them, institutions are born inside human history, often in unequal conditions among actors, rather than outside history through consent among equal actors interacting in a Hobbesian state of nature. Causal claims tend to be inductive.

One practice that historical institutionalism may lend the method of historical structures is its use of process tracing in its historical analysis at both macro-levels and meso-levels (Pierson and Skocpol, 2002, p. 698). It advances the juxtaposition approach advocated by Cox, in that process tracing helps delineate the transition path or traverse⁶ between two periods of institutional stability, which may be represented as historical structures. Process tracing helps us reveal the causal relationships animating the conjuncture. Further, it helps guard against actors getting lost among the structures in the analysis, by recognizing the historic characters (both individuals and groups) in the analysis. For these reasons, two categories (for description and analysis) should be added adjacent the three structural categories in the MHS: 1) processes (for example, economic and political processes) and 2) actors.

Rational choice institutionalism (RCI) is distinct from HI and MHS in its approach to institutional analysis. Its positivist orientation features a single line of focus on narrowly defined institutions. The behavior of the actors is explicitly specified, albeit narrow and arguably unrealistic. Models are used that feature the actors interacting strategically, resulting in outcomes evaluated in terms of efficiency. Its mode of inference is deductive (Shepsle, 2006, p. 23).

As an example of problem-solving theory, RCI does present a demonstrably sophisticated method in explicitly exploring the behavior of interest-bearing actors and how their interactions play out in strategic action. The

⁶ The traverse is the “path between two points that represent states of an economy. In the historical time sense, it is a transition path of an economic system in motion. Points along the traverse represent adjustments of capital and labour in response to new conditions” (Lavoie, 1999, pp. 1182-3). Traverse analysis implicitly draws a connection between historical time and path dependency in economic systems.

exemplar in this case is game theory and its applications to problems such as the prisoners' dilemma. Analysis in the RCI framework is synchronic. Parameters, such as behavioral and institutional definitions, are fixed for a determinate analysis using formalized theory.

This relative strength of RCI may be lent to MHS. While the method of historical structures conceives of ideas and institutions as structures, it does not have a prescribed systematic treatment of actor behavior, other than reference to conflict among groups and differences in held ideas. Citing Germain (1999), nesting problem-solving research strategies, like those of RCI, within a wider critical theory framework such as MHS promises interesting syntheses. It may be possible to apply research strategies like those of RCI within a carefully understood historical context, which includes a description of the interests, or preferences, of the actors revealed by use of the method of historical structures. One needs to locate the interests and behaviors (including strategies) of actors in relation to the historical structure of the temporal period under examination. Specific actor characteristics, such as interests and behavior, are not subordinate to structures but in a semiautonomous sphere. Actors interact in social processes (such as market exchange, or democratic elections) that are organized in a structured environment. In other words, structures interface with actors through processes.

If there has been resistance by historicist scholars to utilize the sort of actor-centered analysis practiced in the RCI framework, it may be due to RCI's allegiance to the tenets of rational choice theory as well as to other assumptions

which gird the neoclassical economics model of exchange between rational actors. However, as Shepsle recognizes, recent developments in the areas of behavioral economics and transaction-cost economics have given alternative specifications of actor behavior and the context of interaction (2006, p. 34)

Furthermore, the criticism of RCI's ahistorical posture is at least partly addressed by the analytic narratives method developed by Bates, Greif, Levi, Rosenthal and Weingast (1998), helping blur the lines between RCI and HI (Shepsle, 2006, p. 34). The analytic narrative approach marries historical process tracing with the use of analytic models in investigating the social mechanisms at work in the processes and conjunctures under investigation. Analytic narratives is an illustration of a problem-solving strategy embedded within a historical structure framework. In such an analysis, one utilizes a narrative mode of explanation while harnessing models of actor behavior informed by bounded rationality theory and behavioral economics. The context of this problem is informed by the MHS, which can provide a check on the appropriateness of the specification of the problem.

Support for integrating and synthesizing these three distinct approaches to political economy is found in invitations in the literature. Hall and Taylor (1996) explore the possibilities of integrating three distinct approaches to institutions, noting that historical institutionalism is best positioned to draw upon the insights provided by both the calculus-oriented rational choice institutionalism and the culture-oriented sociological institutionalism. Elsewhere, Gamble (1995) makes the case for a "new political economy", an interdisciplinary field that marries four

disciplines (international political economy, state theory, government-industry relations and public choice) that are increasingly convergent in their subject matter and complementary in their methods.⁷

Table 1. Comparison of rational choice institutionalism, historical institutionalism and the method of historical structures

	Rational Choice Institutionalism	Historical Institutionalism	Method of Historical Structures
Line(s) of structural inquiry	Institutions	Institutions, but open to others	Institutions, ideas, material capabilities
Definition of institution	Narrow (formal)	Broad (formal and informal)	Broad (formal and informal)
Explanation of origins and persistence of institutions	Efficiency	Efficiency and other (e.g. social legitimacy)	Stabilize and perpetuate social orders
Behavioral microfoundations	Well-specified, narrow (rational choice)	Not specified	Not specified
Relation between actor behavior and institutions	Separate	Interdependent	Interdependent
Actor interaction	Strategic	Strategic and non-strategic	Not specified
Distribution of power	Symmetrical	Asymmetrical	Asymmetrical
Competition and conflict	Competitive/cooperative game on an equal playing field	Not certain	Conflict is commonplace
Approach to history	As a scientist. Solely for proof and illustration of proposition	As a historian. Concern for the continuous narrative of past events.	As a historian. Concern for the continuous narrative of past events.
Mode of temporal analysis	Synchronic	Diachronic	Synchronic and diachronic

⁷ Gamble's "new political economy" program promotes linkages and cross-pollination across disciplinary lines, "in which the historical and institutionalist analysis of structure is combined with the rational choice analysis of agency" (1995, p. 516).

Level of (institutional) analysis	Micro	Meso and Macro	Macro
Signature mode of analysis	Comparative statics	Process tracing	Juxtaposition
Inference	Deductive	Inductive	Inductive
Methodological orientation	Positivist	Historicist	Historicist
Type of theory	Problem-solving theory	Not certain	Critical theory

Sources: Cox (1981), Shepsle (2006), Hall and Taylor (1996), Hall (1997), Pierson and Skocpol (2002).

1.5. A generalized neo-Coxian method of historical structures

The proposition advanced here that Cox's method of historical structures can be modified and generalized is consistent with arguments by Hall and Taylor (1996) and Gamble (1995) for integration and synthesis in political economy. In its original incarnation, the MHS offers a model for integrating ideas and institutions, along with material capabilities, as lines of structural inquiry. To the extent that problem-solving research strategies can be nested within the MHS, actor interests, along with behavioral characteristics, may be handled in a separate analytic category in an expanded MHS framework. As argued above, there is evidence that suggests Cox himself would endorse such a project.

The expanded MHS framework

I can elaborate an expanded framework inferred from this literature:

1. The original MHS articulated by Cox serves as a template for elucidating historical context and positioning problem-solving research.
2. Embedded within the MHS framework is a space to explore the interaction between actors within the structural context as well as the relationship between actors and structure. While inquiry within this space may take

the form of problem solving, there is no prior commitment to a specific approach to actor behavior, such as rational choice theory or behavioral economics.

3. Actions as they occur in the stream of historical time can be framed as belonging to processes, including political and economic ones. Social processes are the media through which structures and actors interact.
4. Processes and actor behavior, as analytically distinct spheres, are thus added to the MHS framework.
5. In addition to juxtaposition, process-tracing methods (such as analytic narratives) may be used to understand both periods of structural stability and change.
6. The framework need not be confined to the international level of the world system.

Applied to national financial order

I seek to apply this last point to the three levels or spheres where Cox applies the MHS framework, namely, social forces, forms of state, and world order. In his blueprint of a new political economy program, Gamble (1995) argues that analysis need not be confined to one level of the social system, such as the international level. While Cox applies the MHS to a specific level of system order, that of world order, I choose to employ the MHS to national financial order, that is, the “particular configuration of forces which successively define” (Cox, 1981, p. 138) the problematic of national finance. I define the

problematic of national finance as how state actors and private economic actors combine to supply financial services.

Two delimiting acts are involved here. One involves focusing on the configuration of forces, or structures, bearing on just one sector of the national economy, the financial sector. Other sectors of the national economy, say manufacturing or the distributive trades, are deliberately left out of focus to allow feasibility of (historical) analysis. This is a provisional closure; it does not presume that these other sectors do not exist or have no relevance for the understanding of the national financial sector. This view on provisional closure also applies to the second delimitation, that of a national financial system as distinct from the international or global financial system. The linkages between the national financial system and the wider community of national financial systems are not of central focus.⁸ Both of these closures help organize the elaboration of a “preliminary approximation” (Cox, 1981, p. 138) or a limited totality, that can later be used to build a fuller representation of a wider totality. But for the purposes here, these delimitations are kept in place.

Similar delimitations will be applied to the other spheres of activity. Given the focus on finance, the general sphere of social forces related to the production process will be narrowed to emphasize the financial dimension, that of lenders and borrowers. Likewise, the category of forms of state is narrowed to the historical forms relevant to the period under consideration. In the case of

⁸ That said, the influence of the wider international financial systems, including both the impact of the international financial institutions (governance) such as the International Monetary Fund (IMF) and the bilateral relations with other national financial systems (such as the United States) cannot be totally ignored

Canadian financial system, this may entail the recognition and scrutiny of a wide litany of state forms that are argued to have characterized the Canadian state over its history; for example, colonial state, national-dream state, welfare state, neoliberal/regulatory state (Panitch, 1977, Hall and Soskice 2001, Braithwaite, 2008).

In his 1981 paper, Cox provides two visualizations of the MHS, one featuring the three structures (or forces) (see Figure 1 in the Appendix) and one featuring the three spheres of activity (see Figure 2). Given the change in focus described here, the three spheres of activity may be re-labeled as Figure 3. Each of these spheres of activity are explored by the three forces. One can visual a fully articulated historical structure model featuring the three spheres described through the three forces. Figure 4 gives a partial model, with the limited totality of national financial order described by the three structural forces. However, with the temporal dimension missing, these models are specified only for synchronic analysis. To include the temporal dimension for diachronic analysis, it is easier to adopt a matrix model which features time on the horizontal axis and focuses on one sphere of activity at a time (see Figure 5). This dissertation will deal with national financial order. The structures that configure national financial orders may be traced out by category over time to identify not only the periods of stability for each distinct national financial order but also the transition periods where there is a shift from one order to another. But as discussed above, this tracing out from order to order should be aided by including categories of social processes and actors. These are featured in the

matrix under the structural categories. This is the fully articulated model of the historical agent-structure matrix for investigating the evolution of the Canadian national financial order from its colonial roots to present days.

This articulated neoMHS framework will be applied to the historical record to explain the puzzle of Canadian bank resiliency during the 2008 financial crisis and prepare the groundwork for answering this essay's principal hypothesis about bank behavior during the crisis. However first, it is used to organize and evaluate the existing literature on the Canadian puzzle.

Figure 3. The three spheres of social activity, adapted for national finance

Figure 4. Partial model of three spheres described through three forces

Figure 5. The historical structure matrix for studying the evolution of a sphere of social activity

TIME	T=1	T=2	T=3
Structural Forces			
Institutions			
Ideas			
Material Capabilities			
Social Processes			
Economic			
Political			
Actor Behavior			
Strategic			
Non-Strategic			

2. Review of the literature of Canadian bank stability

We now turn to the literature on the puzzle of why the Canadian banking system fared better during the 2008 crisis than other national systems, including that of its southern neighbor. How does this literature, this set of explanations or theories about the Canadian banking puzzle, speak to the neoMHS framework and its primary organizing concept, national financial order? This involves applying the neoMHS framework as a template or lens to the gathered literature. Recall that the framework features three categories of structural forces (institutions, ideas and material capabilities) that may be employed to understand a particular sphere or arena of social activity; in this case, national financial order. National financial order is defined as the structural configuration that describes how state and private actors combine to supply financial services. Adjacent to the three categories of forces are the categories of social processes and actor behaviors. This framework can swivel on the temporal axis, between the synchronic “snapshot” dimension and the diachronic “motion picture” dimension.

The application of the neoMHS framework reveals the following conclusions about the literature. The set of explanations or theories about the Canadian puzzle in 2008 is part of a wider, longer discussion about the consequence of industry structure for Canadian banking. Leading up to the crisis, the emphasis was on efficiency effects. In the wake of the crisis, there was a shift towards stability. In explaining Canadian bank stability, institutional structures tend to be the leading factor offered, with the behavior of the banks

being secondary. These accounts tend not to delve into the historic origins and development of these institutional structures, being satisfied with an accounting of the causal factors present at the time of crisis. However, at least two works do probe the historic evolution of the structural factors that compose the Canadian financial order in 2008. Calomiris and Haber (2014), using a rational choice institutional (RCI) framework, focuses on the historic roots of institutions while Bell and Hindmoor (2015), using a historical institutional (HI) approach, dwells on the conditions in the immediate years leading up to the crisis.

Just as confronting Cox's original method of historical structures with the methods of RCI and HI led to a new framework, the application of the neoMHS lens to these two works above advances the larger discussion of the Canadian puzzle. The incongruity between the explanations offered by Calomiris and Haber (2014) and Bell and Hindmoor (2015) presents an opportunity for using the neoMHS framework to describe the Canadian financial order that existed on the eve of the financial crisis as one of a succession of several national financial orders that have existed historically. The neoMHS framework would then seek to explain the behavior of the banks and regulatory authorities in the context of this NFO.

2.1. Situating the literature in space and time: the shift from efficiency to stability

As an eclectic literature spanning the 2008-2015 period, it features both shorter essays written for a popular audience and longer, more academic essays. A first step is to situate this literature, a set of ideas, within time and space. The scholars and journalists who contribute these writings are historical actors, too, reinforcing or challenging conventional understandings about the subject matter.

One immediate characteristic is that the Canadian financial order is often explored through comparison with that of the United States. Canada's relatively resilient performance is in marked contrast to the calamity experienced in the US banking system, which is curious, given the similarity of the two neighbors. In addition to the shared North American geography, Canada and the US have a shared history as both were part of the British imperial empire at one time, and thus have a common linguistic, cultural and institutional background. The two economies are deeply integrated with respect to trade and investment, manifest in a multiplicity of interconnecting channels. This sharp contrast in crisis performance despite their similarities and shared history magnifies the puzzle, naturally inviting comparative analysis of national financial orders.

A second observation about this literature is that it represents a break in the historical discourse about the Canadian bank industry, where interest shifts from bank system efficiency to bank system stability. This literature prior to the 2008 crisis tended to be preoccupied with bank policy issues relating to

efficiency, competition and contestability, issues intrinsically linked to questions of whether large Canadian banks should be permitted to merge and whether to open the Canadian financial services sector to foreign competitions and ownership. Bank stability was discussed in the context of the “stability-efficiency” trade-off, where it was argued that greater stability comes at the cost of less efficiency, and that greater efficiency (realized either through lower consumer prices or higher bank profits) is restrained by a relatively concentrated bank market with high barriers to entry. While this literature varies by audience, from the technical (Northcott, 2004; Allen, Engert and Liu, 2006) and the scholarly (McIntosh, 2002) to the public policy commentary (Bond, 2003), together it arguably represents the state of thinking among policy elites in Canada on the eve of the 2008 financial crisis.⁹ This is not to say that the issue of bank risk and stability was entirely absent in the Canadian literature (see Engert, 2005). However, the events of fall 2008 not only brought to the attention of policy elites the resilient features of the Canadian banking system evident then but also in other past financial crises such in 1930 and 1907 (Bordo, Redish, & Rockoff, 2011). This signifies not only a break in the historical discourse, but possibly a

⁹ This set of ideas shared by domestic policy elites also aligned with a set of ideas asserted to be held by international policy elites (Stiglitz, 2002), such as the central tenets of the so-called Washington Consensus (1990). Policy ideas aimed at achieving greater bank system efficiencies are also found in the recommendations of the International Monetary Fund (IMF) in its Article IV reports on Canada. On the eve of the bank merger decision in late 1998, IMF staff noted “there is considerable scope for reducing barriers to entry into the financial system by both domestic and foreign investors that would serve to increase competition in the financial sector” (IMF, 1998). This policy view would continue to be voiced through the early millennia as late as February 2008 when IMF staff recommended opening the Canadian financial services sector to foreign ownership to promote innovation in the provision of credit to small businesses (IMF, 2008). However, this recommendation is conspicuously absent from post-crisis Article IV Reports (IMF, 2011).

shift in the consciousness of this social group. Using the neoMHS framework as a lens, this may be construed as a structural shift in the realm of ideas.

2.2. Bank stability: mainly an institutional story

Most authors cite institutional structures as the principal explanation of stability of the Canadian financial order. They tend to list these institutional structures without seriously delving into their historical origins and development, betraying a synchronic mode of thought when explaining the puzzle. The responsible institutions can be organized under three categories: those that pertain to banks and bank industry, regulators and the mortgage market.¹⁰ Many of these institutional factors cited are the consequence of public policy.

Bank and bank industry

An oft-cited strength of the contemporary Canadian banking industry is that it is a nation-wide branch banking system (Rabson, 2008; Booth, 2009; Calomiris and Haber 2013, Seccareccia, 2013). Branch banking, rather than the unit banking model in the US, became the dominant banking form in pre-Confederation Canada. Adjacent to this banking model are the legal barriers to entry that have existed in one form or another since the early 19th century, beginning with the initial licensing of banks by the Upper Canada legislature using time-limited charters (Ireland and Webb, 2011). Barriers to entry combined

¹⁰ A fourth category “macroeconomic structures” received fewer references in the literature. White, Northcutt and Paulin (2009) assert that strong macroeconomic fundamentals, such as the introduction of an inflation targeting monetary policy regime and the campaign to reduce government indebtedness in the mid-1990s, positioned Canada’s wider macroeconomy to absorb the financial shock of 2008.

with the branch banking approach conditioned a competitive process that selected banks over time, with some early banks either merging or exiting the market. By 1920, five large banks, as they are currently recognized, emerged to dominate the market (Bordo, Redish and Rockoff, 2011, p. 33). Further transformation of the financial services industry was enabled through Bank Act amendments in the 1980s and 1990s, allowing the large Canadian banks to acquire trust and mortgage loan companies and securities dealers. This resulted in six universal banks offering full service in both commercial and investment banking, as well as in wealth management (Porter and Coleman, 2003). A financial services market concentrated among a few large banks created a simpler, less complex system of banks to regulate as compared to the more fragmented, multi-tier US banking system (Krugman, 2010; Boone and Johnson, 2010; Knight, 2011). Further, Canada's financial system had evolved as a bank lending-centered system, in contrast to the market lending-centered system of the US (Bordo, Redish and Rockoff, 2011).

Regulators

Institutional structures also explain the effectiveness of Canadian bank regulators in supporting bank stability. Calomiris and Haber (2013) observe that bank regulation is exclusively within the federal jurisdiction in Canada, as specified in the 1867 Constitution Act, muting opportunities for regulatory arbitrage¹¹. This contrasts with the United States where banks can be regulated

¹¹ Regulatory arbitrage is when firms search for and use unintended advantages ("loopholes") in a regulatory system or between regulatory systems.

at either the federal or state level. Thus, the financial regulatory apparatus that has developed since 1867 has thus been more centralized at the federal level, involving fewer regulatory organizations (Ireland and Webb, 2011). The different regulatory agencies have clear, focused mandates that have minimum overlap with each other (Northcutt, Paulin and White, 2009; Savage, 2014). Further, these different regulatory agencies are directed by law to meet regularly for information sharing and regulatory coordination (Knight, 2011; Savage, 2014). Complementing the regulatory organization design is the informal institution of a carefully maintained close relationship between state and private industry. This has helped support a more cooperative, less adversarial social dynamic in the development of bank regulations (Heinrich, 2008; Boone and Johnson, 2010; Freeland, 2010). The cumulative effect of these institutional features of the regulatory apparatus is the reduced probability that Canadian banks could exploit weaknesses in the overall regulatory system in the pursuit of risk and profit.

Mortgage market

The third category of institutions frequently cited as supporting bank stability are those associated with the mortgage market, the largest segment of the Canadian household credit market. Mortgage lending is a major source of revenue for Canadian banks, and the large banks dominate this business sector (Kiff, 2009). Unlike US banks, Canadian banks tended to keep more mortgage loans on their balance sheets rather than transfer them off through securitization (Porter, 2010), underscoring that the Canadian system is predominantly an

“originate to hold” system, rather than an “originate to sell” system (Canadian Bankers Association, 2010). Further, at the core of the Canadian bank business model are good quality mortgage loan portfolios (Freeland, 2010; Savage, 2014). The design of mortgage loan products in Canada is simpler (Northcutt, Paulin and White, 2009) and the offerings are less exotic (Kiff, 2009). Combined with loan delinquencies and default rates tending to be low (Porter, 2010; Dodge, 2011), aggregate mortgage loan portfolios are stronger in Canada compared to the United States. While there was some subprime mortgage lending in the Canada, there was relatively little compared to the US (Krugman, 2010; Porter, 2010; Seccareccia, 2013). An influential presence in the mortgage market is the Canadian Mortgage and Housing Corporation (CMHC), an agency of the federal government. In addition to being the leading player in the Canadian mortgage-backed securities market (Hume, 2010), it is also the predominant mortgage insurer in Canada, which essentially implies a government guarantee of the mortgage loan (Kiff, 2009).

2.3. Actor behavior

A smaller number of writers on the Canadian puzzle cite actor behavior, both of suppliers and consumers of financial services, as being a contributing factor. The references are either anecdotal, usually involving expert opinion, or are the results of empirical studies of bank behavior. Ireland and Webb (2011) assert that Canadians are more risk averse than Americans. For example, among consumers, it is expressed through brand loyalty and other forms of

customer inertia (p. 97). With respect to bank behavior and culture, former BMO chief executive officer William Downe (2010) and the Canadian Bankers Association (2010) both cite effective risk management practices as a factor behind bank resiliency, noting that these practices are embedded in the general management culture of the Canadian banks. Conservative balance sheet management is certainly reflected in strong retail deposit bases and low risk mortgage assets (Booth, 2009). Former Bank of Canada governor Mark Carney asserts that “Canadian bankers are still bankers. They still – through the organizations and up to the top of the organization – are proficient at managing credit risk and market risk ... they have retained a banking culture through[out] the organization” (Freeland, 2010).

As an illustration of the problem-solving theory approach to the behavior question, two studies in the literature go further and empirically test for differences in bank behavior that explain variation in performance during the 2008 crisis. Ratnovski and Huang (2009) and Arjani and Paulin (2013) both analyze cross-national samples of over 70 banks using peer comparison and multivariate regression analysis. Among their results, both find evidence that a higher reliance on bank deposits for overall funding needs (compared to use of short-term funding markets) was a statistically significant predictor of bank stability during the crisis. All Canadian banks in the studies displayed this feature. In presenting this finding about bank behavior, the authors allude to institutional features of the Canadian banking system they argue influence the observed bank

behavior (such as capital regulation, liquidity management guidelines and the banking market structure).

2.4. More historical treatments

Most of the works in the literature fall back on a synchronic mode of thought, offering lists of the institutional structures and actor behaviors present on the eve of the crisis believed to responsible for Canadian bank resiliency. A smaller number explicitly recognize the historical character of these features of the Canadian financial order. Bordo, Redish and Rockoff (2011) observe that some of these resilient features were not only evident in 2008 but also in other past financial crises such as in 1930 and 1907. Such observations favor taking a diachronic exploration of the Canadian financial order in 2008. Two works come close in offering this. Drawing on the perspective of rational choice institutionalism, Calomiris and Haber (2014) use historical narrative structured around a model to trace out the evolution of the Canadian banking system from the late 18th century to the present. They argue that the principal factor behind Canada's historic resiliency is the design of its political institutions. In contrast, Bell and Hindmoor (2015) use an agent-centred historical institutionalist framework to explain Canadian resiliency as the outcome of bank behavior conditioned by specific structural features of the Canadian banking market. Both address the Canadian resiliency puzzle through treatment of Canada as a case study in larger comparative studies of the national performance variation during the 2008 financial crisis.

Calomiris and Haber (2014)

Calomiris and Haber (2014) assert that the principal factor behind long-term bank system stability is the basic institutions of national government and how they structure the political process that defines bank regulation. In their view, banking systems tend to be fragile by design. To demonstrate this, the authors employ a problem-solving strategy where they define a theoretical game of strategic interaction among actors, that they call the Game of Bank Bargains. The political institutions outlining how decisions are made are the game rules and the actors include the government, bank owners, depositors, borrowers, minority shareholders, and taxpayers. This game as it relates to bank policy may be understood as a type of collective action problem which must address both a property rights problem and a conflict-of-interest problem. The property rights issue (depositors risk expropriation by banks, while banks risk expropriation by defaulting debtors) is solved by introducing the state to enforce contracts. However, this introduces a conflict-of-interest problem for the state in terms of its regulatory relations with banks (when banks supply financial services to the state), with debtors (source of political support), and with creditors and taxpayers (other sources of political support) (pp. 33-38). With the rules of the game and the parameters of actor interaction specified (e.g. alignment of interests, incentives to act, and coalition formation), the analysis gives several equilibrium outcomes, which may be organized by political regime and banking system types (p. 42). Democratic regimes have two variations: the classical liberal variant where institutions limit government in its redistributive capabilities (and therefore,

tends to be stable), and the “populist” variant where the elected government is responsive to its support base and pursues policy actions amenable to those interests (undermining stability). Underlying this political economy of bank bargains is the “the creation and distribution of economic rents and the maintenance of political power”, which are “the outcome of a strategic interaction” (p. 39).

In the style of an analytic narrative, the authors apply their theoretical analysis of the relationship between state and bank to history, tracing out the coevolution of these two institutions over the last 400 years, where “states made banks, and banks made states” (p. 83). Calomiris and Haber extend this method to the development of the Canadian state and banking relationship. They argue that early experiments with parliamentary democracy, culminating in the 1867 Constitution Act creating the Dominion of Canada, were shaped by “Britain’s determination to hold onto Canada as a colony” (p. 285), the French population’s struggle to maintain its autonomy and the growing British population’s desire to pursue its economic interests. These different political institutions provided the “rules of the game” for giving voice to different interest groups in the political process and for forming government coalitions. Further, they helped shape policies that ultimately contribute to Canadian bank stability. Among the first orders of business before the fledgling legislatures created in Ontario and Quebec in 1791 were applications by merchants, often British, for bank charters. The features of these early charters included limited duration charters (although renewable), the right to issue notes, the right to open branches nationally and the

requirement to disclose accounting information to the government (p. 299). Most importantly, the governments maintained authority to grant bank charters, thus maintaining regulatory authority over entry into the banking market. By 1841, “the basic contours of the modern Canadian banking system had already been laid down,” that of a small number of large banks featuring branch networks (p. 301). Support of these political institutions by local British merchants and financiers was reciprocated through the licenses granted to organize these financial organizations, despite suspicion and opposition by the French community. The 1867 Constitution Act, which created a sovereign federal state, provided further obstacles to social forces opposed to bank chartering by giving the federal government exclusive jurisdiction over banking policy (p. 296). This “populist”-proofed the political institutions that enabled bank chartering banking in Canada by blocking interest groups opposed to the status quo bank bargain from seeking policy change at the provincial level. This contrasts with the United States where ambiguity over jurisdiction gave way to state domination over bank chartering, resulting in a fragmented system of thousands of banks. As many were unit banks, the US system seems to possess an inherent fragility. In Canada, the basic features of 1867 arrangement has continued to the present, mediating a political process which has seen both the federal government take a greater role in the Canadian financial system (e.g. the creation of a central bank in 1934) and the transformation of the banking industry to be dominated by five large universal-style banks. For Calomiris and Haber, the observed stability of the Canadian banking system is attributed to bank system structures, such as

limited duration bank charters and nationwide branching, “all outcomes of the Canada’s Game of Bank Bargains” (2014, p. 327).

Bell and Hindmoor (2015)

Bell and Hindmoor (2015) also address the puzzle of variation in the banking system performance among highly accountable democracies. The authors look to the different market and institutional contexts in nations to explain why some banking systems suffered systemic collapse while others didn’t. The authors employ an agency-centered historical institutionalist approach, that looks to “how institutions shape and are shaped by broader structural transformations”, such as the effects of financialization¹² on the structures of capitalism (p. 16). Understanding the ideas of bankers and regulators, how they perceive the world and operate within it, are equally important. The authors “argue that agents themselves actualize the structural impacts of the context through their behavior and especially their patterns of interaction” (p. 69).

This framework explains performance variation among national banking systems by examining the different institutional histories that result in varying market and regulatory conditions. The 1970s movement to liberalize national financial systems led to the emergence of new market structures that posed new competitive pressures. However, this movement was not uniformly embraced

¹² One definition of financialization is provided by Epstein: “financialization refers to the increasing importance of financial markets, financial motives, financial institutions, and financial elites in the operation of the economy and its governing institutions, both at the national and international levels.” (Gerard Epstein (2001) Financialization, Rentier Interests, and Central Bank Policy. Paper prepared for PERI Conference on "Financialization of the World Economy", December 7-8, 2001, University of Massachusetts, Amherst).

across nations. In fact, even among three Anglo-American nations purported to be “liberal market systems” (Hall and Soskice, 2001), there were differences in the historical path chosen. The governments of the United States and the United Kingdom, with the support of their banking industries, embarked on ambitious programs to deregulate their financial sectors, which encouraged leading banks to shift their business models away from lower-return financial intermediation towards the trader bank model, which relies on fee earnings and trading profits for income. While highly profitable, these activities were also highly competitive and prone to market disruptions. In one sense, the banks in these national markets were liberated by the institutional changes they supported, but were also “enslaved” by the resulting hypercompetitive market conditions (Bell and Hindmoor, 2015, p. 5). Combined with novel financial instruments and practices (e.g. securitization and use of funding markets) and increased interconnectivity between financial actors, especially between banks, conditions of systemic risk surfaced and were ultimately realized in three crisis moments - asset price, credit and fiscal - over the 2006-2010 period. In both the US and UK, the government had to forcefully intervene in their banking systems.

However, Canada managed to avoid these problems, the authors argue, primarily because Canadian banks operated in very different institutional and market environments, where traditional financial intermediation remained the core business activity.¹³ Bell and Hindmoor find evidence from bank balance

¹³ However, performance variation among banks within these respective countries add a caveat that while these structured environments may influence performance outcomes, they do not determine them. There is scope for free will in the guise of individual bank strategy.

sheets that, in contrast to their American and British peers, the large Canadian banks used lower leverage, were less dependent on wholesale funding, and had less exposure to securitized assets for purpose of trade. Further, interviews with Canadian bank CEOs and other bank sector insiders reveal “very different views about risk management, leverage, financial trading, and wholesale funding than their counterparts in the United Kingdom and United State” (p. 127). The Canadian banking market however was “not the product of rational design, but arose more through happenstance and the impact of historical experience and policy legacies” (p. 288). These market conditions that have provided strong incentives for bank executives to run relatively traditional balance sheets and not reengineer them. Complementing these market conditions were banker agency (in the form of leadership and organizational learning from past crises) and strong regulatory authority. In addition to imposing regulatory requirements (e.g. capital ratios, leverage limits) on the banks, Canada’s bank regulator is mandated to engage banks in an on-going dialogue about risk management. Bell and Hindmoor underscore the cooperative nature of this regulatory relationship by noting that the bank regulator did not prohibit the large banks from participating in the securitization market. The banks nonetheless avoided large exposure to assets that ultimately turned toxic.

2.5. Complementary narratives

To address the puzzle of performance among different national banking systems, both Calomiris and Haber (2014) and Bell and Hindmoor (2015) look to the role of institutions, with the former placing emphasis on actor interests while

the latter emphasizes actor ideas. These approaches complement each other. Calomiris and Haber provide a back story to the Canadian case study. Going back to the late 18th century, they offer a narrative account structured around the model of the Game of Bank Bargains to explain how the character of Canadian political institutions has influenced the co-evolution of the state-bank relationship. Actor agency for Calomiris and Haber is somewhat limited to the strategic interaction of actors in the political process of bank bargaining. While this focus on the political process may explain the character of government formation and decision-making in a federal system, as well as the formal structure of bank regulation (e.g. chartering, the Bank Act), the approach stops short of exploring why Canadian bankers and regulators behaved the way they did leading up to, and during the 2008 financial crisis.

Here is where Bell and Hindmoor come in. Instead of relying on a formal model for explanation, they use a looser theoretical framework of agent-structure reciprocal relations specified for banking activity. Their framework is of contextualized banker behavior, drawing on concepts from behavioral economics as well as from historical institutionalism. The structural context of the Canadian banking market, with its peculiar conditions of competition and profitability in contrast to that of the US and UK, exerted a conservative influence on Canadian bank CEOs and bank regulators in terms of their observed behavior and professed beliefs about how banking systems work. Without explicitly stating it, the authors are alluding to a new bargain between banks and regulators began to emerge through the policy learning that followed the failure of two regional banks

in 1985. This banker-regulator relationship, which redefined the roles and expectations between these two actors, is not easily described through the strategic interaction patterns of Calomiris and Haber's Game of Bank Bargains. In their description of the behavior of the regulator and regulated, Bell and Hindmoor have pushed back the frontier by hinting of an alternative conceptualization of this relationship.

2.6. A direction forward

This engagement of the neoMHS framework to the existing literature, especially the works of Calomiris and Haber (2014) and Bell and Hindmoor (2015), clarifies some of the issues in the attempt to answer this essay's question about Canadian bank behavior during the financial crisis. The application of the neo-Coxian method of historical structures to the puzzle of Canadian bank stability marries the general approaches of Calomiris-Haber and Bell-Hindmoor but goes further. It seeks an explanation not only in terms of (institutional) structures existing at the time of crisis, structures defining a national financial order (NFO), but also in terms of actor behavior contextualized by that order. This is a synchronic act. But the NFO under analysis is assumed not to exist ahistorically, but to have originated and developed in historical time. To situate this NFO, one must shift to a diachronic mode of thought and trace out the successive orders that compose history. Where Calomiris and Haber use a formal model, the Game of Bank Bargains, as a device to structure their historic narrative, the neoMHS plays this role here, being used to identify the conjunctures, the marks of successive NFOs, that organize the historical

narrative. Applied to Canadian financial history, the diachronic exercise of describing the backstory brings us back to the principal NFO of interest, with a more rigorous understanding of its genesis, as it is a transformation of a prior order. Analysis then returns to the synchronic mode to re-examine the national financial order and actor behavior. In situating actors in this specific structured context, we can see how both bank and state actors responded to the emerging pressures of the financial crisis. As Bell and Hindmoor suggest, a bank-state relationship unique to this NFO may have existed. All this sets before us two tasks: one, tracing out the evolution of Canadian banking orders and two, exploring the banker-regulator relationship in the conjuncture leading up to the 2008 crisis.

3. The Canadian Financial Order, 1608-1986

The first task in this larger exercise of employing the neoMHS to understand the Canadian financial order on the eve of the 2008 crisis is to move into a diachronic mode and trace out the past successive NFOs that lead up to the NFO of interest (dated to emerge in 1986). This sketch provides its evolutionary backstory. These NFOs are contained in the historical period marked from early European colonial settlement to the early 1980s. I have organized this swath of history into four periods: 1608 to 1791 (early European colonialism); 1791 to 1867 (early colonial financial order); 1867 to 1964 (rise of the financial nation-state) and 1964 to 1986 (turn toward liberalization). These periods are marked by disruptive events, which I argue signify the emergence of a new configuration

of structural forces. In keeping with the literature, with its emphasis on institutional explanations (over ideas and material capabilities), these events are often marking institutional change; for example, the British North America Act of 1867, which created the Canadian nation-state as well as defining the formal approach to bank regulation. For each period, I will answer three questions:

- 1) What is the dominant NFO characterizing this period?
- 2) How did banks behave under this NFO?
- 3) What causes change in the NFO?

While national financial order is the focus here, the adjacent spheres of activity, “form of state” and “social relations”, are drawn upon when needed to tell a cohesive story. To illustrate, while Confederation in 1867 is suggested here to mark a new national financial order in Canada, most readers will more likely associate Confederation as a major step toward post-colonial liberal democracy in Canada, a new form of state. Contributing to the decision to form the Dominion of Canada was the intent that this new political institution would ameliorate the tense social relations between the English- and French-speaking populations in British North American.

Social processes figure into the story, both economic and political, as they are often the media through which specific NFOs both emerge and are subsumed. Within these processes are actors. While the main actors in this history are the Canadian federal government and the chartered banks, several other actors

serve in “supporting roles” in the story arc, including the provincial governments and other types of private financial organizations such as insurance companies, trustee pension plans, and securities brokerages. Of interest are the “near banks” – trust companies, mortgage loans companies, caisses populaires and credit unions – who appear in this history as competitors of chartered banks in the business of providing financial intermediation services.^{14 15}

In this sketch of the successive national financial orders, we will find that it is not a story of dramatic breaks and radical reversals, but rather one of continuities with shifting emphasis between interests of the state and private interests. The accumulating effect of these successive NFOs is the creation of institutional mechanisms, which when combined with market processes, have selected chartered banks as the dominant organizational form of private finance in the Canadian system. Furthermore, the financial functions of chartered banks within the larger financial system evolve over the course of time, as does the role of the state in the system. A third theme that emerges from this history is that the key events that shape the evolving Canadian NFO, such as interest rate deregulation, tend to lead or lag similar events in other national jurisdictions, such as the US or UK.

¹⁴ Of lesser emphasis in this story is the place of financial markets (e.g. equity and bond markets) in Canadian financial history. By financial markets, I mean where borrowers may choose to sell securities directly to investors rather than borrow from a financial intermediary such as a bank. Bordo, Redish and Rockoff observe that while Canada has had a strong banking system relative to the US, the US has had deeper, more robust financial markets (2011, pp. 3-4). The Canadian state has been a pivotal player in the organizing of financial markets in this country (e.g. the role of government debt issuance in the development of domestic bond markets).

¹⁵ While the level of analysis in describing financial order is the national level, this reading is not closed to the larger international system, as events and processes in the international arena have had an important role in shaping Canadian national financial orders throughout time (e.g. Canada’s participation in activities at the international level such as joining the gold standard in 1853).

3.1.1608 – 1791: Early European colonialism

The early colonial period in Canada, marked from the earliest European settlements for trade with indigenous people (Quebec City in 1608) to the 1791 Constitutional Act creating legislative assemblies in Upper Canada (now Ontario) and Lower Canada (now Quebec), did not have any semblance of a national financial order as defined above. For most of this period, the state took the form of colonial administration. Despite an expanding European settlement in parallel with growth in agriculture alongside an extractive economy (cod, fur, timber), basic financial activity in terms of the provision of credit (and organizations which provided it) remained either non-existent or limited (Pomfret, 1993, p. 217)¹⁶. These colonial economies were plagued by shortages of gold and other commodity money, creating frictions or impediments to exchange. There is evidence of innovative attempts to surmount the currency shortage, such as the French experiments with playing card money, a form of state-backed fiat money (pp. 214-215).

However, a larger political issue animating public life in British North America was the search for a political arrangement that accommodated both the interests of the dominant French population in present-day Quebec and the growing English-speaking communities in present-day Ontario, the latter which

¹⁶ Pomfret (1993) observes the issuance of notes (“bons”) by Montreal mercantile houses to customers who could redeem these notes for goods. As promissory notes, these “bons” also circulated as means of exchange. There is also evidence a similar system of the credit, the truck system, was in place in colonial Newfoundland. In the truck system, a local merchant would pay employees in advance using tokens, which could then be used to purchase goods at the merchant’s store. Source: “Truck System” *Heritage Newfoundland Labrador* <http://www.heritage.nf.ca/articles/economy/truck-system.php>. Accessed April 5, 2017.

were fed by refugees fleeing the United States after the American Revolution of 1775–1783 (Calomiris and Haber, 2014, pp. 288-289). The solution was the 1791 Constitution Act, creating two colonial entities, Upper Canada and Lower Canada, with separate legislative assemblies and limited representative government. Among the powers granted to these legislative assemblies was the power to charter banks. The period finishes with a shift in form of state from colonial autocracy toward limited local democracy. This institutional development entails powers that enable financial organization.

3.2. 1791 – 1867: Early Canadian financial order

National financial order and bank behavior

The NFO of this period is characterized by the establishment of local representative assemblies in the colonies of British North America and the subsequent organizing of a private financial services industry in these colonies, led by the chartering of banks by these local assemblies. Government involvement in banking activities will remain a feature of successive NFOs. In this period, government involvement is confined to control over market entry, the range of permitted activities by banks as well as oversight (albeit light) of their operations. Further, we also find in this period the establishment of enduring characteristics of the organizational form of Canadian chartered banks.

The first sustainable chartered bank¹⁷ was the Bank of Montreal, which opened in 1817.¹⁸ Other chartered banks would appear shortly afterward in Quebec and Ontario as well as in the Atlantic colonies. These early chartered banks were permitted to issue their own bank notes as well as accept deposits and grant loans. There was strong demand for these services, especially for note issue as this helped address the problem of currency scarcity. Here, one finds evidence of state regulation of the bank operations in Canada right from the beginning. The colonial governments would include in the charters that banks could issue notes up to some proportion of the bank's capital and that all notes were redeemable on demand to gold¹⁹. The charters required that a bank have half of its capital paid in before operations could commence. These early chartered banks also had to submit accounting records for review (Neufeld, 1972, p. 82).

In their early days, these Canadian banks adopted two organizational features or financial capabilities that continue to the present. One was organizing bank ownership as a joint stock company, where the issuance of transferable shares by a bank provided an efficient means for attracting funds needed to commence and expand the bank's business. The second organizational feature adopted was the branch banking model. A chartered bank

¹⁷ Neufeld (1972) notes that earlier attempts to open banks, dating back to 1792, failed to get off the ground (p. 75-76).

¹⁸ The Bank of Montreal did not receive royal assent of an actual charter until 1822. The Bank was permitted to commence operations in 1817 by signing Articles of Association, an alternative form of business incorporation (Pomfret, 1972, p. 218).

¹⁹ Other rules included restrictions on banks becoming merchants, holding their own shares and making loans to their own directors.

that could operate and manage a network of branches spread out across a geographic expanse stood in contrast to the unit bank model of a single local bank independent of any branches. Compared to a unit bank, a branch bank can gather a larger deposit base, extending greater credit and being more resilient against loan impairment (assuming its loan book was diversified).

Established chartered banks sought to limit competition in their respective jurisdictions by appealing to the local authorities to not only limit the number of new charters granted (McIvor, 1958, p. 35) but also to block the opening of branches by banks headquartered in a neighbouring province. This jurisdictional rivalry would be muted with the 1840 Act of Union consolidating the two colonies.

Despite the obstacles to entry, there was a continuous flow of new entrants over the 1791-1867 period, amounting to 21 active Canadian banks in 1836 on the eve of the 1837 depression originating in the US (The Panic of 1837). After falling to the mid-teens through insolvency, charter repeal or merger, the industry would expand again in 1855 with 23 active banks and continue to grow, reaching 35 in 1867 (Neufeld, 1972, pp. 77-78). The Canadian banking system did not experience any domestic banking crises during this period although the contagion from the Panic of 1837 led Canadian banks to suspend redeeming notes into commodity money and to curtail lending (McIvor, 1958 pp. 42-43).

The undoing of this national financial order

This early version of the Canadian national financial order featured a set of empowered local governments enabling the development of a chartered bank industry in their respective jurisdictions, with the banks characterized by branch banking and activities limited to financial intermediation and note issuance. This NFO came to an end with the British North America Act of 1867 which unified four self-governing British provinces (Ontario, Quebec, New Brunswick and Nova Scotia) into Confederation. The associated constitution would mark a different institutional basis from which a new NFO would emerge, one evolving alongside the development of this new nation-state.

The primary factors that led to Confederation were not financial, but rather related to the domestic unrest in both Upper Canada and Lower Canada that flared during rebellions in 1837-1838, as well the threat of territorial annexation by the United States to the south. Yet the weakening legitimacy of the existing political institutions was in part fed by faltering economic conditions in local communities, exacerbated by deep recession in the United States from 1836 to 1843. It was not uncommon for farmers facing loan default to observe that the local merchant-banker elite also formed the political elites dominating public decision-making in the provincial legislatures (Schauwers, 2009). In addition to linguistic differences, lender-borrower relations were a dimension of social relations in pre-1867 Canada harbouring conflict.

3.3. 1867 – 1964: Rise of the financial nation-state

National financial order and bank behavior

The NFO that evolves following Confederation in 1867 features a new form of state, the federal Dominion of Canada, unifying former British colonies (and later adding new provinces) in a liberal democratic nation-state. Authority over the financial system was laid out in its constitution, with banking placed exclusively in the federal jurisdiction, muting regulatory competition from and between provincial governments going forward. This institutional event marked a period where this new Canadian state becomes progressively involved in the financial system, not only as organizer and regulator, but as direct participant in the supply of financial services as well. The state's partnership with private financial organizations, with chartered banks, in the supply of credit, evolves into a new form. Chartered banking as an industry becomes concentrated over the course of this period. It is also confronted by the competitive threat posed by emerging "near bank" institutions such as mortgage loan companies. Near the end of this period, the chartered banks begin to gain admission to areas of lending beyond their traditional focus on short-term business lending.

This new nation-state was interventionist in the economic system, beginning with the political need to build infrastructure to bind the country together (e.g. the transcontinental railway) and then later for supporting its participation in wars abroad, macroeconomic stabilization and the building of social welfare institutions. It was not uncommon for these interventions to be

policy responses to events and processes outside Canada's border, yet of domestic consequence. For example, Canada's decision to enter World War I in 1914 contributed to the development of the fiscal capacity of federal government through the introduction of an income tax and the significant public debt issuance. The experience of the Great Depression from 1929 to 1933 informed the decision to form a central bank (Bordo and Redish, 1987)

Over this period, the chartered banks ceded their power to issue bank notes to the state. The 1870 Dominion Notes Act introduced state-backed notes, which circulated alongside bank notes. This arrangement would continue up until the 1934 Bank of Canada Act, which gave the central bank exclusive power of currency issuance. One also observed in this period the establishment of state agencies to support the functioning of the private banking system. The 1914 Finance Act made the federal Department of Finance the bankers' bank, offering short-term borrowing privileges to the chartered banks (Pomfret, 1993, p. 227). This lender-of-last-resort role would later be assumed by the Bank of Canada.

In addition to creating institutions that support the private financial system, the state also formed several agencies in the mid-1940s to support or directly provide finance to specific sectors or activities in the Canadian economy: Canada Mortgage and Housing Corporation (1946), Business Development Bank of Canada (1944), Export Development Bank (1944) and Farm Credit Canada (1959). The Canadian Housing and Mortgage Corporation (CMHC) would subsequently lead the organizing of the contemporary Canadian mortgage market (Hunter, 1991, pp. 78-93). Yet this trend in state-led development of the

Canadian financial system during this period should not overshadow the instances where the governance of key parts of the system was performed by private organizations. An example is the Canadian Bankers Association (CBA), formed in 1891 to improve “banking standards and education” but effectively becoming a lobbyist for the chartered banks (Pomfret, 1993, p. 224). Later, the CBA would be tasked by statute in 1900 to provide payment clearing services for the banks (McIvor, 1961, p. 78).

As the Canadian state’s presence in the financial system grew as both a supporter of and direct participant in financial processes, the chartered banks repositioned themselves to supply other financial services to a growing Canadian economy. Shortly after Confederation, the 1871 Bank Act was legislated, laying out the rules governing banking practices. This act became the main vehicle for institutional change concerning banking rules. In addition to setting rules on bank entry such as the minimum amount of paid-in capital for a new bank, it has featured a 10-year sunset clause on the act, forcing the federal government to renew the Act (as well as the bank charters embedded in it) and entertain revisions to its provisions.

Under this national financial order, the chartered banks continued to engage in conventional financial intermediation but would encounter competition from “near banks”. Trust companies, building societies and mortgage loans companies, caisses populaires and credit unions would appear in the Canadian marketplace between the mid-19th century and 1900. Unlike for chartered banks, the regulation of these “near bank” intermediaries is shared with the provincial

government or in the case of the caisses populaires and credit unions, entirely under provincial authority. These near banks could compete with chartered banks for attracting deposits (although the CBA would successfully lobby for the withdrawal of the power of mortgage loan companies to accept deposits (Pomfret, 1993, p. 224). At the beginning of this period, the chartered banks continued to focus their lending activities on shorter-term business loans as they were restricted from participating in the growing market for longer-term real estate-backed mortgages. Yet with the growth in demand for other types of credit, the banks would ultimately seek out and receive admission to new areas of finance. For example, revisions to the Bank Act in 1954 permitted chartered banks to participate in mortgage lending.

One also observes during this period the increased concentration of the chartered bank industry. The addition of progressive barriers to entry in successive Bank Acts, such as raising the minimum paid-in capital needed to open a bank (Neufeld, 1972, p. 97), helped create conditions for concentrating the industry. The number of active chartered banks would peak in 1874 at 51. By 1925, through mergers and insolvencies, this number would fall to 18, and would fall again to 8 by 1964 (pp. 78-79). This concentrated industry structure has essentially continued into present days, with the Big Six banks dominating.

With the trend toward concentration, Canada's system of chartered banks remained relatively stable over this period, including during the 1907 and 1933 financial crises in the United States. Efforts to introduce government inspections of banks were successfully resisted by the bank lobby. However, the failure of

the Merchants Bank in 1922, followed by the Home Bank in 1923, boosted the argument that bank inspections needed to be added to the regulatory regime. In 1924, the Office of the Inspector General of Banks (OIGB) was established, signifying further development in bank regulation (Savage, 2014, p. 5)

The undoing of this national financial order

This national financial order lasted almost 100 hundred years (1867-1964), containing perhaps the most turbulent period in the modern world history (1914-1945). This Canadian NFO withstood the pressures that emerged during this period. As discussed above, many state institutions supporting the NFO were established as a response to these pressures. The larger macroeconomic order that coalesces in the early postwar era is that of a Canadian social welfare state underpinned with the macroeconomic policy levers of fiscal and monetary policy. Within this structured framework is found the national financial order, which describes a role for the operation of private financial actors supplying financial service, such as credit. Chartered banks are the dominant players in this system.

Over this period, this NFO was contested, not only by other private financial organizations, but also by other levels of government.²⁰ Further, this

²⁰ A good example of a provincial government contesting the federal government's monopoly on banking legislation is the Social Credit movement that surfaced during the Great Depression, in response to the economic downturn. The movement organized itself around a non-orthodox monetary theory that proposed policy alternatives that would address the economic malaise. The movement did organize itself politically across the country, managing to form the Alberta provincial government from 1935 to 1971. While the Social Credit movement failed to carry out its program of issuing prosperity certificates and bringing the chartered banks under provincial control (McIvor, 1958, pp. 159-164), the creation of Alberta Treasury Branches, a government-owned bank with branches across the provinces, is the legacy of one province's attempt to challenge the authority of the federal government over banking.

period did feature events suggestive of liberalizing the existing NFO. In terms of macroeconomic policy, the Canadian government in 1950 chose to leave the Bretton Woods system of exchange rate management and allow the Canadian dollar to float on international currency markets, becoming the first industrialized country to adopt a flexible exchange rate regime.²¹ In terms of bank policy, revisions to the Bank Act in 1954 expanded banking powers to include loans for residential housing on the security of mortgages under the new National Housing Act. Chartered banks were now able to grant mortgage loans, an activity previously exclusive to trust and mortgage loan companies.

However, it was the Coyne Affair of 1961, which acted as a lightning rod for accumulating pressures for change to the NFO. Bank of Canada governor James Coyne resigned in that year after a highly-publicized disagreement with the Diefenbaker government on the direction of fiscal and monetary policy. This signified a crack in the post-war consensus on the conduct of macroeconomic policy and its theoretical underpinnings. In part a response to the aftermath of the Coyne Affair, the Royal Commission on Banking and Finance (the Porter Commission) was organized “to enquire into and report upon the structure and methods of operations of the Canadian financial system, including the banking and monetary system.” (Canada, Royal Commission, 1964, p. 569). Several of its recommendations aimed to reduce the regulatory constraints on chartered banks, who were facing strong competition from near-bank deposit-taking

²¹ Its early departure was made extra significant in that the Province of Canada (following union in 1840) was one of the early adopters of the British gold standard in 1853.

lenders. Symbolically, the report of the Porter Commission is an agenda for molding a new national financial order.

3.4. 1964-1986: Turn toward liberalization

The national financial order and bank behavior

The NFO that emerged between Confederation and the mid-1960s has been described above as a state-led financial order, with the chartered bank industry exploiting their niche within the system while showing signs of expanding into other areas of the system. Recommendations from the 1964 Porter Commission report led to several policy reforms to the Canadian financial system over the next twenty years. While some of the recommendations aimed to liberalize the regulations facing chartered banks, others sought to continue to build the regulatory side of the state. These two streams or policy tracks become more distinct in the national financial order of this period.

Amendments to the 1967 Bank Act included lifting restrictions on the interest rate that banks could levy on loans and deposits. This policy shift preceded similar moves in the United States, which would not take place until 1980 (Johnson and Kwak, 2011, p. 67). Also, Canadian chartered banks were permitted to own leasing companies as subsidiaries. This was another example of allowing the banks to enter a new business line and compete with near-banks and foreign competitors (Darroch, 1994, p. 278). A principal objective of amendments in the 1967 act and in subsequent revisions was to increase

competition in the financial sector. Freedman (1998) argues that a key outcome of this objective “has been a gradual erosion of the segmentation of the financial systems across the five pillars” (pp. 6-7). By five pillars, he refers to five large industry groups in the Canadian financial system - chartered banks, trust and mortgage loan companies, cooperative credit providers, life insurance companies and securities brokerages - all which had tended to operate in segmented business lines.

But in addition to legislation that liberalized the business rules affecting chartered banking, Bank Act revisions and other legislation also sought to revise the rules surrounding bank ownership and entry, as well as to create or modify regulatory agencies and financial system infrastructure. Provisions in the 1967 Bank Act prevented any single shareholder from owning more than 10 percent of a bank’s voting shares. Also, the aggregate of foreign shareholding cannot exceed 25 percent. (Darroch, 1994, p. 279). These rules seek to avoid the emergence of dominant shareholders among bank owners as well as ensuring the banks remain Canadian-owned. The 1980 Bank Act modified the rules with respect to entry into the Canadian banking market. The creation of the Schedule A and Schedule B bank systems encouraged foreign entrants into the banking industry while protecting widely-held, Canadian-owned chartered banks. It clarified ownership and entry rules with the intent of promoting competition. In a bid to add an additional safeguard against instability among deposit-accepting organizations, the Canadian Deposit Insurance Corporation was created in 1967. In 1980, federal legislation created the Canadian Payments Association, which

assumed the responsibility of operating the payment and clearing system previously undertaken by the Canadian Bankers Association.

The Canadian bank system displayed surprising stability during a period where there was much turbulence in the international financial system, marked by the United States halting convertibility of its dollar to gold in 1971. The 1973 oil shock was a contributing factor to the emergence of stagflationary conditions observed in several industrialized countries from approximately 1973 to 1982 (Bordo, Redish and Rockoff, 2011, p. 20). In this period, one also observes institutional changes in international currency and commodity markets, leading to greater price volatility.²² Yet despite a decade of dangerous living in the international financial sphere, the domestic economic malaise in several industrialized nations helped contribute to the birth of the neoliberal policy movement, which informed the agendas of the Thatcher government elected in the UK in 1979 and the Reagan administration elected in the US in 1980.

No large Canadian banks collapsed during this period. One possible explanation is that Canadian banks, and for that matter, American banks, were still prospering in what Johnson and Kwak (2011) call the “boring banking” era when “commercial banking became the stereotype of a conservative, low-risk profession” yet nonetheless provided the funds needed for flourishing post-war economies (p. 62). This era of “boring banking” would come to an end in the

²² Two high profile bank casualties during this period were the failure of West Germany’s Bankhaus Herstatt in 1974, followed by US’s Franklin National Bank, two banks that had become overextended in foreign exchange markets, either for investment purposes (Herstatt) or for funding purposes (Franklin) (Germain, 2010, pp. 46-47). Their failures motivated the creation of the Basel Committee on Banking Supervision, the international organization that would coordinate bank regulation.

1970s, at least in the US. What is observed in Canada is the chartered banks, already a concentrated industry, more closely competing with near banks in areas such as mortgage lending. With loosening the restrictions on interest rate setting, much of this competition would be focused on capturing the business of depositors and borrowers with attractive prices. At the same time, the banks would continue experimenting with new business lines, such as the introduction of credit cards in the late 1960s (Neufeld, 1972, p. 132). Canadian banks were also increasing their activities abroad, mainly in the US and the UK. The Bank of Nova Scotia and the Royal Bank would also begin to lend in Latin America (Darroch, 1994, p. 260).

The undoing of this national financial order

The stagflationary dynamic of the 1970s would come to a head in the early 1980s with high interest rates contributing to the deepest recession in several industrial countries since the 1930s. The default in 1982 by Mexico on its sovereign debt marked the beginning of the Latin American debt crisis. This overseas debt crisis would negatively affect Canadian banks with investment there, leading to a retreat to North America (Coleman and Porter, 2003, p. 246). However, it would not cause any of the larger Canadian banks to collapse, unlike what was experience in the United States with the failure (and subsequent public bail-out) of Continental Illinois in 1984.

However, amid the high interest rates, recessionary conditions and falling world oil prices, two Alberta-headquartered banks Canadian Commercial Bank

(CCB) and Northland Bank collapsed in 1985. A public response to these failures was the formation of a public inquiry into their failure, the Estey Commission. The vision extending from the commission's recommendations did not signal the end of liberalizing the Canadian financial system. What it did suggest was that future policy changes to enhance the competitiveness of the Canadian financial system would take place alongside actions to ensure the soundness of the system through transforming and strengthening the financial regulatory state.

3.5. Summary

This section provided a demonstration of the neoMHS in diachronic mode. It describes four national financial orders argued to have led up to the order existing during the crisis. Each NFO was described mainly in terms of institutional structures. Also, details of bank behavior under these evolving structural conditions were noted. Right before the failure of the two regional banks in 1985, we observe a bank order where there is a strong presence of the federal government as organizer, regulator and participant in the financial system. This is the policy legacy of the order that emerged during the 1876-1964 conjuncture. Yet with the turn toward liberalization that began with the Porter Commission in 1964, the chartered banks were able to leverage advantages established earlier (such as branch banking) and exploit policy changes such as permitted entry into new financial activities. This aided the chartered banks becoming progressively more dominant among Canadian financial institutions in the delivery of financial

services. These inheritances from the past underscore that Canada's national financial order is not entirely the product of rational design but also the process of history.

4. Canadian Financial Order, 1986-2007

Having traced out the four successive national financial orders leading up to 1986, noting the origins of enduring structures along the way, we now switch to a synchronic mode and use the neoMHS to describe the national financial order for the period marked from 1986 to 2007. Like the principal concern of Bell and Hindmoor (2015), that of variation in crisis performance across nations, we are interested in exploring the market and institutional context that explains the Canadian puzzle. This will involve elaborating on the evolutionary paths of both the regulatory state and the chartered banking industry.

As we shall see, growing momentum in the increased scope of bank activities alongside increased industry concentration was halted through a public policy decision in 1998 preventing the mergers of four large banks. This, combined with the maturing of a new regulatory regime, marks the achievement of a stable national financial order that endures right up to the outbreak of the crisis in 2007. The behavior of banks under this stable NFO is described. This elaboration of the financial order and the actor behavior therein provides a context in which to explore the performance of the Canadian banks and the government responses during the crisis.

4.1. Regulatory system

The impetus behind a renewed drive to further develop the Canadian financial regulatory apparatus was found in the 1986 Estey Commission, a public inquiry into the 1985 collapse of two smaller, western Canada-based Canadian Commercial Bank (CCB) and Northland Bank in 1985. The recommendations in the Commission's report would inform the agenda for bringing about several institutional changes.

The commission found no reason for the failure of the two small regional banks to shake the public confidence of the larger banking system. After all, these two banks represented only "one per cent of the Canadian banking system as measured by assets, earnings or any other reasonable standard" (Canada, 1986, p.1). However, their demise provided an opportunity not only to investigate the causes behind their insolvency but to assess the capability of the current banking regulatory system in light of the recent changes introduced through the 1980 Bank Act, with the creation of the bank schedule system. The Inquiry Report noted that since 1980, sixty new banks had entered the industry as Schedule B banks, yet "no provision was made in the Act for an enlargement of the inspection system or for any adjustment or realignment of that system to accommodate these new banks" (p. 3).

Among the Inquiry's recommendations are several to revamp the existing approach to bank supervision. The existing Office of the Inspector General of Banking (OIGB) would be integrated within a reorganized Canada Deposit Insurance Corporation (CDIC). The bank supervisor would work in new

framework geared toward actively responding to early signals of bank distress. The supervisor would be given enhanced powers, including to inspect the loan portfolios of supervised banks and issue cease-and-desist orders. When the survival of a bank is deemed in the public interest, the new framework would include a plan to assist distressed banks avoid bankruptcy (pp. 19-20) while avoiding risk to the taxpayer.

The vision extending from the Estey Inquiry's recommendations did not signal the end of liberalizing the Canadian financial system. In fact, it envisioned a regulatory system that ensures competition within the industry, including entry of new competitors (p.21). Future policy changes to enhance the competitiveness of the Canadian financial system however should take place alongside actions to ensure the soundness of the system through transforming and strengthening the financial regulatory state.

With respect to adopting the inquiry's recommendation, the Government of Canada chose not to fold the OIGB into the CDIC but rather merge it with the Department of Insurance (which oversaw the insurance industry) to create in 1987 a new supervisory agency, the Office of the Superintendent of Financial Institutions (OSFI). CDIC would remain a separate agency but would receive enhanced powers to intervene²³. Further, OSFI and CDIC would join the Department of Finance²⁴ and the Bank of Canada to form in 1987 the Financial

²³ CDIC's main objective is to provide insurance against the loss of part or all the deposits at member institutions. Its enabling legislation was revised in 1987 and again in 2001, allowing it to become active in determining the risk posed by member institution to minimize risk to the deposit insurance scheme.

²⁴ The Department of Finance, headed by the Minister of Finance, is responsible for developing financial sector policy (such as the Bank Act) as well as managing wider economic, fiscal and tax policy. The

Institutions Supervisory Committee (FISC). Following its formation in 2001, the Financial Consumer Agency of Canada (FCAC)²⁵ would join FISC. FISC was mandated by legislation for these four agencies involved in financial regulation to conduct an on-going dialogue among themselves on issues of regulation and supervision, share information and jointly develop strategies that address banks and other regulated institutions in distress (Dodge, 2011, p. 88). Each government agency pursuing its activities according to its unique mandates spelled out in legislation mitigates against regulatory competition. The activities of the four FISC agencies – prudential supervision, lender of last resort, deposit insurance and consumer protection – combine to form the federal safety net. See Appendix A for further details.

The following focuses on two key agencies with bank stability functions, OSFI and the Bank of Canada, as well as the federal government's involvement in the domestic mortgage market. Among these five agencies, OSFI is the regulatory agency that provides continual, on-going oversight of the regulated banks. It also imposes two key rules for the asset-liability management by banks, that of capital adequacy and leverage. OSFI requires banks to maintain a sufficient proportion of capital (or shareholder equity) of a particular quality on their balance sheets relative to their assets. This is to act as cushion against unexpected losses and asset value change. Among its various objectives, the Bank of Canada can act as the “lender of last resort” to chartered banks who are

minister is responsible for these four financial agencies, despite their ability to operate at arms' length of the minister.

²⁵ FCAC provides oversight of consumer protection measures in the federally regulated financial sector and expands consumer education.

unable to find short-term financing through other sources. OSFI seeks to ensure that banks are self-sufficient in capital “food” over the long-term while the Bank of Canada will provide “water” (liquidity) to banks when they cannot find any elsewhere.²⁶

As US subprime mortgages were at the heart of the 2008 crisis, this section finishes with a discussion of the transformation of the federal government’s involvement in the domestic mortgage market, specifically as organizer and participant in the country’s mortgage securitization market.

Office of the Superintendent of Financial Institutions

Through the 1987 OSFI Act, OSFI opened its doors with newly assumed responsibilities. A year later, an international agreement on bank capital standards, the Basel I capital accords, was negotiated. These principles were recognized by Canada, informing the capital adequacy requirements prescribed by OSFI. Another key development was a legislated mandate for OSFI in 1996 to create a formal incentive for the regulator to act early in the event a financial institution (FI)²⁷ got into trouble, rather than delay intervention (forbearance). This gave clarity where once there was ambiguity. The legislation also introduced new principles that would guide the relationship between OSFI and the banks, notably the value of self-regulation, and emphasis on early detection/intervention²⁸ in moments of distress not only specific to an FI but also

²⁶ The “food - water” analogy was suggested by Vlasios Melessanakis, Director of Policy, OSFI, during a course on bank regulation at Carleton University, September 2011.

²⁷ Financial institution (FI) is the more general term that includes not only chartered banks but insurance companies, trust companies and pension funds.

²⁸ OSFI. “Our History” <http://www.osfi-bsif.gc.ca/eng/osfi-bsif/pages/hst.aspx>. Accessed July 18, 2013.

in the wider system. Further, in recognizing that banks do take risks in a competitive market environment, risks that can lead to impairment and insolvency, OSFI will not save banks at all costs but let them fail. OSFI's priority is to protect depositors and other creditors, not shareholders, directors or senior managers. Yet to minimize the costs of insolvency, an amendment in 1996 gives OSFI the power to take control of an FI's assets.

With the conclusion of a consultation with the regulated institutions, OSFI's Supervisory Framework was approved and implemented in 1999. The Framework defines the supervisory process, the principles guiding the interaction between the public regulator and the federally regulated deposit-taking institutions. The 1999 Framework directs OSFI officers to focus on those significant activities it deems risky. Early identification of emerging risks and issues is emphasized. With its focus on risk, the Framework distinguishes between inherent risk, quality of risk management, net risk of activity and overall risk to the wider bank. Information on risk is collected and organized in a matrix for developing overall assessments of the banks. This information is drawn upon for providing feedback to institutions and in intervening if necessary. The supervisory process is a planned, cyclical activity, organized along an annual schedule, but with sufficient flexibility to be responsive to emerging issues. Since its implementation in 1999, there were subsequent developments that would complement and support the Framework. For example, in 2002, the Composite Risk Rating began to be provided to regulated institutions.

Understanding the effectiveness of the OSFI Supervisory Framework must take into consideration the relationship between the coercive powers OSFI has at its disposal, the rules it applies and enforces and the guidelines it issues. OSFI is described as a principles-based regulatory regime, which relies on conforming one's behavior to broad principles rather than narrower, more specific rules. An advantage of this approach is that it reduces compliance monitoring and litigious responses. However, this should not diminish the importance of coercive powers and rules for sustaining the effectiveness of the principles.

- *Power of intervention:* A key component of the overall apparatus is the “Guide to Intervention for Federal Financial Institutions”, was originally introduced in 1995.²⁹ It explicitly details the approach that OSFI and CDIC would take in intervening in the business affairs of the bank. There are graduated steps, that ultimately culminate in the seizure of the assets of the banks, replacing management and the board of directors, requesting a business winding-up order and cancellation of the bank's deposit insurance. The guidelines also outline the circumstances which would trigger the different stages of interventions (there are four stages above “normal”).
- *Rules:* The rules that OSFI does impose are praised for being relatively simple and few. The most prominent are those that apply to capital adequacy requirements, namely the regulatory capital ratio and the assets-to-capital multiple (ACM), which is a leverage limit. These capital

²⁹ The 1995 Guide was replaced in 2008 with the “Guide to Intervention for Federally Regulated Deposit-Taking Institutions”.

rules align with international standards (Basel I and II standards).³⁰ OSFI requires a minimum capital ratio above the Basel standard. Further, OSFI prescribes the ACM of 20 (or higher than 20 upon regulatory approval).

- *Guidelines*: On the softer side, OSFI has issued numerous guidelines which give substance to the “principles-based” approach to regulations. Further, they cultivate an expectations-based relationship defined by expectations about behavior, not rule compliance. To the extent that guidelines are developed through industry consultation, compliance is probable as the regulator and the regulated are on the same page. Examples of guidelines issued by OSFI to deposit-taking institutions include “Prudent Person” (1993), “Large Exposure Limits” (1994), “Liquidity” (1995) and “Capital Adequacy” (2007).

Bank of Canada

The Bank of Canada is another agency assigned special responsibilities in the general effort to maintain an efficient, stable financial system. Among its primary functions, the Bank of Canada acts as a lender of last resort. The Canadian state acting as the ultimate provider of liquidity to the financial system (that is, lending funds in the event of market failure) goes back as far as the 1914 Finance Act, which created a short-term lending facility (a discount window) at the Department of Finance for chartered banks. This function would later be transferred to the Bank of Canada in 1935. Subsequent institutional

³⁰ The Basel II capital guidelines introduced in 2001 were implemented in Canada in 2007.

developments with respect to short-term money markets, the payment and settlement system and the conduct of monetary policy would ultimately culminate in their integration through the creation of the Large Value Transfer System (LVTS), a wholesale payment settlement and clearing system that began operation in 1999. Charging interest on overnight loans made to LVTS participants (deposit-taking institutions as well as life insurance companies, securities dealers and mutual funds) would provide a new mechanism for conducting monetary policy by the Bank of Canada. The LVTS framework also assists the Bank of Canada with its lender of last resort responsibilities. All emergency lending to LVTS participants must be collateralized or secured. As part of the day-to-day normal functioning of the LVTS, the Bank makes available collateralized overnight loans to LVTS participants who are experiencing “temporary shortfalls in their settlement balances” (Daniel, Engert and Maclean, 2004-05, p. 3). These overnight loans are made available through the Standing Liquidity Facility (SLF).

In extraordinary moments of illiquidity, the Bank has three tools to respond as lender of last resort. The tool of interest here is Emergency Lending Assistance (ELA).³¹ The ELA is available to qualified LVTS participants who are

³¹ The other two tools are designed for more difficult circumstances. The Bank will lend to a LVTS participant (against past collateral) who has defaulted in the settlement process, even if that participant is now insolvent. This is to ensure that failed participant settles its obligations in the payment system and not unintentionally risks systemic collapse (Daniel, Engert and MacLean, 2004-05, p. 55). The second means is the legislated authority of the Bank to provide funds to firms, both financial and non-financial, that are judged by the Bank to threaten the stability of the larger financial system. The funds are provided through the purchase of the firm’s assets, where eligible assets are widely defined (p. 54). Described in paragraph 8 of the Bank of Canada Act, the intent is that this authority be exercised in periods of “severe or unusual stress on a financial market or financial system.” (p. 54)

solvent and “requiring more substantial and prolonged credit” (p. 49) support due to temporary challenges in balancing its demand deposit liabilities and relatively illiquid assets. Historically, the ELA has been rarely used.³² This special lending facility maintained by the Bank of Canada would provide a framework for providing extraordinary short-term funding support during the financial crisis.

Mortgage market regulation

As discussed above, the Canadian state has been long directly involved in the real estate and mortgage market, with the creation of the Canadian Mortgage and Housing Corporation (CMHC) in 1946 and the introduction of public mortgage insurance in 1954 (Hunter, 1991, p. 82). This insurance program would be a factor in the 1987 creation of the National Housing Act Mortgage-Backed Securitization (NHA MBS) program, administered by the CMHC.³³ Securitization is a financial engineering process where relatively illiquid assets (e.g. real estate loans) underpin the creation of tradable securities. The NHA MBS program allows Canadian mortgage lenders to issue MBS that are backed by pools of residential mortgages insured under the National Housing Act. For a private mortgage lender such as a chartered bank, securitization through the NHA MBS program not only provides balance sheet liquidity and a good, cost-effective funding source, it also supplies a high-quality liquid asset. To meet regulatory

³² Before the 2007 financial crisis, the facility was used once in 1977 by Unity Bank, a small regional bank, and then again in 1985 by troubled lenders Northland Bank and Canadian Commercial Bank (who ultimately became insolvent) as well as three regional banks who lost public confidence in the wake of the failures of Northland and CCB (Daniel, Engert, MacLean, 2004-05, p. 8).

³³ While private-label residential mortgage securitization did begin in 1985 in Canada, it would ultimately be overwhelmed by the CMHC's public securitization program.

requirements regarding balance sheet liquidity, lenders may retain on their balance sheets much of the NHA MBS that they originate (Mordel and Stephens, 2015, p. 45). Investor demand is strong for NHA MBS, as well as the Canada Mortgage Bonds³⁴ issued by the CMHC, as these instruments provide regular payments of interest and principal to the investor and are considered a government security, with their strong credit rating. Public securitization has been a key driver in the supply of mortgage loans, as “mortgage credit in Canada has tended to move directionally with public securitization” (p. 42). On the eve of the financial crisis, the ratio of outstanding securitizations to residential mortgage debt in Canada was about 20%, with the clear majority being through MHA MBS (p. 42).

4.2. Chartered bank industry

Turning to the second track of NFO development during the 1986-2007 conjuncture, I describe the transformation of the chartered bank industry and its movement to a position of dominance among other types of private financial institutions in the Canadian system. It is the political process, through legislative change (mainly relating to the Bank Act), that drives this industry transformation. Chartered banks are enabled to acquire securities brokers and trust companies, signifying the emergence of the universal bank in Canada amid the partial

³⁴ The Canada Mortgage Bond program was introduced by the CMHC in 2001, where NHA MBS could be sold to the Canada Housing Trust (CHT), which then re-bundles the NHA MBS into Canada Mortgage Bonds (CMBs) to be sold. The funds generated by CMB sales are used to purchase NHA MBS. CMBs are similar to NHA MBS but with the advantage of promising smoother payment flow (of interest and principal) to investors, much like conventional “plain vanilla” bonds.

collapse of the “pillar” system which had characterized the Canadian system since the late 19th century. However, momentum toward greater concentration in the financial system, both among banks and between banks and other financial institutions (such as life insurance) was halted by the blocking of proposed mergers between four large banks in 1998. As we will see, this event, combined with 2002 Bank Act which followed from it, signifies the stabilizing of this emerging NFO. It is a structural configuration with public policy objectives to encourage both competition and growth of financial institutions are balanced by state interests in further developing consumer protection and prudential regulation.

1987 Bank Act

The 1987 Bank Act featured provision that allow chartered banks to “engage in all types of securities dealings” (Darroch, 1994, p. 279). Dubbed the “Little Bang” due to the resemblance to similar reforms undertaken in the UK in 1986, the response by four of the chartered banks was to acquire major independent brokerages operating in Canada. This policy move was the equivalent of removing the 1933 Glass-Steagall Act in the United States, which separated commercial banking from investment banking³⁵. In Canada, bank lending and brokering securities had always been separated.

It was the policy actions of provincial governments which spurred this legislative change at the federal level. While the 1867 Constitution placed chartered banking in the federal jurisdiction, the regulation of securities dealing

³⁵ The 1933 Glass-Steagall Act would be repealed through the 1999 Financial Services Modernization Act (Gramm–Leach–Bliley Act), twelve years after Canada’s move.

fell under provincial authority. In 1986, Quebec's Autorité des Marchés Financiers permitted the Bank of Nova Scotia a license to create a full-service underwriter, Scotia Securities (Darroch, 1994, p. 279). In 1987, Ontario relaxed restrictions on ownership and direct entry by foreign brokerages in the Ontario market (Freedman, 1999, p. 12).

While policy changes at the provincial level may have precipitated the reform in the 1987 Bank Act, two main pressures or forces underlay this response (Freedman, 1999). Non-financial corporations were increasingly using market funding (such as the issuance of bonds, shares and short-term instruments such as corporate paper) as an alternative to bank lending. This financial innovation gave more choice to corporate borrowers but at the same time put into doubt the future of corporate lending by banks (and thus the banking firm itself). The second pressure was that Canadian brokerages were relatively small, especially compared to Wall Street investment banks, and were believed to need a broader equity capital base to conduct business activities of greater scale and risk. With foreign financial firms, notably from the US and Europe, increasingly able to provide these services to Canadian companies, there was worry that Canadian brokerages would fall behind in the competition to provide these services. To provide full service one-stop shopping to corporate clients, the brokerages would either grow through industry consolidation or merge with other domestic financial institutions. As it was, the chartered banks and securities brokerages, as well as the trust and life insurance pillars, had already been encroaching on each other's core business domain. For example, while the banks were not able to underwrite

and distribute corporate securities, they were permitted to do so for government debt. Securities dealers had begun paying interest on the credit balances of clients, placing them in effective competition with deposit-taking institutions. The 1987 legislation would remove remaining restrictions on the activities separating the banks and securities brokerages, including ownership. Following its promulgation, four large banks each acquired a securities dealer, giving each an investment banking wing and hollowing out the industry of independent brokerages.³⁶

1992 Bank Act

The 1992 Bank Act eliminated additional restrictions on financial activities and ownership between the pillars, again motivated by the perceived need to formally clarify the appropriate scope of business undertaken by each financial industry group (Freedman, 1999, pp. 12-13). Encroachment on the core activities of a rival pillar had long existed between the chartered banks and the trust companies. There were two factors behind these amendments. First, there was a need to formalize an even playing field among the pillars who were competing in the same market space.³⁷ Second, these amendments provided options for business transformation for a trust and mortgage loan industry that had been experiencing episodes of stress throughout the late 1980s and 1990s,

³⁶ The four acquisitions were: Dominion Securities by RBC (1988), McLeod Young Weir by CIBC (1988), Nesbitt Thomson by BMO (1987), and Wood Gundy by Scotiabank (1988) (Bordo, Rockoff and Redish, 2011). Toronto Dominion would build its own investment bank wing from scratch. In 1999, National Bank acquired Toronto-based brokerage First Marathon, which it would later merge with its subsidiary Lévesque Beaubien Geoffrion to form its investment banking subsidiary.

³⁷ One measure that sought to level the playing field between banks and other FIs was the phase-out of the reserve requirement imposed only on chartered banks. This reform would remove this policy lever used in the conduct of monetary policy by the Bank of Canada (Freedman, 1999, pp. 14-15).

with several trusts becoming insolvent.³⁸ The Bank Act updated the legislation governing these near-banks, as well as insurance companies, giving them full household and business lending privileges. Chartered banks were given powers to further diversify and enter activities of other pillars (such as in trust companies and insurance companies), either through in-house services or through subsidiaries (p.14). Further, these financial institutions could seek networking arrangements with third parties to offer other services through their branch networks. Some restrictions were maintained. The banks continued to be prohibited from selling insurance product in their branches (although they could offer insurance products through an insurance subsidiary) or participating in car leasing or owning a car-leasing company (p. 14). With the 1992 Bank Act³⁹ allowing the chartered banks to acquire trust companies as well as offer financial services offered by trusts, such as wealth management services, the large banks began acquiring trust companies⁴⁰. “With Canada Trust merging with TD Bank in 2000”, Coleman and Porter (2003) observe, “the trust-company sector has become virtually insignificant as a separate force within banking services” (p.

³⁸ Between 1987 and 1996, 21 members of the Canadian Depository Insurance Corporation failed. With the exception on one bank (Bank of Credit and Commerce Canada), all were trust and mortgage loan companies (CDIC, 2017).

³⁹ Beyond removing the barriers between banks and trust companies, the 1992 Bank Act also lifted restrictions on banks from other areas of financial activity. For example, chartered banks were permitted to hold, manage and develop land through their real estate property corporations and to own real estate brokerage firms. They could now provide specialized financing services such as venture capital and merchant banking. At the retail level, the banks could offer in-house investment counselling, portfolio management and financial planning (Darroch, 1994, p. 280).

⁴⁰ The acquisitions include: Central Guaranty Trust (1992) and Canada Trust (2000) by TD, Royal Trust (1993) by RBC, Montreal Trust (1994) and National Trust (1997) by BNS, and General Trust (1993) by National Bank (Coleman and Porter, 2003, p. 250).

250).⁴¹ Again, institutional changes with the aim of increasing competition within the Canadian system has led to further collapse of the original five-pillar system, leaving chartered banks, life insurance companies and the provincially regulated credit unions as the remaining pillars.

Pressures of globalization and the 1996 MacKay Task Force

Yet despite the flexibility afforded by the 1987 and 1992 Acts to acquire brokerages and trusts, the Big Six banks sensed greater competition both at home and abroad in the mid-1990s. Using several measures to compare the position of Canadian banks in 1982 and 1997, Coleman and Porter (2003) conclude that although the large Canadian banks are “exceptionally strong in their dominance of traditional banking activities within Canada” (p. 243), “their foreign operations have become more concentrated in the United States and their presence in securities markets has not been as strong as the presence of their global competitors” (p.248). Further, home market dominance was not completely secure. Looking at the rank order of the ten largest chartered banks by asset size in 1999, one finds three foreign bank subsidiaries (HSBC in 7th place, Citibank in 9th and Bank of America in 10th), whereas there were none before the easing of restrictions on foreign bank subsidiaries in the 1980 Bank Act (Siklos, 2001, p. 366). Another indicator of new competitive forces in the home market was the entry of ING Direct Canada in 1997. This signified the arrival of the direct banking model in Canada, which offered retail banking

services (such as high interest rate savings accounts) over the internet, phone, or ATM instead of through traditional branches.

Adding to the perceived pressures on the banks was the general pressure posed by the spirit of the 1988 Canada-US Free Trade Agreement (FTA) and the superseding 1994 North American Free Trade Agreement (NAFTA), the latter which committed each member country to forward-looking guiding principles toward financial services, the broadest one being “firms providing financial services should have equal access to customers in member countries, either through rights of establishment or through cross border trading, and all must be subject to non-discriminatory regulation” (White, 1994, p. 12).⁴² This principle (as opposed to a rule), along with implicit aspirations for the evolution of banking between the three countries, arguably created an additional idea structure that supported the progressive liberalization of Canada’s financial services industry. This fed scrutiny of the existing legislative regime describing rules on entry, ownership and legal status (e.g. subsidiary versus branch). Yet reforming the status quo contained some challenges. While changes to the entry and ownership regime hold potential improvement in competition in the Canadian market, they could also place the established domestic banks at a disadvantage.

⁴² However, White finds the two regional trade agreements did not precipitate greater inflow of foreign entrants in the Canadian banking system, finding instead that there was greater inflow before the 1988 FTA, where some 57 new entrants likely took advantage of the removal of restrictions on foreign subsidiaries in the 1980 Bank Act (White, 1994 p. 10). He also observes that the foreign banks who did set up shop in Canada, “far from overrunning the system after 1980, have on balance failed to achieve rates of return on equity as high even as those on Canadian treasury bills” (p. 10). Following the ratification of NAFTA, US banks appear to have looked for profitable opportunities in Mexico rather than the “highly competitive Canadian banking system” (p. 17).

This did present threats to the interests of established financial institutions, not least the Big Six Canadian banks, who enjoyed high franchise value⁴³, the consequence of years of evolution in the financial system, with banks rising to their dominant position. To shore up their competitive positions, the banks began to lobby for permission to move into other financial activities such as cross-selling insurance products in their branches and lease automobiles (Harris, 2004, p.161). This demand led to pressure on the Chretien Liberal government to address this issue of competitiveness in the Canadian financial services industry in this apparent new era of globalization. With the Bank Act scheduled for revision by 1997, then Finance Minister Paul Martin sought to manage the pressures from Canada's financial industry by forming in 1996 the Task Force on the Future of the Canadian Financial Services Sector ("MacKay Task Force"), charged with investigating and giving options on not only how to improve competition but also consumer service. The inclusion of consumer interests in its mandate posed an obvious challenge for the task force, that of protecting Canadian consumers amid further industry transformation⁴⁴.

⁴³ Franchise value is defined as "the present value of the stream of profits that a firm is expected to earn as a going concern" (Demsetz, Saidenberg, & Strahan, 1996). Marcus (1984) argues that public regulations can support a relatively high franchise value for a bank due to the limits on competition or to the insurance against instability that regulations provide.

The franchise value of a bank is related to its market power, its ability to earn economic rents enabled by restrictions on competitive forces, such as barriers to market entry.

⁴⁴ With the Task Force scheduled to report in 1998, revisions in the 1997 Bank Act sought to "update and fine-tune the 1992 legislation"⁴⁴ (Freedman, 1999, p.15) rather than introduce an overhaul of the legislative framework as did the 1987 and 1992 Bank Acts.

Interlude: 1998 Bank Merger Announcement

With the Task Force set to report later in the year, the Royal Bank and the Bank of Montreal made the surprising announcement on January 23, 1998 of their intent to combine in a merger of equals. Three months later on April 17, a merger of equals was announced by Toronto Dominion and CIBC. The four banks argued that becoming bigger through mergers was the best way to prevent Canadian banks from shrinking in both home and overseas markets. Given the implications for concentration in Canada's banking markets, a public debate ensued. Before the House of Commons Standing Committee on Finance in September 1998, TD CEO Charles Baillie argued that the effect of the government saying no to mergers would be:

“to rule out our competing effectively in world markets. Canadian financial institutions would also see their domestic market shares dwindle, squaring off against much larger foreign-owned competitors ... Certainly, with consolidation continuing elsewhere – and make no mistake, bank mergers are a worldwide phenomenon – we would gradually lose our place at the table” (CBC, 1998).

The four banks asserted that the combination of their operations would result in stronger positions to compete effectively at home and abroad, as well as create significant cost savings without diminished competition (Competition Bureau, 1998). Beneath this, a more specific motive for merging was asserted. Before a Senate Committee in 2002, Bank of Nova Scotia CEO Peter Godsoe, whose bank opposed the mergers testified that:

“You merge for only one reason, in my view. There is one overwhelming reason that can be given to the Canadian people, which is the overall scale of our equity base. Why do you need the size? It is to grow and expand outside of Canada faster” (Lott, 2005, p. 8).

In addition to public hearings taking place before both the House and Senate committees in the Parliament of Canada, the Liberal caucus organized its own research committee and published a report, which recommended the government not support the proposed merger. Two government agencies weighed in on the proposals. OSFI offered the Minister of Finance its assessment of the two proposed mergers on prudential grounds, finding no reason why they should not be considered for approval. However, OSFI was unable to conclude that the resulting consolidated banks were financially stronger. Further, it warned that it would be more difficult for these larger banks to “recapitalize, sell, or restructure” if they became distressed (p. 12). The Competition Bureau expressed reservations about how the proposed mergers would affect market competition for financial services, especially for household banking and small and medium enterprises. The Bureau concluded that both mergers would likely lead to a “substantial lessening or prevention of competition that would cause higher prices and lower levels of service and choice for several key banking services in Canada.” (Canada, 1998). Finance Minister Paul Martin rejected both proposals on December 14, 1998. Citing the concentration of economic power and reduction of competition that would result if the mergers

took place, and that this in turn would “reduce the government’s policy flexibility to address potential future prudential concerns” (Martin, 1998).

2002 Bank Act

In response to the MacKay Task Force’s report tabled in September 1998, the Government of Canada circulated a public consultation paper in 1999.

Seeing “it is incumbent upon the government to put into place a policy framework that allows the sector to evolve” amid the forces of financial innovation, globalization and an aging population, the consultation paper organized its recommendations along four policy themes: 1) giving financial institutions the flexibility to adapt to the changing landscape and contribute to economic efficiency and growth, 2) promoting competition in the domestic market, 3) updating the regulatory framework to reduce burden while maintain prudential and public interest objectives , and 4) preserving consumer access to financial services and improving consumer protection (Canada, 1999, p. 10).

The first two themes, enabling Canadian financial firms while promoting domestic competition, have been the focus of financial policy discussion since the 1964 Porter Commission. The theme of regulation was introduced to the national policy discourse through the 1986 Estey Commission. The Mackay Task Force, and the government’s response to it, explicitly added the consumer of financial services (whether households or non-financial businesses) to the policy discourse. This event marks the second moment in the formation of the national financial order of this contemporary period, one with empowered consumers as well as regulators.

Like its 1987 and 1992 counterparts, the 2002 Bank Act was designed to significantly transform the legal framework of the Canadian financial system by adopting several task force recommendations.⁴⁵ In terms of consumer access and protection, the bill created the Financial Consumer Agency of Canada (FCAC)⁴⁶, giving it responsibility for enforcing the consumer-related provisions of legislation governing federal financial institutions. To encourage new entrants and enhance competition within the market place for financial services, several provisions update the rules on entry, ownership and permissible activities. For example, smaller banks, having equity less than \$1 billion, could be closely held rather than widely held (where no single shareholder owns more than 20% of the voting equity). Also, the minimum capital investment to start up a bank was \$5 million, reduced from \$10 million. Lastly, foreign financial institutions were now able to operate in Canada through branches in addition to subsidiaries.

Balancing these competition measures, existing financial institutions within the federal jurisdiction were afforded additional flexibility in devising business strategy. While maintaining the principle of widely-held ownership of large banks, the share ownership limit for a single shareholder was raised from 10% to 20% (Harris, 2004, p. 175). Further, banks and life insurance companies were given the option of forming holding companies, giving them added versatility in structuring their corporations. Finally, to follow up the bank merger decision of

⁴⁵ Not to be ignored was a separate public review of the Canadian payments system that ran in parallel with the Mackay Task Force. This Payments System Advisory Committee was tasked to study expanding membership to the payments system and changing its governance structure. Some of its recommendations were enshrined in the 2001 Canadian Payments Act.

⁴⁶ Following its creation, FCAC would become a member of the Financial Institution Supervisory Committee (FISC).

1998, the Government formalized a process to review merger proposals among large banks. Large banks interested in merging would need to provide a public interest impact assessment, a document that outlines the costs and benefits of the proposed merger, such as its impact on lending on different types of consumers in different markets. Parliamentary committees from both the House and the Senate could scrutinize the proposal and assessments were sought by OSFI and the Competition Bureau. The final decision on any proposed mergers was left with the Finance Minister. This policy statement on bank mergers reduced the likelihood of large bank consolidation in the near term, and thus dampened dramatic changes to the structure of the banking industry. This event, alongside the establishment of OSFI's Supervisory Framework in 1999, are indicators of the congealing of the national financial order of this conjuncture.

Post-2002 Bank Act

Given the five-year sunset clause, the Bank Act needed to be renewed by 2007 at the latest. With a new government, the Harper Conservatives, elected in January 2006, the 2007 Act was modest in its changes to the financial services framework, securing updates and technical changes.

Yet even with a formal merger review process put place in the 2002 Act, there continued to be agitation for changes to the review process, with arguments that the government has made the "process so cumbersome, that it becomes self-defeating" for large banks interested in merging (Bond, 2003, p.1). Another critic asserted that "the government should not try to micromanage the outcomes or pick winners and losers" but leave the merger decision to private

decision makers subject to clear regulatory criteria (Hartt, 2004, p. 65). In its annual Article IV reports on Canada leading right up to 2008, the International Monetary Fund advocated “further opening of the Canadian banking system to takeovers would boost market flexibility, support financial innovation, and widen access to finance.” (IMF, 2008, p. 52). The Harper government sought to address the lingering bank merger issue by (again) turning it over to a consultative task force, the Competition Policy Review Panel (Red Wilson Panel) established in 2007. In its June 2008 report, titled “Compete to Win”, the panel reaffirmed retaining the widely held ownership rule applicable to large FIs yet recommended the Minister of Finance remove the “de facto prohibition on bank, insurance and cross-pillar mergers of large financial institutions subject to regulatory safeguards” (2008, p. 52).

By September, the international financial system would be in crisis.

4.3. Bank behavior, 1998-2007

The intervening years between the 1986 Estey Commission and the 2002 Bank Act featured a series of events in both political processes and economic processes that together helped mold and stabilize a new national financial order. A multi-agency regulatory apparatus had been assembled with OSFI's Supervisory Framework at the centre of it. Further, the 2002 Bank Act dampened the chances of large bank mergers radically altering industry structure in the near term. This order would remain relatively unchanged right up to the outbreak of the 2007 crisis. With these new institutional “rules of the game” in

place, the large banks would adjust their business strategies and carry forth. The following describes ensuing bank behavior and performance.

Post-1998 strategic directions

Notwithstanding the Bank of Nova Scotia with its large footprint in Latin America and the Caribbean, the large Canadian banks have mainly focused on American expansion as the international component of their overall growth strategy (Coleman and Porter, 2003, p. 243). This pattern emerged in the 1980s and 1990s and is more regional than global. This contrasts with the position of the large Canadian banks in international markets in the 1960s, when “three of the twelve largest banks in the world were Canadian” (Darroch, 1994, p. 260). The rejection of large bank mergers in 1998 and the subsequent clarification of the merger review process in 2002 meant that four of Canada’s large banks focused their US expansion strategy to acquiring smaller regional banks rather than larger American commercial or investment banks.⁴⁷ Yet despite the investment activities abroad in the years leading up to 2007, the home market remained the largest source of income. On the eve of the crisis, Canadian operations account for at least 60% of overall profit among the six large banks (Bloomberg Data Service).

⁴⁷ RBC would acquire Centura Bank in 2001, followed by Admiralty Bancorp in 2002. TD would purchase Banknorth in 2002 while BMO’s American subsidiary Harris Bank would buy Mercantile Bancorp in 2004 and First National Bank and Trust in 2006. Encouraged by the success of PC Financial through its partnership with Loblaw’s, CIBC attempted to replicate this model in the US through the Winn-Dixie and Safeway supermarket chains in 1999. After two years of losses, CIBC closed operations in 2002 (Swire Chin, 2014).

Response to loss events

Given this adjustment in strategic direction, how did banks behave/performance in the period leading up to the financial crisis, keeping in mind the national financial order that emerged and solidified in the early millennium? A variety of experiences over these nine years, including several high-profile loss events, led banks to shift their overall business models and make changes to corporate governance. These changes helped position the large Canadian banks to weather the financial storm that would begin to gather in 2007.

The profit performance over this period right up to July 2007 show that the banks were consistently profitable, booking strong, and growing, quarterly profits in the range of \$300 million to \$1.5 billion. While the trends in all three indicators for the Big Six banks support the view that the Big Six banks enjoyed long-term profitability and positive returns to shareholders, there is variation evident among the six banks. Separating RBC, BMO, and BNS (Chart 4 below) from TD, CIBC and NBC (Chart 5 below) brings into focus these differences.

What is noteworthy in chart 4 is that all three banks experienced at least one quarter of a sharp drop in profit or actual losses over this period. Review of the annual reports of these banks allows identification of the causes for the

diminished profit performance. BNS' net income fell sharply in Q1 2001 as consequence of its exposure to the Argentinian economic crisis in 2001 and 2002. RBC's involvement in the Enron accounting scandal led to fines that lowered the bottom line in Q4 2004 and Q4 2005. Significant losses in natural gas trading sank the profit line for Bank of Montreal in Q1 2007. These three banks had varied response to these quarterly losses: BNS divested its operations in Argentina and Bank of Montreal commissioned both an internal and an external review into its risk management practices. RBC appeared to absorb the loss and give greater emphasis in its communications to shareholders of the importance of "knowing your client" (Royal Bank, 2005).

These responses were relatively smaller compared to significant changes in strategic direction undertaken by TD and CIBC in response to sharp losses. In 2002, TD suffered back-to-back losses in their third and fourth quarters, and again in Q2 2003, in part due to exposure of their wholesale banking division to the troubled telecommunications sector as well as to the Enron corporate accounting scandal. In response, TD senior management decided to make more fundamental changes. In its letter to shareholders in its 2002 Annual Report, senior management said, "we had no choice but to move swiftly and aggressively to change the risk profile of the Bank, and overhaul our corporate lending strategy" (Toronto Dominion, 2002, p. 3) TD chose to divide to its wholesale lending relationships into core and non-core loans and exit from its non-core loans, a process that would take three years. Further it implemented an enhanced credit framework with stricter industry, portfolio and name

concentration limits. Also, there was a change in senior management that year as Ed Clark succeeded Charles Baillie as CEO.

This heightened emphasis on risk management likely influenced the decision in 2005 to exit certain global structured product portfolios in a bid to further de-risk its wholesale banking division. According to Clark, “They (the structured products) became too complex. If I cannot hold them for my mother-in-law, I cannot hold them for clients.” (Ireland and Webb, 2011, p. 101). Up to that point, TD was one of the top ten holders of securitized assets in the world. The restructuring of its investment banking business and the impact this would have on overall bank profitability would be offset by the strategic goal set earlier in 1999 when TD acquired Canada Trust and sought to transform TD’s retail operations by adopting Canada Trust’s “comfortable banking” approach, one that promised to deliver high customer service standards to clients of the new TD Canada Trust (Campbell and Kazan, 2005, p. 1).

CIBC also suffered a string of quarterly losses in the early 2000s, often associated with losses in its investment banking business. Deep losses suffered in third quarter 2005 (partly due to \$2.9 billion legal settlement resulting from its involvement in the Enron accounting scandal) led CIBC to be dubbed in the media as the bank “most likely to accidentally maim itself while running with scissors” (DeCloet, 2007). With Gerry McCaughey succeeding John Hunkin as CEO in that year, CIBC embarked on significant strategic re-orientation to de-risk the bank. This was as much a public relations campaign as it was a reorganizing of business strategy. For example, its 2005 annual report was titled the “Annual

Accountability Report". In the message to shareholders, the chair of the board wrote "“CIBC is a much different bank than it was four years ago.” Further, he wrote “your Board believes however, that the extensive risk management and governance programs we have implemented will serve CIBC well in reducing the risk of a recurrence of the past events that led to these settlements” (CIBC, 2005, p. 4). Part of the overall strategy included maintaining the strength of the bank’s core business lines. In wholesale banking, there was a decision to reduce its merchant banking portfolio. However, adjusting portfolios can take time, and this meant that past business practices had material consequence once the financial crisis began to unfold in the summer 2007. CIBC began to write down its portfolio of unhedged collateralized debt obligations (CDOs), whose value had been eroded by rising subprime mortgage defaults in the US. CIBC would survive the 2008 financial crisis, but not unscathed, booking \$6.7 billion in write-downs⁴⁸.

Changes to organization design and corporate governance

In addition to changes in business strategies, there is evidence among the large banks over the 1998-2007 period of organizational redesign with respect to corporate governance as well as the place of risk management among corporate priorities. Over this period, all six banks separated the role of chair of the board of directors from the role of chief executive officer, signifying greater independence of the board from senior management. Also, the banks undertook

⁴⁸ This write-down estimate is gathered through the Bloomberg Data Service using the WDCI command.

some reorganization of corporate structure and enhancement of how risk is managed. For example, between 1998 and 2007, CIBC added five new categories of risk it would monitor.⁴⁹

Tullo (2014) uses the term “burning platform” to describe a “substantial loss event that lead(s) the bank leadership to realize the importance of enterprise risk management” The impact of the loss event draws the attention of management to sources of risk that threaten the long-term franchise value of their banks. Five of the large banks experienced “burning platforms” to some degree in the ten years leading up the 2008 financial crisis.⁵⁰ Evidence from bank communications suggest that these events led to changes in risk management and in some cases strategic direction. That these took place ahead of the unforeseen crisis in 2007 is an example of lucky timing.

4.4. Summary

The national financial order that comes to characterize the 1986-2007 period in part reflects a continuity of two trends observed in the previous NFO, that of policy changes that liberate or enable banks in their business activities and of policy actions where the state becomes more involved in the regulation of the bank-centred financial system.

⁴⁹ Liquidity, strategic, reputational and legal, regulatory and environmental risk joined credit, market and operational risk (CIBC, 2007).

⁵⁰ While National Bank of Canada did not experience a serious “burning platform” in the years leading up to 2007, it certainly did in the early days of the crisis in August 2007 when it was implicated in the malfunction (and subsequent freezing) of the Canadian non-bank asset-backed commercial paper (ABCP) market. This affected National Bank both as a sponsor of trusts issuing non-bank ABPC and as an institutional investor in these products.

There were several factors present, both within the Canadian system and without, which would suggest a continuation along the trajectory set in the previous NFO (1964-1986). There was clear evidence of change in financial capabilities (e.g. securitization), in institutions (e.g. globalization) and in ideas about financial policy (e.g. neoliberalism) that created pressures to pursue policies favouring the liberalization of national financial systems with a diminished role of the state.

Yet, through a political process triggered by the failure of two regional banks in 1985, the Canadian NFO would feature a financial regulatory regime that did not shrink but instead grow and transform. This new regulatory regime could be best described as a responsive regime, emphasizing self-regulation and co-production of rules and guidelines while being backed up by a legislated mandate to intervene early and in a graduated manner. Further, the NFO is dominated by six large universal-style banks, having acquired trust companies and securities brokerages following legislative change, and increasing their overseas presence (albeit mainly in the United States).

This NFO provided a context for the behavior of the banks during this period. While the large banks continued to grow and be profitable, the experience of loss events (interpreted as threats to the banks' franchise value) led many to change business strategies and enhance risk management. Such prudent measures were aligned with the overall principles of the new regulatory relationship.

With this national financial order and pattern of pre-crisis bank behavior in mind, we turn to examine the performance of the large Canadian banks and the actions of the state during the financial crisis.

5. Financial crisis of 2008

The performance of the large Canadian banks during the 2008 financial crisis is consistent with what we would expect under the sort of national financial order described above. This national financial order had matured by the early 2000s with the passage of the 2002 Bank Act. This order was characterized by a new regulatory relationship and a stable industrial structure. The behavior of the large banks under this new NFO leading up to the crisis appears broadly aligned with the principles of the new regulatory relationship. With the chances of large mergers being sharply reduced under the 2002 Act, the banks pursued alternative growth strategies, mainly through the acquisition of regional financial institutions in the US. Most of the banks experienced some significant loss event over this period, with the response tending to involve improved risk management and corporate governance, as would be expected under the new regulatory regime.

The influence of this NFO on the behavior of both the regulators and the banks also helps explain how the banks performed from the onset of the credit crisis in August 2007, through the period of peak stress in September and October 2008. This provides a new explanation of the Canadian puzzle. In this section, I describe the response of the Canadian state and the actions and

performances of the six large banks during this specific phase of the crisis, what is broadly understood as the part which involved a freezing of several linked national credit markets.

As the focus of this essay involves the financial performance of the large Canadian banks, this time line is subdivided into sections corresponding to the fiscal calendar of the Canadian banks, whose end of year is October 31. See Appendix B for a more detailed description of these time periods.

- August 1- October 31, 2007 (Fourth quarter 2007)
- November 1, 2007 - January 31, 2008 (First quarter 2008)
- February 1, 2008 - April 30, 2008 (Second quarter 2008)
- May 1, 2008 - July 31, 2008 (Third quarter 2008)
- August 1, 2008 - October 31, 2008 (Fourth quarter 2008)
- November 1, 2009 – January 31, 2009 (First quarter 2009)
- February 1, 2009 - onward

5.1. Canadian government responses

In looking at the responses of the Canadian government to the crisis, it should be noted that all the state actions were based on institutions that had already been put in place though the evolution of the regulatory apparatus. The policy levers were in place and capable of being modified. With this in mind, I turn to the segment of history spanning August 2007 to January 2009. The public responses may be organized into two distinctive periods: pre-peak crisis, dating from August 2007 to peak crisis in September 2008, and post-peak crisis,

the period between the bankruptcy of Lehman Brothers and end of January 2009.

Responses during the pre-peak crisis period (August 2007 – September 2008)

Government responses were limited to actions by the Bank of Canada, which began with a 25-basis point (0.25%) cut to its key policy interest rate of 4.5% on December 4, 2007. This action was the first in a series of cuts to the overnight rate it charges to borrowers who participate in the Large Value Transfer System (LVTS). The rate cuts would continue until April 21, 2009 for a cumulative drop of 425 basis points to 0.25%, where it would remain until June 1, 2010. This easing of the Bank's key rate would ease short-term liability costs for LVTS participants and exert downward influence on other short-term interest rates.

In the same month, the Bank of Canada would also introduce its term Purchase Repurchase Facility (PRA) to provide liquidity to the Canadian short-term credit market, which had become progressively tighter since August. Here, the Bank was acting in its role as lender of last resort, supplying short-term loans below market rates. Designed as an auction of available funds, the first term PRA was for loans with a one-month maturity and made available to primary dealers of Government of Canada securities (a group which includes the Big Six banks). As the credit crisis evolved throughout 2008, the periodic auctions through the PRA facility would be expanded along four dimensions: terms to

maturity, the actual amounts, the eligible participants and the permitted securities to post as collateral (Longworth, 2010, pp.5-6).

Other than these central bank actions, there were no other actions by the Canadian state leading up to September 2008, apart from periodic communications by elected officials and senior public servants. Unlike the situation with Bear Stearns in the US and Northern Rock in the UK, no Canadian financial firms fell into distress, prompting government involvement in their resolution. The freezing of the non-bank asset-backed commercial paper (ABCP) market in Canada was a clear exception to the relative uneventful Canadian financial landscape, but even in this case, its resolution was led by private sector actors, with the federal government playing a role of observer and behind-the-scenes facilitator. See the Textbox A below.

Responses post-peak crisis period (September 2008 - onward)

Following the sudden burst of stress in financial systems abroad in September, the key federal financial agencies responded with a series of measures to provide support, flexibility or accommodation to Canadian bank assets, liabilities and capital.

Monetary policy interest rate

The volatile aftermath of the failure of Lehman on September 15, 2008, provoked further actions by the Bank of Canada. The Bank would continue to cut its key rate on its fixed announcement dates, as well as an unscheduled cut of 50 bps on October 8 as part of an unprecedented coordinated monetary action by

seven central banks. After the cut on April 21, 2009, the key policy rate would remain near zero at 0.25% until June 1, 2010, a cumulative drop of 425 basis points since December 2007.

Lender of last resort

The Bank also continued to administer its term Purchase and Repurchase Agreement (PRA) lending facilities following the September turmoil, making auctions more frequent, expanding the number of eligible participants, lengthening the loans terms and allowing wider eligible collateral. The use of this facility by eligible participants peaked in December 2008, with a total of \$41 billion lent (Longworth, 2010, p. 6). In Longworth's assessment, "through the crisis, the Bank's regular term PRA

Textbox A: The Canadian non-bank ABCP market

On August 13, 2007, the Canadian market for non-bank asset-backed commercial paper (ABCP), valued at approximately \$32 billion, suddenly seized when investors refused to buy new issuances out of fear these securities were tainted by toxic US subprime mortgages. ABCP is a form of securitized instrument where a trust (or conduit) purchases and holds various assets (both conventional assets or derivative instruments) and issues short-term commercial paper backed by these assets. A financial institution like a bank acts as the manager or sponsor of the trust. While ABCP matures in 30 to 90 days, its underlying assets tend to be longer term and less liquid, creating a maturity mismatch. To insure against "roll-over" risk, where investors do not purchase sufficient new issuances of ABCP to pay for the issuances that are maturing, sponsors of ABCP trusts seek liquidity arrangements either in-house or through a third party. This is an insurance agreement where sponsors can draw on a standby credit line in the event of a "general market disruption", such as when the ABCP does not roll-over. Here lies a distinction about sponsors. Sponsors who were large banks tended to provide their own liquidity arrangements for their own ABCP. Smaller financial firms that sponsored "non-bank" ABCP had to seek this liquidity backstop from a third party. The sudden seizure of the non-bank ABCP market in mid-August is explained by two factors. Investors suddenly lost confidence in a financial instrument that was inherently fragile yet nonetheless lightly regulated and highly rated. The second factor was when new issuances failed to roll over, many third-party providers of the liquidity backstops didn't honor these arrangements, disputing that a "general market disruption" had taken place. Many large Canadian banks sponsored ABCP issuance and were able to maintain a functioning market in bank ABCP without incurring significant losses. Some were also third parties to non-bank ABCP sponsors. One interesting case was National Bank of Canada. Despite being the sixth largest Canadian bank, it had arranged liquidity backstops from Deutsche Bank and CIBC for its three affected ABCP trusts. When they refused to lend, National Bank was caught among other non-bank sponsors in not being able to rollover their issuances. National Bank was also affected as institutional investor, holding about \$1.3 billion in the frozen non-bank ABCP (Chant, 2009, p. 48). The bank joined other large investors to develop the Montreal Accord, an agreement to avoid asset value collapse by freezing the affected ABCP and restructure them as medium-term notes, allowing them to trade once again (Erman et al, 2007).

facility was used heavily and appears to have contribute to reduced market stress and a return to well-functioning money markets” (p. 6).⁵¹

Beyond the actions of central bank, the Government of Canada, led by the Minister of Finance, and in partnership with several arms’ length financial agencies, announced measures in October and November to support private lenders in the Canadian economy. These individual initiatives would be combined by the federal government under the banner of the Extraordinary Financing Framework (EFF), a set of initiatives to support financial institutions and markets. The EFF would later be portrayed by the government as a component of Canada’s Economic Action Plan unveiled in early 2009, the larger program of federal interventions in the faltering macroeconomy, including fiscal stimulus measures. The EFF programs relating specifically to banking sector are summarized below.⁵²

Asset purchase program

In cooperation with the Canada Mortgage and Housing Corporation (CMHC), the Government of Canada introduced the Insured Mortgage Purchase Program (IMPP) on October 10. The purpose of the IMPP was to support the mortgage market and bank liquidity by helping mortgage lenders raise funds. To

⁵¹ In addition to the term PRA, the Bank of Canada introduced three other targeted lending programs (term loan facility, term PRA facility for money market instruments, and the term PRA facility for private sector instruments). However, there was little use of them as they were designed to backstop and supplement existing lending programs. With the improvement of credit conditions by the spring 2009, these supplemental programs were wound up in the fall 2009 (Longworth, 2010, p.6).

⁵² It is noted that programs under the Extraordinary Financing Framework (EFF) were not exclusive to the chartered banks. For example, the Canadian Life Insurer Assurance Facilities (CLIAF), announced May 22, 2009, provided borrowing guarantees to insurers, similar those offered to lenders. The Canadian Secured Credit Facility (CSCF), announced May 8, 2009, aimed to purchase up to \$12 billion of term asset-backed securities (ABS) backed by loans and leases on motor vehicles and equipment with the intent of supporting private confidence and participation in this market.

achieve this, the CMHC would purchase government-backed National Housing Act Mortgage-backed Assets (NHA MBS) from mortgage lenders (such as the large banks) in exchange for cash. As such, this initiative could directly affect the asset side of bank balance sheets, with mortgage loans converted to cash.

The funding for these asset purchases would be raised through government debt issuance. Further, the purchase of the mortgage-backed securities from the private lenders was through a reverse auction mechanism⁵³, a mechanism that would ultimately ensure the Government earns revenue from these operations rather than be an expense (Nadeau, 2009, p.1). At its inception, the IMPP was authorized to spend up to \$25 billion, an amount that was increased to \$75 billion in November 2008 and then raised to \$125 billion in 2009 federal budget announced on January 27, 2009. Use of the IMPP began to taper off after February 9, 2009, the first reverse auction which did not allocate the full envelope of funds⁵⁴. The program expired at the end of March 2010.

Supporting the MBS purchases through the IMPP was the Canada Mortgage Bonds (CMB) program run by the CMHC. The CMHC repackages NHA MBS purchased from lenders into a security with a maturity duration and scheduled interest payments more attractive to investors. On August 1, 2008,

⁵³ The reverse auction mechanism involved the government purchasing agent (CMHC) announcing a total amount of NHA MBS it is willing to purchase in a single auction, for example \$8 billion. Participating lenders submit their offers, consisting of the total amount of asset they will to sell and at what yield (interest rate) they are prepared to pay. The CMHC first buys the amounts offered by lenders who submit the highest yields, progressively purchasing MBS from lenders in descending order of yield offered. This process continues until all the funds in CMHC's envelop are allocated or there are no other offers. A minimum yield is stated by the government to ensure that the asset purchase yield is above the interest costs of the funds raised by the government (Nadeau, 2009, p. 3).

⁵⁴ Of the \$8 billion authorized for the Feb.9 auction, \$7.945 billion was distributed. At the following auction on February 20, only \$2.338 billion was distributed from the authorized \$7 billion envelope (Nadeau, 2009, p. 6).

which notably preceded the upheaval in September, the CMHC announced that it would issue a ten-year CMB in addition to its five-year CMB issuances. This was welcomed by private investors; adding a ten-year CMB would give further breadth to this segment of the Canadian bond market (McLister, 2008).

Together, the IMPP and the expanded CMB program provided liquidity for private mortgage originators.

Government guarantees of bank debt

To support the liability side of bank ledgers, the government announced the Canadian Lenders Assurance Facility (CLAF) on October 23, 2008. This program provided insurance or guarantees of the long-term borrowing of federally and provincially regulated deposit-taking institutions, including the chartered banks. This provided a public backstop to bank bond issuances over a three-year period until April 30, 2009, securing this source of fund-raising and thus supporting continued bank lending. In some respects, it acted as a longer-term counterpart to the shorter-term borrowing facilities available to Canadian lenders at the Bank of Canada.

Capital regulation

Shortly after the announcement of CLAF, OSFI issued an Advisory on November 1, notifying the public that senior unsecured long-term debt issued by regulated financial institutions under CLAF would qualify as a risk weighting of 0. Ceteris paribus, this would lower the value of the risk-weighted assets of any bank that bought the CLAF-backed bonds of another bank. Further, to provide banks flexibility in maintaining their regulatory capital adequacy ratios, OSFI

increased the proportion of high quality preferred shares that could be counted as Tier One capital from 30% to 40%. If banks wished to increase their Tier One cushion, they could achieve this by issuing preferred shares instead of common shares, and thus not dilute existing common shareholders.

Together, these three programs, the IMPP, the CLAF and the relaxed capital regulations, along with existing lender of last resort facilities, sought to provide support or flexibility and accommodation to bank assets, liabilities and capital. Of notable absence was a bank recapitalization program using public funds (a bail-out) like those introduced in the US and UK in October 2008. Another important observation is the timing of the roll-out of the program. Apart from the central bank liquidity facilities, all the programs were put in place after September 2008, the month when several financial institutions (FIs) failed in the US. As few FIs in the US or in Europe collapsed after September but instead were buttressed by public capital injections, it may be argued the Canadian programs were aimed less at trying to prevent a Lehman Brothers-like failure at a Canadian bank and more at sustaining the supply of financial services, including lending, in the larger Canadian economy at pre-crisis levels.⁵⁵ Support of this view will become apparent in the next section on bank behavior and performance during the crisis.

⁵⁵ One explanation for the introduction of these support programs is that in their absence, the banks could deleverage their balance sheet by simultaneously reducing debt liabilities and assets to reduce overall risk. Bank deleveraging would bring reduced bank lending.

5.2. Bank behavior and performance

What is curious about the government responses amid the crisis is that most policy actions were made after the moments of peak stress in September 2008. This is telling. Amid the economic processes unfolding from the initial freeze of credit markets in August 2007, the performance of Canadian banks leading up to the peak stress did not necessitate earlier responses by the government. While there were asset write-downs, losses and falling share prices, none of the large Canadian banks filed for bankruptcy, were forcibly merged with other banks, nor were they nationalized or re-capitalized by taxpayers. This is in contrast with some of their peers in other countries (e.g. Citigroup in the US or Royal Bank of Scotland in the UK).

Asset write-downs and credit losses

As did many other banks over this phase of the crisis, the Big Six Canadian banks did declare value write-downs on assets affected by the market downturn. However, the write-downs were not as severe in magnitude as compared to banks in other countries. Chart 6 below featured the cumulative asset write-downs as a percentage of pre-crisis total assets for the six Canadian banks and six American peers.⁵⁶ Compared to their American peers, Canadian banks tended to have less write-downs. There is performance variation within

⁵⁶ The six American banks include three larger money centre banks (JP Morgan Chase, Wells Fargo and Bank of America) and three regional banks (BB&T, Fifth Third and PNC). The period of cumulative write-downs is third quarter 2007 to first quarter 2009 and pre-crisis assets are measured at fourth quarter 2006.

each national group, with CIBC having a higher write-down ratio than US regional bank BB&T.

Chart 6.

Profit

The Big Six banks remained relatively profitable over this segment of the crisis period. These asset write-downs did affect the six banks' bottom line through fallen profits, or in the case of CIBC and National Bank, quarterly losses. Refer to Chart 7 below. However, it is telling that the losses booked by CIBC (first and second quarter 2008) and National Bank (fourth quarter 2007) were announced months before the high stress period of September and October 2008 (fourth quarter 2008 using the Canadian bank reporting calendar). Arguably, any actions these banks took in response to their quarterly losses

helped return them to profitability and cushion the impacts of the upheaval in early fall 2008.

Chart 7.

Capital raising

One measure the banks took to strengthen their balance sheets during this period was raising capital from private investors, bolstering their equity capital cushions. See Chart 8 below. Several conclusions may be drawn from this evidence. First, it demonstrates an ability for all six banks to either tap equity markets to raise private capital throughout this crisis period. Second, it shows that three banks (RBC, BMO and TD) were able to do this during the August-October 2008 quarter (fourth quarter) when equity markets were tanking following the Lehmans bankruptcy. As described above, this upheaval was only beginning to stabilize after governments, including the US, intervened in mid-October and recapitalized several banks with public funds (not private funds).

Third, the individual Canadian banks were possibly raising capital for different reasons. CIBC raised about \$2.5 billion (USD) in the first quarter of 2008, likely to offset the loss of a similar amount it declared in that same quarter. In contrast, TD tapped private investors in both the third and fourth quarter of 2008 for a total of \$3.4 billion. However, as TD had few asset write-downs to date and remained profitable throughout, one may surmise that these capital raising were in preparation for other strategic objectives than insurance against future losses; for example, building a war chest for acquisitions.

Chart 8.

Lending

While sustained profitability is an indicator of strong performance for a bank investor, this does not necessarily mean that the banks continued to lend at the same levels during the crisis. One tactic for a bank facing increased risk and uncertainty is to convert assets into less risky categories. Calling in existing

loans (and converting them into relatively risk-free government securities and cash) while not granting new loans are expressions of deleveraging, which halts growth in overall bank loans.

Estimates of net loans (total loans net of loan loss provisions) over the crisis period for the Canadian banks show either stable or growing net loan levels. While net loan levels do slightly decrease for RBC and CIBC between fourth quarter 2008 and first quarter 2009, this may be due to the slackened demand for credit by households and businesses following September 2008. Aggregate demand in several economies had contracted in the aftermath of early fall. For the most part, Canadian banks continued to lend over the crisis period.

Chart 9.

Share price

If only a single indicator could be used to assess the performance of Canadian banks during the crisis period, share price is an all-in measure of investor confidence. While all six Canadian banks saw their share prices fall from the onset of the credit freeze in August 2007 to the bottoming out of the American stock market in early March 2009, they did not fall as severely as their American counterparts. The share price of the average American bank (as measured by the S&P500 Bank Index) fell almost 40 percentage points more than the average large Canadian banks. See Chart 10 below. All banks were running backwards; it was just that Canadian banks were running slower.

Chart 10.

5.3. Summary

By several metrics, the large Canadian banks not only outperformed their American counterparts during the crisis period (by relative asset write-downs and share price declines) but also displayed abilities to remain (mostly) profitable while continuing to lend and raise capital from private lenders. As much of this behavior is observed before several support programs were announced by the Government of Canada in October 2008 (e.g. the Insured Mortgage Purchase Program (IMPP), the Canadian Lenders Assurance Facility (CLAF) and the relaxed regulatory capital rules), this begs the question about the impact of these public programs on the crisis performance of these banks.

Macdonald (2012) finds that the large banks' use of these support programs⁵⁷ described above over the period October 2008 to July 2010 was materially significant. By March 2009, support through these three government programs for Canadian banks peaked at \$114 billion, the equivalent of 7% of Canada's 2009 GDP (p.11). He continues that "while these funds were re-paid in full, it is clear that the banks benefited enormously from public financing when private funds were unavailable" (p.12). That the banks benefitted from their participation in government programs like IMPP is not disputed here, nor is the possibility that there were insufficient private funds available to the Big Six in the months following the peak stress observed in September 2008. The point is that

⁵⁷ MacDonald focuses his analysis on the Big Six's use of the IMPP, the Purchase and Repurchase Agreement program at the Bank of Canada, as well as liquidity support offered by the US Federal Reserve to Canadian-owned bank subsidiaries.

there is evidence that suggests that the availability of private funds to Canadian banks leading up to the peak stress moment and immediately after was not an issue. Further, there is evidence, displayed above, that supports the view that banks continued to lend and be profitable up to and through the peak stress period of 2008 *before* the announcement of these public measures. Considering this, it is not conclusive that Canadian banks would have encountered serious difficulty in the absence of these public programs.

Regardless, the bottom line of this analysis is that none of the large Canadian banks (or any large financial institution) experienced serious distress during the crisis raising doubt about the solvency of these institutions. Unlike in other nations such as the US and the UK, no public capital injections were used. This relatively resilient performance is tied to the banks being well positioned at the onset of the crisis in August 2007. Their behavior leading up to the crisis did not introduce significant vulnerabilities to their balance sheets and business operations that would materialize during the crisis and threaten their solvency. Actions during these years, such as improvements in risk management and corporate governance and change in business activity (at least for two large banks), were in part learning responses to loss events. Reinforcing this prudent behavior were structural advantages enjoyed by the banks such as maintaining strong deposit base through branch banking, allowing the Canadian banks to be less reliant on short-term funding. That these bank actions align with the expectations inherent in the new regulatory relationship that was largely in place by the early millennium supports the proposition that the influence of the national

financial order of this period “caused” the relative stability of the banks during the crisis. This proposition does raise a question about the relationship between financial order and its constituent actors. Can one disentangle the autonomous behavior of banks within this NFO?

6. Did bank behavior play an important role in avoiding instability?

“Nothing in Canada's regulations banned risk-taking. Good, prudent management prevented excess.”

Marie-Josée Kravis, Wall Street Journal, May 7, 2009.

Cox (1981) asserts that we seek to explain the order of things in the world in one of two ways: the positivist problem-solving method and the historicist critical theory method. By having applied to the puzzle of Canadian bank resiliency a modified version of Cox's method of historical structures (the neoMHS), this essay has been foremost an exercise in the historicist method. Yet in keeping with the neoMHS elaborated above, positivist research strategies may be nested within this framework.

While Cox trained his method on questions of international relations or world order, this essay focused on national financial order (NFO) - the configuration of structural forces, such as institutions, that describe how state and private economic actors combine to supply financial services. In a bid to understand the Canadian puzzle, the neoMHS was applied to reveal the structures of the NFO (as well as actor behavior under this NFO) that contextualizes the performance of the large Canadian banks during the 2008

crisis. NFOs as they emerge in the stream of time are unique in their constitution. While the Canadian financial order identified in the 1986-2007 conjuncture may elucidate why Canada didn't have a banking crisis in 2007, it does not necessarily explain why Canada didn't have crises during other moments of international financial instability such in 1930 or 1907 (Bordo et al., 2011). A different Canadian NFO existed during those events.

Having described the banking order in place on the eve of the financial crisis as well as the behavior of banks and state regulators leading up to and during the crisis, we turn to the principal question posed in this essay: *among the factors responsible for the observed stability of the large Canadian banks in 2008, was it the behavior of the banks themselves, above and beyond that required by public regulation, which played an important role in avoiding instability?* In other words, did the large banks display evidence of voluntary risk management in the years leading up to and during the 2007 crisis, voluntary risk management that played an important role in avoiding instability. It follows that if the banks did not exercise the good, prudent management, management that Kravis asserts in the quote above prevented excessive risk-taking, then the Big Six Canadian banks would have experienced instability.

The argument put forth here is that a decisive yes-or-no answer is not possible; the hypothesis is indeterminate. Two reasons are given. The first concludes that observation of bank compliance with regulatory capital rules does not necessarily indicate prudence above regulatory requirement. The second, deeper reason asserts that regulatory relationship between banks and the state

as described in the contemporary national financial order does not allow the disentanglement of such autonomous behavior on the part of the regulated banks. The nature of these two reasons curiously parallel the two explanatory strategies described above, positivism and historicism.

6.1. Bank compliance with regulatory capital rules

The first reason supporting indeterminacy follows from imagining the use of a problem-solving strategy (like a statistical hypothesis test) to answer the question. One needs to consider the necessary conditions to adequately test the hypothesis, specifically whether the evidence gathered on bank behavior is capable of being treated in a definitive test. Having quantitative evidence certainly lends itself in such a test. Among the primary factors of Canadian bank stability that are cited in the literature, the regulatory capital ratios are quantifiable instruments. It has been argued that the Big Six banks held “far more capital as a cushion to offset losses” than their counterparts in the US, and that they “exceed the capital holding requirements of both national and international standards by significant amounts” (Rabson, 2009). Observation of the two measures of regulatory capital for which OSFI prescribe limits, the Tier 1 capital ratio and the asset-to-capital multiple (ACM),⁵⁸ finds that the Big Six have

⁵⁸ The Tier 1 capital ratio is the ratio of a bank's core equity (or Tier 1, as defined in the Basel Accords) capital and total risk-weighted assets. Tier 1 capital is the measure of a bank's financial strength based on the sum of its equity capital and disclosed reserves, and sometimes non-redeemable, non-cumulative preferred stock. A firm's risk-weighted assets include all assets that the firm holds that are systematically weighted for credit risk. The total capital ratio is the ratio of a bank's total regulatory capital ratio and total risk-based assets. The assets-to-capital multiple (or leverage) is the ratio of total assets to regulatory capital. Assets are not risk-adjusted. Source: Investopedia (www.investopedia.com). Accessed: May 31, 2015. The limits set by OSFI are: tier 1 capital ratio, 7%; total capital ratio, 10%; assets-to-capital multiple, 23.

maintained regulatory levels in non-trivial excess of OSFI's requirements over the 1998-2008 period. In the case of the Tier One capital ratio, there seems to be some discernible trend that the Big Six increased their actual ratio over this period (see Chart 11 below). However, if this is indicative of increasing prudence, this may be offset by the observed trend that the banks became more leveraged as they moved towards 2008 (as displayed by the narrowing difference in the banks' ACMs and OSFI's regulatory ACM limit– see Chart 12 below).

While this analysis deserves further work⁵⁹, there is one immediate consideration which casts uncertainty about the meaning of these regulatory capital ratios maintained in excess of regulatory limits. On the one hand, it may be argued that they demonstrate the prudence of the banks, their willingness to go further than regulatory requirement. But on the other hand, the observed ratios may be the unavoidable consequence of the bank's management trying to manage capital and asset levels on a complex balance sheet, minimizing capital levels (which are a cost) while maximizing certain asset levels, all while keeping the ratios within regulatory limits. This groping toward optimization is a tricky exercise for bank managers, to target both a capital ratio (say, the Tier 1 capital ratio) and a leverage level (the ACM), given that assets are risk-weighted in the Tier 1 capital ratio but are unweighted in the ACM formula. Adding to the challenge is the operational complexity of the large Canadian banks with their multiple business lines spread over national borders. One way to manage this

⁵⁹ For example, one could find the dollar amounts of required regulatory capital and regulatory capital held in excess at the discretion of the banks, and calculate how sensitive these levels are to the actual asset value write-downs experienced by the banks during the financial crisis.

challenge is to publicize one's target for one ratio and not the other. This is essentially what the Big Six banks do in their communications with shareholders through their annual reports. The industry standard is to publish in the front sections of the report the actualized Tier 1 capital ratio and how it compares to the target set for that year. Further, the bank will set a target for the Tier 1 capital ratio for the upcoming fiscal year. However, there is usually no reporting of the ACM in the front pages of the annual report, but is instead consigned to the management discussion and analysis pages where it is reported without reference to any target set by bank management. This interpretation of the banks' management of its regulatory capital is less supportive of "above the call of duty" view of bank behavior.

Chart 11.

Chart 12.

6.2. Bank autonomy within a responsive regulatory relationship

A critical historicist approach to the question looks to the national financial order on the eve of the crisis, as revealed through synchronic application of the neoMHS, and how this interfaces with observed actor behavior. A deeper reason for the indeterminacy of the “above the call of duty” hypothesis considers the meaning of regulatory regime that has developed following the 1986 Estey Commission, with focus on OSFI’s Supervisory Framework that was put in place in 1999. A general theme in this essay has been the evolution of the banking regulatory regime as a component of the national financial order, from the minimal (yet consequential) regulation of pre-Confederation days (for example, restricting bank entry and regulating note issue) to the complex multiagency

regime⁶⁰ of the early millennium as reflected in the membership of the Financial Institutions Supervisory Committee (FISC).

Focusing on the agency responsible for direct oversight of the banks, we find that since the introduction of its Supervisory Framework in 1999, OSFI has entered a relatively close or intimate relationship with the banks it regulates. Except for the hard rules OSFI sets with respect to capital adequacy, most of the regulatory instruments that used are principles or guidelines on such matters as liquidity standards and exposure limits to types of investments. Further, OSFI consults with the banks and together they establish these guidelines designed to guide bank behavior. OSFI then monitors the banks' performances, issues report cards, which give OSFI's assessed composite risk rating of the banks, and will raise issues during their regular cyclical communications when it becomes apparent that a bank has deviated from the expectations of the regulator. Backstopping the credibility of the regulator in this process is the latent power of OSFI to intervene in graduated stages to the point where they can replace management and the board and seize assets. This latent power is enshrined in legislation, incentivizing early detection and intervention by OSFI. This in turn incentivizes compliance and self-regulation by the banks to avoid intervention by the regulator. In a way, the regulatory apparatus "nudges" the banks (Thaler & Sunstein, 2008).

⁶⁰ To this description, one may add multilevel regulation to include the involvement of international organizations such as the Basel Committee on Bank Supervision, which seeks international accords on bank regulations, and the Canadian provincial governments, which oversee securities regulation.

What we observe today of OSFI's role in this contemporary regulatory regime is not the result of intentional policy design (rational design) but the emergent product of over two centuries of successive national financial orders, culminating in a bank-dominated financial system. This insight is shared with Bell and Hindmoor (2015), who tackled the Canadian puzzle with an agent-centred historical institutionalist framework. This has been demonstrated above. Therefore, we do not have a single theory that can explain *ex ante* the design of this current Canadian regulatory regime. There is however a theory that may shed further light on it *ex post* and that is the theory of responsive regulation developed by Ayers and Braithwaite (1992). Seeing it more as an attitude or philosophy than a theory, the authors position responsive regulation as a middle approach between the opposites of command-and-control regulation and *laissez-faire* self-regulation that had dominated regulatory debate in the 1970s and 1980s, which happened alongside the neoliberal ideological movements at the same time.

What make this approach responsive is that it eschews a universal one-size-fits-all view of regulation, instead encouraging the regulatory authority to recognize or be responsive to difference in the structure and behavior (including motives) of the regulated. This flexibility of outlook by the authority gives way to a flexibility to the tactics or instrument that may be used to achieve overall regulatory goals. Among the core tenets of responsive regulation is the principle of escalating intervention, that regulators will do best by demonstrate a willingness to escalate intervention or de-escalate intervention in response to firm

or industry performance with respect to regulatory goals (p. 6). The authors depict this principle as an escalation pyramid. See Figure 6 below. Grounding this pyramid is a latent power of the regulator to intervene with increasing intensity and consequence. Ayers and Braithwaite argue that “regulatory agencies will be able to speak more softly when they are perceived as carrying big sticks” (p. 6). If the regulated firms do not show satisfactory compliance with some behavioral standard through self-regulation, the regulator may choose to escalate intervention by moving to the next level in the pyramid, in this case requiring enforced self-regulation.

Figure 6. Escalation pyramid (Ayers and Braithwaite, 1992)

Enforced self-regulation is a second core tenet of responsive regulation. As a tactic, it finds itself between self-regulation and command and control by a

state authority. “It means that firms are required to write their own set of corporate rules, which are then publicly ratified. And when there is a failure of private enforcement of these privately written (and publicly ratified) rules, the rules are then publicly enforced” (p.6). This practice of having the regulated writing their own rules, which are then publicized, binds the regulated to these rules. This creates an expectational relationship, where the regulatory authority (and the public) has the expectation that you will abide by the guidelines that you helped draft. Failure to abide by them may trigger the escalated intervention. This expectation, backstopped by the threat of increased regulatory intervention, should reinforce self-discipline by the regulated.

The theory of responsive regulation with its principles of escalating intervention and enforced self-regulation describes the relationship between the Canadian banks and their principal supervisor, OSFI. The four stages in OSFI’s intervention framework, from “early warning” to “non-viability/insolvency imminent” correspond to an escalating pyramid. The consultative process that OSFI undertakes with the banks to design the numerous guidelines that compose this principles-based regime is an exercise of enforced self-regulation. This amounts to a relationship between regulator and regulated built on expectations.

So far, this second reason for indeterminacy has been developed using the historicist research strategy followed throughout this essay. However, as argued above, the neoMHS does not preclude following a nested problem-solving strategy. In their take on the Canadian puzzle using rational choice

institutionalism, Calomiris and Haber (2014) use a game theoretic model, the Game of Bank Bargains, to explain how Confederation in 1867 (itself an institution resulting from competing social groups) had structured the subsequent political process surrounding bank regulation. This, they argue, is the main factor behind the long-term stability of the Canadian bank system. There is no dispute here that Confederation, with the designation of bank policy as an exclusive federal responsibility, has been an important contributing factor to bank stability. However, as argued above, crafting a narrative explaining 140 years of national finance around a single model may fall short. It is not the only game in town.

Thus, in summoning the theory of Ayers and Braithwaite (1992) to deepen our understanding of regulatory relations at the centre of this national financial order, we can go further, switch to problem-solving mode and recast this explanation as a model, the Game of Responsive Regulation.⁶¹ The game can be described in terms of actors, preferences, rules of the game (institutions) and equilibrium outcomes. However, it is the present NFO, revealed through the application of the neoMHS, that provides the data. For example, the two bank failures in 1985 arguably shifted the preferences of the state toward bank stability. The long-term preferences of the banks were to grow while maintaining existing profitability. Going forward, the Canadian state sought to engage the banks on matters of regulation through a newly formed agent, the Office of the Superintendent of Financial Institutions (OSFI). As an arms' length organization with a specific mandate and incentives defined in legislation, OSFI went forth and

⁶¹ This is in fact what Ayers and Braithwaite (1992) appear to do in chapters 2 and 3, drawing on the pioneering work of Stolz (1984), who applies game theory to regulatory behavior.

engaged the Canadian banks in the cooperative effort of building new “game rules”, the institutions defining the new regulatory relationship. This is argued to have emerged with the 1999 Supervisory Framework. Using the familiar two-person repeated prisoner’s dilemma game, one can represent the interactions between the state and the banks in terms of choices to cooperate with or defect from the expectational-based regulatory relation. This can explain the observed evolution of bank cooperation with the regulatory regime. Defection results in escalated intervention by the regulator. Cooperation leads to continued profitable business operation with no punishing intervention.⁶² As the banks continue to enjoy long-term profitability (reflected in high franchise value) uninterrupted by banking crises, they have an incentive to cooperate in this expectations-based regulatory regime.

Let us return from this digression on the Game of Responsive Regulation argued to be at the heart of the present NFO. If this description of this expectations-based relationship is accurate, then it is difficult to ascertain what bank behavior is above and beyond that required by rules (capital ratios and leverage limits) or by guidelines when overall bank behavior is circumscribed by the general principles of behavior set out in the expectations communicated by OSFI to the banks. As discussed above, there is evidence of shifts in business

⁶² This application of game theory to understand the present regulatory regime in Canada is a potential fruitful line of further inquiry. One question is what would happen if high franchise value, which arguably acts as an incentive for banks to cooperate in the regulatory game, were reduced. Another is an observation made by Ayers and Braithwaite (1992, pp.54-100) that this type of regulatory game can also explain the evolution of regulatory capture and corruption. The authors suggest that introducing a third person to the game, an empowered public interest group, can help deter capture and corruption. To my knowledge, no such empowered public interest group exists in the present Canadian financial order.

strategy by some of the Big Six banks prior to the 2008 crisis, measures that either reduced their exposure to financial instruments related to US subprime mortgages securities and/or improved their capabilities to manage the risk posed by such assets. In addition, all banks also took measures to improve corporate governance and risk management processes in the years leading up to 2008, as they all had experienced some “burning platform” events that jeopardized the consistent flow of future profits. However, by the very definition of this relationship described here, it may be impossible to demonstrate that these actions were the autonomous decisions of the banks. While bank behaviors observed to depart from regulator expectation would be interpreted as defections from regulatory equilibrium, triggering regulatory intervention of an escalating nature, bank behaviors that meet or exceed regulator expectations must be interpreted as within general regulatory expectations. We conclude then that in seeking to understand the puzzle of Canadian resiliency during the 2007 financial crisis, it is difficult to separate the behavior of regulators or the banks and attempt to evaluate their individual contributions to banking system resiliency in isolation. They are best understood in combination through their interactions in the national financial order of that day.

7. Conclusion

Among the factors responsible for the observed stability of the large Canadian banks in the 2007 financial crisis, was it the behavior of the banks themselves, above and beyond that required by public regulation, which played an important role in avoiding instability? This question extends from the debate

over why Canadian banks performed relatively well compared to their peers in the US and in several European countries. Explanations offered tend to cite the strong regulatory system, prudent management of the banks themselves, or a combination of both factors. This essay concludes that not only are a combination of these two general factors responsible, but that it is misguided to attempt to disentangle bank behavior from the relationship they have with the regulatory state. It is difficult to identify autonomous behavior of the banks both on the eve of the crisis and during it which would allow a satisfactory test of this proposition. The reason for this is due to the specific features of the existing national financial order in which the banks and the public regulators are embedded.

This argument about autonomous bank behavior within the contemporary national financial order was developed through the application of a political economy framework to the history of Canadian banking. A review of the existing literature on the puzzle of Canadian resiliency finds the frequent reference to institutional structures, such as restrictions on industry entry and public involvement in mortgage finance, as the principal explanators of the puzzle. Another finding was the advantage of viewing these structures as historical products rather than as givens on the eve of the crisis. This essay attempts to push this line of argument further by harnessing Robert Cox's method of historical structures for studying questions of national finance. At the heart of Cox's method is the use of a device or template featuring three inter-related categories of structural forces (institutions, ideas and material capabilities). This

template is then applied to a sphere of social activity to identify the constituent structures that configure that social sphere at a moment in time. In this study here, this template is applied to the sphere of national financial order, that is, the configuration of structural forces that explain how state actors and private economic actors combine to supply financial services. National financial orders, like most spheres of social activity, are not structurally static over time but shift and transform through pressures that emanate from within and without. One can use the method of historic structures to trace out the history of national financial orders and that has been attempted here with respect to the Canadian financial history. Over the span of 1608 to 1986, four successive national financial orders (NFOs) were identified and described. I drew three conclusions about the evolution of the Canadian financial system from this reading of history. The historical trajectory of the system is characterized more by continuities rather than dramatic breaks and reversals. The shifting emphasis between the interests of the state and private interests have created institutional mechanisms, which when combined with market processes, have selected chartered banks as the dominant organizational form of private finance to emerge in the Canadian system. Lastly, the key events that shape the evolving national financial orders in Canada have tended to either lead or lag similar events in other national jurisdictions, such as in the US or UK.

One such event was the unforeseen collapse of two regional banks in 1985, which led a 1986 national inquiry investigating the causes of the bank failures to recommend the strengthening of the financial regulatory system

through the reorganizing of regulatory agencies, imbuing them with new powers and adopting different attitudes or philosophies to financial regulation. On this latter point, the new regulatory approach that would be adopted for bank supervision is a principles-driven regime where banks collaborate in developing the principles that guide their behaviors, principles which are then publicized to help hold the supervised bank to account when deviations from these guidelines are observed. This enforced self-regulation, an aspect of the responsive regulatory approach, is argued to create an expectation-based relationship between the bank and the regulator. This relationship would develop to become the heart of the regulatory regime embedded with this new national financial order. That this policy movement began while governments in the United States and the United Kingdom had taken significant steps to deregulate their financial sectors is not of minor consequence when considering the future outcomes of these national systems. While the financial regulatory system continued to develop into the 1990s according this new vision set out in the mid-1980s, a number of legislative changes allowed banks to widen the scope of permitted business activities as well as acquire non-bank financial firms such as securities brokerages and trust companies. This momentum toward greater dominance by a few large banks in the Canadian financial services industry was abruptly halted by the blocking by the federal government of two proposed mergers of four large banks. This announcement and subsequent bank legislation reinforcing this policy decision marked the emergence of a stable national financial order that would last right up to the 2007 financial crisis.

In these years leading up to the crisis, the banks appear to comply with the general expectations of bank behavior contained in this regulatory regime. When two large banks suffered significant loss events in the early millennium, they took immediate corrective action and changed their business strategies, shifting toward activities with less risk. The directors and managers did not double down on their earlier bets and throw good money after bad. Thus, their decisions were aligned with the expectations of their regulators. When the financial crisis did break out in August 2007 and gradually developed into a moment of peak stress in September 2008 with several financial firms abroad failing, the large Canadian banks, while shaken, managed to perform relatively well and did not require public recapitalization through taxpayer dollars. Several responses by the government, including an asset purchase program and public guarantees of bank debt, were announced after the moment of high stress in September 2008, appearing to be designed more to support the continuing supply of financial services, such as mortgage loans, than to buttress the banks against insolvency risk. Having now the benefit to reflect on those events and processes leading up to and during the crisis while keeping in mind the expectation-grounded relationship between the banks and regulator, it is difficult to identify and isolate any prudent action taken by bank managers that would fall outside the expectations of the regulators. In other words, autonomous behavior by the banks appears to be the indistinguishable in this regulatory regime.

Essay Two: Do “mergers of equals” contribute to riskier behavior by the consolidated banks?

Do “mergers of equals” contribute to riskier behavior by the consolidated banks? This essay conducts a quantitative analysis to test whether a bank’s behavior becomes riskier as a result of having experienced a merger with another bank of roughly equal size in the recent past. Research in the past two decades (Demsetz and Strahan, 1995; De Nicoló, 2001) has found evidence supporting a positive relationship between bank size and measures of bank risk, a tendency in bank behavior that applies across developed economies. It is often implicit in these studies that banks can grow through mergers with other banks.

This study seeks to contribute to the literature in two ways. First, it attempts to measure the possible impact of a merger of equals on consequent bank behavior. The merger of equals transaction is a relatively rare form of corporate consolidation, involving two firms of similar size (in terms of assets or revenues) and some sort of power sharing agreement between the directors and senior managers of the two firms involved in the transaction.

Second, this study uses information from the period leading up to, and including, the 2008 financial crisis. As the 2008 financial crisis is commonly understood to be an extraordinary episode of widespread financial system instability, using this period provides a unique historical window during which the performance of banks across several countries may be observed. From among various measures of performance, this essay identifies whether a bank was

bailed out⁶³ during the crisis period (defined here as August 2007 to October 2009). Many banks in several countries were significantly weakened during the crisis and had to be bailed-out. The factors that differentiate these bailed-out banks from those that were not, including a past merger of equals, are of interest.

Motivation

This essay's hypothesis about bank behavior is motivated, in part, by interest in the performance of Canadian banks during the 2008 financial crisis. Canadian banks performed relatively well as compared to several US and European counterparts (Ratnovski and Huang, 2009). Indeed, the observed stability of Canadian banks has attracted the interest of governments seeking policies to address banks deemed "too big to fail." Causal factors suggested to explain the stability of the Canadian banks include regulatory policies as well as the behavior of the banks themselves (Harris, 2010-2011, p. 69). Among past public policies that contributed to the Canadian regulatory framework in place in 2008, the decision by the Government of Canada in 1998 to block two proposed mergers of equals involving four of the six large Canadian banks raises the question of what impact this policy decision could have had on the subsequent risk behavior of these banks and their performance during the financial crisis. An analysis of "mergers of equals" leading to larger banks and therefore riskier behaviour indirectly addresses this question. If there is a positive relationship

⁶³"Bail-out" is defined here as the experience of one or more of these three events during the 2008-2009 crisis period: 1) bankruptcy; 2) private acquisition or government nationalization; or 3) receipt of capital support from government (Arjani and Paulin, 2013, p. 10).

between bank size and bank risk, the merged Canadian banks would have behaved in riskier ways and perhaps been more likely in need of a bail-out in 2007-2009.

The literature

Questions of bank consolidation and behavior toward risk are situated in the literature that examines the relationship between bank behavior and bank size. Contrary to predictions extending from portfolio theory that banks reduce risk through diversification as they grow larger, empirical studies using both national (Demsetz and Strahan, 1995, 1997) and cross-national bank samples (De Nicoló, 2001; Demirgüç-Kunt and Huizinga, 2010) reveal that large banks offset their diversification advantage by taking on additional risk. Some, in fact, increase their overall risk exposure. Complicating this search for a clear relationship between bank size and bank risk is the possible presence of several intervening factors operating at the national-institutional level and the industry level, such as the influence of franchise value and moral hazard problems induced by being “too big to fail”.⁶⁴

As banks can grow as the consequence of mergers, the bank merger literature is also relevant. While preoccupied with the effects of mergers on firm efficiency and shareholder value, there is some attention given to how mergers affect bank risk and stability. These studies tend to ask if bank mergers result in greater diversification or concentration of business activities by the consolidated

⁶⁴ While the influence of these external factors on overall behavior is relevant, the limited scope of this essay's question means they will not be dealt with in detail.

banks and if this increases insolvency risk. Among bank mergers in general, the merger of equals between two banks is infrequent and studies are few.

Nonetheless, a provisional theory of why mergers of equals between banks may lead to riskier bank behavior can be assembled.

Research design

To test the hypothesis about bank consolidation and behavior, the research design employed by Arjani and Paulin (2013) is adopted and modified. Arjani and Paulin (AP hereafter) use mainly accounting-based indicators to measure bank behavior and performance. Accounting-based indicators, such as return on assets and the capital-to-assets ratio, are derived from a bank's disclosed financial statements. This study adopts the same suite of behavioral indicators as AP, and adds an additional indicator, a categorical variable signifying whether a bank experienced a merger of equals between 1990 and 2008. It also adopts AP's use of a categorical variable (bail-out/no bail-out) as the dependent variable signifying performance during the crisis. Taking a cross-sectional approach to analysis, data measuring bank characteristics as of year-end 2006 (the eve of the crisis) are gathered from a sample of 78 major banks from 20 developed countries. The method of analysis includes comparing descriptive statistics and estimating a regression model.

Results

Evidence from both descriptive statistics and the estimated econometric model is used to test the hypothesis that the presence of a merger of equals in a bank's corporate history in the twenty-eight years prior to the 2008 financial crisis contributes to the likelihood that the bank is bailed out during the crisis . The evidence is ambiguous in showing whether to reject this hypothesis that a past merger of equals has any statistical significance in explaining performance during the 2007-2009 financial crisis. Because the estimated coefficient on the merger of equals variable is not statistically significant, the test as it is constructed here is inconclusive. However, the empirical analysis does reproduce the earlier finding by Arjani and Paulin (2013) that a bank's liability funding model is a statistically significant explanatory variable of bank performance. Further, a measure of a bank's risk appetite is also found to be a significant predictor of bank performance.

The following essay will proceed with an outline of the general framework, giving way to the literature review. A description of the research design is followed by a discussion of the empirical results and the conclusion.

1. General framework for inquiry

The following describes the basic theoretical and empirical tools for studying bank behavior⁶⁵, thus offering a framework for investigating this essay's central hypothesis. It begins with a definition of a bank, noting how the definition has evolved over time. As a bank's relationship to risk explains much of its organizational behavior, the subject of risk and how it is manifest in finance is introduced, followed by a discussion of how banks manage financial risk. The section finishes with a description of three empirical approaches to studying bank behavior.

1.1. The changing definition of "bank"

Traditional financial intermediation involves accepting deposits and making loans and has its institutional roots going back to 14th century Italy (Ferguson, 2008, pp. 41-48). This basic organizational form remained in place until the late 20th century. Regular episodes of individual bank collapse as well as industry-

⁶⁵ For more comprehensive surveys, see Berger, Molyneux, and Wilson (2015) 2nd edition of the *Oxford Handbook of Banking*, an edited collection of articles, is organized around five themes: theories of banking, performance and operations, regulatory and other policy views, macroeconomic perspectives and specific national financial systems. Van Hoose (2010) provides a textbook summary of the banking scholarship from an industrial organization of banking perspective. The conventional thinking on finance and economics in mainstream academic circles is in the midst of confronting the challenges posed by the 2008 financial crisis. Berger, Molyneux and Wilson's (2015) note that the continuing transformation of banking systems following the 2008 financial crisis has led to a revitalized research agenda that is revising parts of the existing banking scholarship. A good illustration of how the field is transforming is the vindication of Raghuram Rajan's prescient 2005 paper "Has Financial Development Made the World Riskier?", a paper that originally attracted the scorn of some peers. Also, this essay recognizes the contributions made in the heterodox literature on finance and banking. One strand in heterodox economics that has dealt with the financial behavior of banks is the thought of Hyman Minsky (1986). Kindleberger's 1978 *Manias, Panics, and Crashes: A History of Financial Crises* adopts Minsky's financial fragility model in his framework.

wide panics and crises led to the conclusion that banking is a potentially unstable activity. The seminal paper by Diamond and Dybvig (1983) provided a formal model of the instability of traditional banking. The model shows how the combination of the illiquidity of a bank's assets (i.e., its loans, which will be repaid at some point in the future) and the liquidity of its liabilities (i.e., its deposits, which may be withdrawn at any time) may lead to a sudden loss of confidence in the bank's solvency by depositors, who in turn withdraw their deposits and cause a bank panic.

However, in the decade following Diamond-Dybvig, several articles investigated the emerging argument in the mid-1990s that traditional banking, at least in the United States, was in decline. As evidence of the movement away from traditional banking by US banks, Boyd and Gertler (1994) find that the observed decline in loan assets owned by domestic US banks relative to other forms of credit was offset by the rise in other financial activities by domestic banks, such as off-balance sheet activities, as well as the growth in credit provision by foreign-owned banks operating in the U.S. (p. 3). On this latter point, the consequence of increased competitive pressures for market share in the traditional intermediation space meant diminished profitability for this business line. Edwards and Mishkin (1995) argue that the search for activities more profitable than traditional financial intermediation may explain the expanding trade in derivatives.⁶⁶ However, Edwards and Mishkin caution that

⁶⁶"A derivative is a security with a price that is dependent upon or derived from one or more underlying assets. The derivative itself is a contract between two or more parties based upon the asset or assets. Its value is determined by fluctuations in the underlying asset. The most common underlying assets include stocks, bonds, commodities, currencies, interest rates and market indexes"

such developments may undermine financial stability and thus may require regulatory action (p. 27). James and Houston (1996) argue that what is really being observed is not the decline of banking but its transformation, driven by the strategic actions of bank managers in response to competitive pressures created through deregulation, technological development and globalization (p. 9). James and Houston distinguish between financial function (i.e., extending credit to customers or providing them savings vehicles) and financial product (i.e. the means for carrying out these functions). They conclude that “while the basic functions of banks and other financial service companies have remained relatively constant over time, the specific products and services through which these functions are provided have changed” (p. 8). This last point by James and Houston that the basic functions of banks have remained constant over time may not stand up today, with the observed shift of some banks in the late 1990s and early 2000s from an “originate to hold” model to an “originate to distribute” model enabled by growth in loan securitization in the United States. In the latter model, the bank no longer holds to maturity the loans they issue but instead securitize these loans and then sells them, moving them off its balance sheet. This model may diminish the incentive of banks to screen and monitor creditworthy borrowers.

As it appears the real world of financial services provided by banks in the mid-1990s has moved away from solely offering traditional depository and loan

(Investopedia, <https://www.investopedia.com/terms/d/derivative.asp>, Retrieved November 29, 2017).

services towards more complex organizations offering a multiplicity of financial services, this then raises the question of the applicable scope of such models as Diamond-Dybvig. One way forward is to model banks as “producers of multiple outputs using multiple inputs” (Allen and Liu, 2005, p. 79). Such an approach aligns well with using the bank holding company (BHC), the highest level of management in a corporate ownership pyramid, as the unit of analysis in research. Within bank holding companies, non-traditional financial activities such as those associated with investment banking and wealth management are included. This is appropriate for universal-style banks such as the large chartered banks that dominate the financial services market in Canada. In addition to offering traditional banking services, Canada’s large chartered banks supply other services such as investment banking, wealth management and some forms of insurance.

1.2. Decision-making in the banking organization

Business decision-making at the level of the organization is an aspect of corporate governance. As corporate governance involves several distinct groups organized in a hierarchy, there lies the potential for misalignment of interests between actors within the organization, or what is known as principal-agent problems. The basic governance structure common to most publicly-traded universal banks features a group of owners or shareholders who elect a board of directors to represent their interests when decisions are made about the bank’s general business strategy, including the risk appetite of the bank. The board

then communicates these decisions to bank management and oversees their execution. Bank senior management then oversees the employees in carrying out these business plans or strategies. Differences in interests and preferences among groups and individuals and how these differences are expressed in behaviors, such as toward risk, can be ameliorated through the provision and alignment of incentives among the different groups involved in governance. In this essay, the decisions made at the highest levels of the bank organization (the combined decisions of the board and senior management) about the bank's overall business objectives and plans are the focus.⁶⁷

1.3. Bank behavior toward risk

The Diamond-Dybvig model of banking describes one type of risk arising from the practice of borrowing “short” and lending “long”, that of liquidity risk. As seen below, the complex banks of today face many types of risks depending the type of banking activities they pursue. Risk and risk in finance is first explained before a lengthier exploration of the dimensions of bank risk management is given.

⁶⁷ The decisions and actions of individuals within the employee rank-and-file, such as those of rogue trader Nick Leeson which led to the collapse of British investment bank Barings Bank in 1995, are outside the scope of this essay.

1.3.1. Risk

All financial systems (and economic systems in general) feature elements of certainty, risk and fundamental uncertainty. Drawing on the taxonomy developed by Lavoie (2014, p. 73), certainty is when an act (including that of human choice) leads to a specific outcome (or event) with a probability of one. Risk is the condition where an act leads to one of a set of possible outcomes *whose probabilities are known*. Fundamental uncertainty is distinct from risk as it involves the likelihood of events whose probability cannot be measured (“known unknowns”) and of events that are not thought possible or even imagined (“unknown unknowns”).⁶⁸ Research and teaching in mainstream economics tends to focus only on risk in the narrower sense. For example, the chapter titled “Uncertainty” in Varian’s popular graduate microeconomics textbook (1992) is about how economic agents handle estimable risk in decision-making, beginning with the fundamental concept of expected utility. This tendency reflects also in the content of financial economics textbooks. The first chapter of Eichberger and Harper (1997) is titled “Decision-Making Under Uncertainty”, an exposition of probability theory applied to financial decision-making, where known probabilities are assumed. This pedagogy extends to professional development in the finance industry; the course of study for the Certified Financial Analyst program emphasizes risk to the exclusion of

⁶⁸ These expressions are attributed to former U.S. Defense Secretary Donald Rumsfeld (2003). Lavoie (2013, p. 73) gives a more precise definition of fundamental uncertainty: “There is uncertainty when the value of an outcome is unknown, when the probability of an outcome is unknown, when the outcomes that can possibly result from a choice are unknown, or when the spectrum of possible choices is unknown”.

fundamental uncertainty (CFA Institute, 2016). This is not to ignore or discount the role that fundamental uncertainty has played in the histories of financial systems, histories that have been marked by episodes of systemic dysfunction, such as the 2008 financial crisis (see Textbox 1 below). For the purpose of introducing the literature on the behavior of the decision-makers managing banks, the focus is on risk in the narrower sense, if only because the mainstream discipline tends to organize itself around a worldview that only assumes certainty and risk.

Imagine a world that only features certainty and risk. The decisions of actors are made either in the expectation that an act X will lead to a single outcome Y_i or that act X may lead to a set of different outcomes Y_j , (where $j > 1$), each with a known (or estimable) probability. How the decision-maker manages certainty and risk helps describe the behavior of the actor. Risk envelops the decisions of actors and subsequent outcomes. There are two sides of risk for the decision-maker: an upside where the outcome is greater in value than expected (a payoff) and a downside where the outcome is a loss. The observation of historical outcomes (events) of certain types of activities (e.g., the daily weather, horse races, stock prices) allows the estimation of probabilities of the different values of the event. This underpins the probability distribution of gains (payoffs) and losses. This method features the implicit assumption that future probability distributions will be the same as or similar to past probability distributions. When applied to the financial sphere, risk may be defined as “a measure of uncertainty about the future payoff to an investment, measured over some time horizon and

relative to a benchmark” (Cecchetti and Redish, 2010, p. 83). The authors are careful to use the expression “measure of uncertainty” to distinguish it from unmeasurable fundamental uncertainty.

1.3.2. Risk in finance

Grounded on probability theory, the subdiscipline of mathematical finance has developed a range of tools that are implemented in practice by financial actors, in particular financial service providers like banks. A feature of the daily operations of financial firms is the estimation and monitoring of risk as it pertains to the firm’s decisions, including the management of the assets and liabilities held on its balance sheet. Every financial asset and liability can be assigned a measure of risk with respect to its future value and/or future flow of income. Asset classes with little chance of value change, such as cash, are deemed risk-free assets, whereas asset classes with a large likelihood of value change, such as stocks, are deemed high risk in that there is a higher probability of a large gain or a large loss.

The lexicon of financial risk borrows generously from probability theory. Suppose, for example, that the possible future values of an asset follow a well-behaved probability distribution such as a normal Gaussian distribution. An investor in this asset can then calculate the expected value or mean of the distribution of future asset values as well as the probability that the asset’s future value will fall in a specific range. On the assumption that asset values follow a normal distribution, one can predict that 68% of the values will fall within one

standard deviation from the expected value or mean, that 95% of values fall within two standard deviations from the mean and that 99.7% of values fall within three standard deviations from the mean.⁶⁹ Here, we find the origins of the expression “tail risk”, which came into popular usage during the 2008 financial crisis. Tail risk, in this context, is the probability that realized asset values will fall more than three standard deviations from the mean, the tail regions of the normal distribution. While values found in the right-side tail of the distribution would signify improbably high returns, values found in the left-side tail would signify improbable losses. This simple tool illustrates the fundamental approach towards investment decisions. In other words, it describes how a financial actor, such as a banker, can manage the risk associated with the assets and liabilities on its balance sheet.

Normal probability distributions are a key assumption underpinning risk management tools widely used by the finance industry leading up to the financial crisis. The Value-at-Risk (VaR) indicator was developed to offer an answer to the investment manager’s question “how much will I lose if the worst possible scenario occurs?” (Cecchetti and Redish, 2010, p. 92). Developed by the American financial conglomerate JP Morgan Chase, it became an industry standard for enterprise-level risk management in the 1990s as it provided a timely single number, expressed in dollars, of what the firm was at risk of losing in the next business day (Nocera, 2009)⁷⁰.

⁶⁹ For additional characteristics of the normal distribution, see Gujarati (1995) pp. 771-773.

⁷⁰ As was revealed during the recent financial crisis, there are good reasons to doubt the assumption that financial risk is always and everywhere normally distributed. Nassim Taleb’s book *The Black Swan* (2010) illustrates the consequences of not taking into consideration the possibility that a rare, improbable event

Textbox 2. Fundamental uncertainty and systemic risk

The 2008 financial crisis, largely understood as a systemic crisis, may have reinvigorated interest in fundamental uncertainty. Apart from being a research theme of the post-Keynesian and neo-Austrian school of economics (Lavoie, 2014, p. 73) as well as the occasional concern of central bankers (Greenspan, 2004, pp. 36-37), little attention has been paid to fundamental uncertainty in academic and policy circles. Yet, fundamental uncertainty arguably contributed to realized systemic risk observed in 2008. Systemic financial risk connotes the probability of crisis or catastrophic breakdown in the functioning of the wider financial system, possibly involving the failure of large numbers of financial actors such as banks, across markets and possibly nations (IMF, 2009, p. 3). While seen as an extremely acute case of financial instability, there is difficulty in quantifying such events in part because of the transformable nature of the underlying data generating processes: "contagious events, which can result from asymmetric information or uncertainty, generate changes in the normal behavior of prices and thus in the distribution of returns used for trading and risk management purposes, causing the distributions to be skewed and "fat-tailed" (p. 4). This is an example of what can be deemed ontological uncertainty (Lavoie, 2014, pp. 74-75) where human actions, individual or collective, can unintentionally transform the underlying stochastic reality. The possibility of non-normal statistical distributions (skewed and fat-tailed) undermines the assumption that financial risk is always and everywhere normally distributed. Taleb's *The Black Swan* (2010) illustrates the consequences of not taking into consideration the possibility that a rare, improbable event featuring a large negative impact is actualized. The fallacy of assumed normality contributed to the malfunction of risk management tools, such as Value-at-Risk (VaR), during the crisis (Nocera, 2009; Boucher, Danielsson, Kouontchou and Maillet, 2014). Yet despite this, how individual banks recognize and address fundamental uncertainty may have had a role in their relative performance in the 2008 systemic financial crisis, including whether or not one was publicly bailed-out. Insolvency was not a randomly distributed event during the crisis, but the consequence of a bank's business practices, including its approach to risk management and how it connected to other financial actors and markets. Goldman Sachs is an example of one bank having possibly recognized the limits posed by their "objective" risk management frameworks at the onset of the crisis. Nocera (2009) writes that Goldman senior management realized in late 2006 that there was an incongruence between its risk models and real market outcomes when its mortgage business had ten consecutive days of losses, leading to the decision to reduce its risk exposure to mortgage-backed securities. This may demonstrate the prudent wisdom of combining insights from the risk models with subjective managerial judgment, which entails recognition of fundamental uncertainty as a feature of the actual environment in which one operates.

featuring a large negative impact is actualized. Part of his explanation is the fallacy of assuming an underlying normal distribution where in fact the distribution is non-normal.

1.3.3. Management of financial risk

Banking, by its nature, is risky business. There is no such thing as risk-free banking. Confronted by probabilities of gain and loss pervading its business activities, how does a banker behave with respect to risk, or in other words, how does she manage risk? This may be answered by looking at several dimensions of risk management: (a) one's propensity toward risk, (b) the complexities of controlling risk-laden business activities through accounting devices, (c) the distinction between individual risk exposure and risk shared by a group (or system), (d) the different types of financial risk and (e) the sources of risk management power.

What I will review below is the different kinds of risk a bank may face depending on the choice of business activities it chooses to pursue. This is followed by a discussion of measures a bank may take to mitigate or manage these risks. Some risk-mitigation factors lie outside the banking firm, through both the forces of the market and public regulation. These factors contribute to explanations of why banks may vary in their risk management behavior.

- ***Risk aversion versus risk seeking***

While all banks bear risk, banks vary in their risk behavior.⁷¹ Risk-aversion and risk-seeking are relative organizational behaviors better seen on a continuum rather than as dichotomies. A bank's risk aversion relative to its peers may be

⁷¹ One way to describe this variation is found in the microeconomic theory of the consumer. In making a choice between a certain outcome of a value x and an expected value of an outcome y that is greater than value x , one may be risk averse (if choosing the certain outcome), risk neutral (indifferent) or risk seeking (if choosing the "risky" outcome) (Varian, 1992, p. 177).

influenced by both the amount and types of assets and liabilities the bank manages. Some types of asset, such as cash and government bonds, have lower risk associated with them than other asset classes such as commercial loans and mortgage-backed securities. The choice of business activity and strategy by a bank may reveal much about its risk preference. This includes what measures a bank takes to minimize or mitigate the different risks to which it is exposed; in other words, its enterprise risk management strategy.

- ***Asset-liability management and the balance sheet***

Despite the possibility that banks differ through their individual preference towards risk, all banks share a common organizational feature: they all manage simultaneously a set of assets and liabilities, which are recorded and monitored on balance sheets (see Textbox 2 for a discussion of this accounting device. Thus, a bank's approach to risk management may be understood through its approach to asset-liability management (ALM). ALM encompasses several financial management domains: liability, asset, capital, risk, liquidity and cash. ALM's emergence as a consolidated business practice and research subject is argued to be the consequence of the evolution of three inter-related management activities: cash management, funds management, and risk management. The development of new choices for firms, including banks, to invest cash surpluses on their balance sheets in the short-term finance market ("lend short"), corresponded with the rise in demand by firms to borrow on short-term finance markets to meet their liquidity needs for liability obligations ("borrow short").

While this presented new choices for liability management, several high profile financial problems in the United States (the insolvency of the Continental Illinois in the 1984 and the collapse of the savings and loans industry from 1986 to 1995) helped draw attention to the need for comprehensive risk management by managers and to integrate these separate activities into the broader function of ALM (Lewis, 1992, pp. 70-74). ALM figures into the overall business strategy devised and followed by the bank's management.

- ***Relational risk: idiosyncratic, systematic and systemic***

Another dimension of bank behavior toward risk is whether a particular risk is limited only to a specific bank or if it affects all banks in an industry. In this sense, financial risk can be distinguished as idiosyncratic, systematic and systemic. The amount and quality of financial risk associated with an individual banking firm is understood as idiosyncratic risk whereas systematic risk is more widespread in that it affects all actors in the system, such as the entire banking industry or the entire stock market. Systematic risk should not be confused with systemic risk, which connotes the probability of crisis or catastrophic breakdown in the functioning of the wider financial system. This may involve the failure of large numbers of financial actors such as banks, across markets and possibly nations (IMF, 2009, p. 3). As the probability of systemic failure is difficult to quantify, there is a close link between systemic risk and fundamental uncertainty. In this essay, idiosyncratic bank risk is the focus.

- ***Financial activity risk***

Beyond the idiosyncratic-systematic-systemic risk distinction made above, there is an additional categorization made based on the specific type of financial or business activity that is associated with a particular risk (Cecchetti & Redish, 2010, pp. 266-274; Van Hoose, 2001, pp. 18-19). The example above of a traditional banker facing the risk that a depositor will demand to withdraw its bank balance at a moment's notice without the bank having sufficient liquid cash assets available to honor this redemption is the classic illustration of *liquidity risk*, the "probability of having insufficient cash and borrowing capability" (Van Hoose, 2010, p. 19). Another category is *credit risk*, the risk that borrowers will default on their loans, eroding the value of the loans held on the asset side of the bank's balance sheet. *Market risk* is the risk of change in market prices. For example, if a bank trades in financial markets on its own account, using its own money (proprietary trading) instead of customers' money, the bank faces *trading risk*, the risk that changes in market prices can lead to losses. This can involve trading in equity, commodities, and currencies. Another form of market risk is *interest rate risk*, the risk that a change in interest rates will change the stream of interest income the bank earns on its interest-bearing assets (such as loans or government bonds) relative to the interest it pays on its liabilities (such as on deposits), changing the net interest revenue the bank earns. This is another complication of the maturity mismatch that arises when a bank borrows short (i.e., accepts demand deposits) and lends long (i.e., issues a loan that matures in five years). *Foreign exchange risk* is the risk that movement in the relative

prices of currencies will negatively affect the value of assets and liabilities on a bank's balance sheet denominated in foreign currency. If a universal-style bank has insurance operations, these operations face *actuarial or insurance risk*, the risk that the assumptions underpinning a table or model that prices a specific insurance contract, are inaccurate.

There are two forms of financial risk that are less easily quantified as compared to liquidity risk and market risk above. *Operational risk* is the risk of loss due to inadequate or failed processes or systems internal to the organization or with respect to its relations with external actors (e.g., with the bank's customers and partners). Operational risk is a broad category and goes beyond these specific categories of financial risk. Arguably, it is faced by all organizations.⁷² Actualized operational risk can contribute to reputation risk. Reputation risk is the risk of financial loss stemming from a loss in public confidence in the bank. Operational and reputation risk may be understood as types of enterprise-wide risk as they may not be contained to one specific business activity.

Finally, it is important to note that a bank may engage in activities that complicate the measurement (and thus management) of financial activities for a bank. Considered off-balance sheet activities, as they are not associated with assets or liabilities on the bank's balance sheets, they nonetheless generate income and expenses for the bank. An example would be the investments of a

⁷² These are the common risk categories featured in Cecchetti and Redish (2010). Other categories in usage include sovereign risk, five variations of operational risk (legal, model, political, valuation, country), volatility risk, profit risk, settlement risk, and systemic risk.

mutual fund that a bank manages for its clients. The clients as fund unit holders own the assets contained in the mutual fund, not the bank. However, the bank earns fees from managing the fund. Another example of an off-balance sheet activity is securitization, where banks bundle, securitize and sell loans it has granted. The bank no longer has the loan assets on its balance sheet (and the risk associated with them), but may continue to receive fee income for continuing to service the loans. A final example is the origination and trade of financial derivatives, such as contracts insuring against movements in interest rates (Van Hoose, 2010, pp. 21-22). While these activities are not represented on the bank's balance sheet, they may still expose the bank to various forms of financial risk.

Figure 3: Banking activity by risk exposure
(universal bank model)

Type of activity	Commercial banking	Investment banking	Wealth management	Insurance	Enterprise-wide
Type of risk	Liquidity, Credit	Market	Market	Market, Actuarial	Operational, Reputation

- ***Sources of risk management power***

While banks make decisions about managing the risks of their business activities, this power does not exist in a vacuum but co-exists with two other disciplining forces within the financial system: the forces of the market and that of public regulation.

○ ***Self-management***

As noted above, universal-style banks face several types of risk in their complex business operations. There are several risk-mitigating tactics a bank may employ to avoid the actualization of loss events that threaten the bank's profitability if not its solvency. For example, banks may use hedging instruments (a category of financial derivatives) to offset the risk associated by certain asset and liability classes. Another risk management tactic is the diversification of instruments held on the balance sheet, as informed by financial portfolio theory. A bank's overall approach to managing these different types of risk, where the identified sources of risk are organized in a framework for analysis, response and monitoring by bank managers is known as enterprise risk management.⁷³

○ ***Market discipline***

Reinforcing the use of risk management tools by the banking firm is the presence of effective market discipline, that is, the discipline imposed on the firm's conduct through the power exercised by external actors, such as depositors, debt holders and shareholders.⁷⁴ The implicit power of these actors, whether to withdraw deposits or sell their holdings of bonds or shares issued by the bank, acts as a disincentive to behave in ways that introduce risks to the

⁷³ Enterprise risk management (ERM) appears to have emerged as a managerial response to the corporate governance scandals of the early 2000s. Several professional associations published their own ERM frameworks in those years: the Casualty Actuarial Society (2003), Committee of Sponsoring Organizations of the Treadway Commission (2004), and Risk and Insurance Management Society (2008).

Source: https://en.wikipedia.org/wiki/Enterprise_risk_management. Retrieved November 29, 2017.

⁷⁴ More broadly, this would include the force exerted on an individual bank by other competing banks, although this market force bears more on the price and quality of financial services offered by the bank rather than the management of underlying risk.

bank's balance sheet that exceed the risk appetite (or threshold) of these external market actors. The effectiveness of market discipline is contingent on the transparency and timeliness of information about the bank's financial condition as well as the ability of actors to act on this information. There must be a credible threat to punish unacceptable behavior.

- ***Public regulation***

However, the incidence of banking crises throughout history, arguably a form of market failure, has motivated policy makers who oversee financial systems to introduce regulatory measures that backstop or supplant the risk management practices of banks themselves. Two are mentioned here. *Deposit insurance* is a scheme that insures deposits against the risk of loss if the bank is unable to service its debt obligations. *Capital regulation* is the prescribed amount of shareholder equity ("capital") a bank must hold on its balance sheet in proportion to its assets. Requiring a bank to maintain a minimum ratio of regulatory capital to bank assets (such as loans) helps ensure the bank has a sufficient cushion to absorb possible losses on assets, especially when the bank is expanding its balance sheet through credit extension or other asset acquisition.⁷⁵ The introduction of public regulations to direct or influence the risk management by banks has in turn raised the question of whether these regulations have perverse consequences on the behavior of banks. For

⁷⁵ Some scholars contest the effectiveness of capital regulation. Lavoie (2014) observes that the international rules (under the Basel Accord) defining capital and the schedule of risk weights for bank assets affords sufficient flexibility for banks to reconcile asset growth with regulatory requirements (p. 199).

example, there has been debate about whether the imposition of deposit insurance creates a moral hazard problem where bank managers are less prudent about managing risk and protecting deposits when those deposits are insured by the taxpayer (Keeley, 1990).

1.4. Empirical tools for studying bank behavior and performance

Bank behavior is understood here as the observed actions, both purposeful and unintended, of banks interacting with other banks as well as with other financial actors within an environment. Bank performance is understood as the observed outcome of behavior of a bank, where the outcome is a variable representing some normative standard for appraisal and comparison (e.g., efficiency, profitability, stability). Performance may be measured on a continuous basis or for a defined period, which for the purposes here include financial crises.

Interest in the risk behavior of banks has been an active empirical research program since at least the 1980s when interest in the subject rose alongside the movement to deregulate banking industries in the US, the UK and in other jurisdictions (Marcus, 1984). This interest peaked following the 2008 financial crisis, which raised the question of what explains the observed variation in performance among banks during the crisis. Why did some banks need significant public support while others did not? On the premise that bank behavior towards risk may provide answers, the three empirical approaches researchers use to measure bank behavior and performance are reviewed.

- **Accounting data approach**

The most common approach to measuring bank behavior is to collect and examine indicators derived from the disclosed financial statements (balance sheet and income statement) of the individual bank holding companies. Examples of such indicators include the ratio of total assets to shareholder equity (bank leverage) and the ratio of liquid assets to short-term debt (balance sheet liquidity). No single accounting-based indicator, however, serves as a proxy for a variable “bank risk”. Rather a suite of indicators is used to inform a behavioral profile of a bank and compare with other banks. Following the 1997 Asian Financial Crisis, the International Monetary Fund commissioned the development of such a suite of indicators, referring to them as Financial Soundness Indicators (FSIs). They include indicators related to capital adequacy, asset quality, profitability, liquidity and sensitivity to market risk (IMF, 2009, p. 118; see also Sundararajan, 2002). In their analysis of the Asian crisis, the IMF found that two FSIs, leverage ratios and return-on-assets, were reliable indicators of bank vulnerability within a global sample of financial institutions (IMF, 2009, p. 1). A disadvantage of accounting-based data is it is not immune from possible distortion enabled through flexibilities in accounting practice. Accounting data is also inherently backward-looking and available at a lower frequency compared to financial market data.

- **Market-based indicator approach**

Market-based indicators reflect the collective perception by investors of a bank's performance through the market price of bank shares, bonds and more recently, derivative instruments such as options⁷⁶ and credit default swaps⁷⁷. This price information may be used to compare performance variation among banks, such as differences in price volatility patterns. Contrasting patterns may be interpreted to infer market perceptions of differences in risk exposure among banks. An advantage of this approach is that these market prices are forward-looking and high-frequency, capable of displaying the evolution of investor sentiment toward these banks, including when a bank begins to experience difficulty or stress (IMF, 2009, p. 118). While these indicators can show when investors perceive a bank to be in distress, they do not indicate why they are in distress; the use of market data should therefore be used in concert with accounting-based data.

⁷⁶ "An option is a financial derivative that represents a contract sold by one party (the option writer) to another party (the option holder). The contract offers the buyer the right, but not the obligation, to buy (call) or sell (put) a security or other financial asset at an agreed-upon price (the strike price) during a certain period of time or on a specific date (exercise date)." (Investopedia, <https://www.investopedia.com/terms/o/option.asp#ixzz4zqt5X5Rg> , Retrieved November 29, 2017)

⁷⁷ "A credit default swap is a particular type of swap designed to transfer the credit exposure of fixed income products between two or more parties. In a credit default swap, the buyer of the swap makes payments to the swap's seller up until the maturity date of a contract. In return, the seller agrees that, in the event that the debt issuer defaults or experiences another credit event, the seller will pay the buyer the security's premium as well as all interest payments that would have been paid between that time and the security's maturity date." (Investopedia, <https://www.investopedia.com/terms/c/creditdefaultswap.asp#ixzz4zqrdXSPx>, Retrieved November 29, 2017).

- **Governance quality approach**

While it is difficult to observe and measure the strategic thinking of senior management of banking firms, a second-best approximation is measuring aspects of bank governance. This relatively new research direction involves the construction and use of indices that measure characteristics of corporate governance quality at the firm level as well as the quality of national institutions supporting private enterprise (such as property rights and type of legal system) and the quality of bank regulation. As an illustration of this approach, Beltratti and Stulz (2009) perform regression analysis using a suite of variables that measure governance quality to assess their relative influence on bank performance during the 2008 financial crisis, using stock returns as a market-based indicator of bank performance. Ellul and Yerramilli (2013) go further and develop a risk management index (FMI) using information about the firm's management and general organization structure with respect to the bank's risk management function. Among the variables the authors use to construct the index is the whether the bank has a chief risk officer (CRO) and whether the CRO is a member of the executive team.

2. Literature Review

This section reviews selections from the scholarship that help situate this essay's central hypothesis about bank consolidation and risk behavior. The first section looks at the issue of change in bank size and resulting change in activity diversification. After outlining how portfolio theory informs the size-diversification relationship, the section turns to the insights offered by empirical studies on this relationship. The tentative conclusion from these studies is that there is a positive relationship between bank size and bank risk. Banks tend to offset any diversification benefit of becoming larger by choosing riskier banking activities. However, an illustration of the contrasting Canadian and American experiences with bank size and stability draws our attention to the role of intervening factors when attempting to disentangle this relationship. The section finishes with an overview of five categories of these intervening factors, such as corporate governance and public regulation.

Having explored the bank size-diversification relationship, the second section turns to the literature that deals with one form of bank growth, that through merger and acquisition. A brief introduction to mergers and acquisitions in general gives way to a survey of the literature on bank mergers, which tends to organize itself around the question of whether such transactions result in efficiency gains and added value. This leads to a review of the relatively limited research on mergers of equals among banks.

2.1. Bank size and risk diversification

2.1.1. Insights from portfolio theory

Given their risk preferences, bank managers must manage their assets and liabilities in such a way as to achieve the bank's strategic objective (for example, maximize profits or achieve a targeted return) while maintaining risk exposures within certain parameters. Bank size is by convention understood as total bank assets. Growth in bank size involves growth in the value of total assets, which may occur through a variety of means, including creating assets (e.g. issuing loans) or purchasing existing assets from another party (e.g. loans or securities). Regardless of whether a bank's total stock (or portfolio) of assets is constant or changing, a principal responsibility of bank managers is to choose an arrangement of assets among available asset categories that meets the bank's strategic objective. Modern portfolio theory provides an explanation of how bank managers may carry out this task. It also gives insight into the risk behavior of bank managers as balance sheets grow larger.

Pioneered by Markowitz (1952), modern portfolio theory is very much the formalization of the folk adage of "not putting all of one's eggs in one basket" in demonstrating the benefits of diversifying the portfolio of assets one manages. The risk exposure of the whole portfolio can be reduced by distributing the total asset stock among different asset categories whose relative performances are not correlated, or in other words, whose values are not likely to move in unison in the same direction. These asset categories, or baskets, may differ by instrument

(e.g. cash, government bonds, mortgages, commercial loans, corporate shares) or by geographic market (e.g. commercial loans to western farmers versus eastern manufacturers). The asset categories vary by expected risk and return characteristics, where higher return is associated with higher risk. Using this risk-return information, the bank manager diversifies the asset stock among asset categories to maximize risk-adjusted return.

Putting this in terms of lending decisions (i.e. asset creation), the bank manager uses such information to decide how much to lend to who and where, keeping in mind how these lending decisions contributes to overall risk exposure of its loan portfolio, which is a component of its overall asset portfolio. This explanation could also be applied to the management of securities held on asset-side of the bank balance sheet. Furthermore, the same principle may be applied to liability management; that is, the choice of what sources of liability funding to draw upon.

Portfolio theory also provides an explanation of decision making when the value of assets managed by the bank becomes larger. Growth in total bank assets allows further diversification of the assets across existing asset baskets. Here is where risk preference described above comes into play. A risk averse banker will use the additional cash value of assets to adjust the overall portfolio to an allocation featuring the same overall expected return but with lower risk exposure; in other words, a higher risk-adjusted return. This is the diversification benefit of scale, where a bank has the added ability to participate in additional asset markets which were previously out of reach due to scale limitations.

However, the scale effect can coincide with the opposite scope effect, where a less risk-averse bank manager chooses to adjust its asset portfolio to categories having higher risk-return profiles. In effect, this can offset the internal diversification advantage afforded by the scale effect. Complicating these two possible behavioral responses to a growing balance sheet are changes in the banking environment, such as deregulation (allowing entry into new markets) and financial innovation (allowing production of a broader set of products), that expand the existing menu or opportunity set of asset baskets, pushing out the risk-return frontier. The now infamous example that had an important role in the 2008 financial crisis is the mortgage-backed security market enabled by securitization. For a given risk preference and a menu of asset categories with varying risk-return properties, Stiroh warns that “risk-taking is endogenous and diversification need not lead to lower observed levels of risk” and that this “is a fundamental implication of standard portfolio theory” (2015, p. 229). This possibility complicates finding a clear and stable relationship between diversification and risk taking (p. 230).

2.1.2. Empirical studies about bank size and risk behavior

What do empirical studies say about the relationship between size, diversification and risk? The theoretical explanation above suggests it should be possible to observe diversification leading to lower risk or higher risk. Four studies, two of US banks and two of international banks, find evidence of larger banks tending to display indicators of riskier behavior.

Demsetz and Strahan (1995, 1997) also draw on portfolio theory to predict that all other things being equal, larger banks have diversification advantages over smaller banks. “The potential for diversification increases with the size of the portfolio” (Demsetz and Strahan, 1995, p. 14). But a larger bank, not being constrained to maintain scaled-up versions of its portfolio allocations when it was smaller, may choose to reallocate them, especially if the bank is changing its overall business model and strategic direction. In this case, the risk diversification logic may be applied to other activities of the firm, including the liability side of the balance sheet as well as off-balance sheet activities. Demsetz and Strahan find the risk diversification benefit of becoming larger tends to be offset by choosing riskier activities.

In both Demsetz and Strahan studies, a bank’s stock return variance⁷⁸ serves as a market-based indicator of a bank’s overall risk from the perspective of shareholders. The authors empirically decompose stock return variance into two components: systematic (or industry-wide) risk and idiosyncratic (or bank-specific) risk. On the assumption that the bank-specific risk component reflects the market perception of a bank’s portfolio diversification (and thus riskiness), the authors test the relationship between bank risk and bank size. In both studies, Demsetz and Strahan use a sample of over 100 US bank holding companies (BHCs), drawing data from the 1980s into the early 1990s.⁷⁹

⁷⁸ Intended as an indicator of equity risk, stock return variance is measured as the “degree to which a bank holding company’s weekly stock return fluctuates over a one-year period” (Demsetz and Strahan, 1995, p. 14). A stock return is the combined change in share price and dividend income flow over a time interval.

⁷⁹ Demsetz and Strahan (1995) use data from 1987 to 1993, with a sample of 100 BHCs and Demsetz and Strahan (1997) test from 1980 to 1993, using an original sample of over 150 BHCs.

In their 1995 study, the authors find that the amount of risk facing large BHCs was not significantly different from that of small BHCs, although there were differences between larger and smaller BHCs in the kind of risks featured in their typical business models. This is attributed to different banking activities. Larger banks were more likely than smaller banks to be 1) geographically diversified, 2) engage in more commercial and industrial lending and less consumer lending, 3) have smaller capital-to asset ratios, 4) hold assets in a trading account, 5) participate in derivatives markets and 6) generate larger percentages of net revenue from non-interest revenue sources such as fees and commissions⁸⁰ (p. 17). What this suggests is that while the “advantage of size has allowed larger institutions to diversify their risk”, larger banks diversify toward activities entailing greater risk, “leaving large bank holding companies with no less risk than small companies” (p. 13) for most of the period examined. This finding is replicated in their 1997 study. To add further to this list of characteristics that differentiate large banks from small banks, Uzun and Webb’s 2007 study of what distinguishes US banks that securitize from those that do not, is that they tend to be larger (as measured by total assets).

Complementing these two U.S. studies are two examinations featuring cross-country bank samples. In his 2001 study into the relationship between bank size, risk and charter (or franchise) value, De Nicoló finds evidence of a positive relationship between bank size and risk of insolvency, supporting the conclusion of Demsetz and Strahan (1995, 1997). “Size-related diversification

⁸⁰ See precise definition of non-interest revenue in Textbox 2.

benefits and/or economies of scale in intermediation are either absent or, if they exist, are more than offset by banks' higher risk taking" (De Nicoló, 2001, p. 1). The study features an international sample of 826 banks drawn from 21 developed economies for the 1988-1998 period. While taking a similar cross-sectional approach as Demsetz and Strahan, the author uses the z-score⁸¹ corresponding to the bank's return on assets as an accounting-based indicator of bank risk instead of stock return variance. De Nicoló concludes⁸² that "absent future structural changes in the fundamentals of technologies and incentive structures of banking markets of developed countries, bank consolidation is likely to result in an average increase in banks' insolvency risk" (p. 24).

Demirgüç-Kunt and Huizinga (2010) investigate the implications of a bank's diversification profile on the asset side as well as its funding strategy on its liability side for its risk and return (p 627). While they do not directly address bank size, they examine banking activities that are associated with the universal banking model, a model which tends to be predicated on being larger.

⁸¹ The z-score is defined as the "number of standard deviations that a bank's return on assets has to fall for the bank to become insolvent" (Demirgüç-Kunt and Huizinga, 2010, p. 628).

⁸² De Nicoló also tests the relationship between bank size and charter value, the latter being the stock market's valuation of a firm's future stream of profits. A high franchise value is associated with a degree of market power enjoyed by a banking firm, market power which may translate into the stream of profits. Contrary to the theoretical prediction of a positive relationship between charter value and bank size, finds evidence that charter value decreases in size for most banks in the sample. This presents a puzzle as this is intuitively contrary to the argument made above of the role charter value may have in providing market discipline against excessive risk-taking by banks. Combined with empirical evidence that larger banks tend to pursue greater risk taking (offsetting their diversification risk-reducing advantage), larger banks tend to have lower charter values and greater risk-taking tendencies. Growth in bank size can either be through de novo investment or through merger and acquisition. An outstanding question then is whether a bank's decision to merge with another bank is precipitated by loss of charter value or leads to a loss in charter value. If it is the former situation, what are the factors that lead to a bank's loss of charter value? Regulatory change (such as liberalizing entry into banking markets) and financial innovation are among the factors that can disrupt stable charter values enjoyed by banks.

Specifically, it looks at the significance of non-interest income flows and non-depository sources of liability funding in a bank's overall asset-liability management strategy, activities that depart from the traditional loan-granting, deposit-accepting model where net interest income is the main source of revenue. The authors study a cross-national sample of 1,334 banks from 101 countries over the 1995-2007 period. Using correlation and regression analysis, Demirgüç-Kunt and Huizinga assess the relationship of non-interest income and non-deposit funding, as well as several macroeconomic and institutional explanatory variables, to two different dependent variables, bank risk (measured alternatively by the z-score and stock return volatility) and bank return (measured by return on assets and the Sharpe ratio).⁸³ The main finding is that “while universal banking can be beneficial in terms of diversifying risks and increasing returns, banking strategies that rely predominantly on generating noninterest income or attracting non-deposit funding are very risky” (p. 650). Their study adds evidential weight to the conclusion that the diversification that follows from bank growth tends to be in riskier activities.

2.1.3. Challenges to a stable relationship between bank size and risk

The empirical findings of the above four studies provide the provisional conclusion that bank risk does not necessarily fall with growth in bank size, that the risk diversification benefit of becoming larger tends to be offset by choosing to pursue riskier activities (Demsetz and Strahan, 1995, 1997) and may even be

⁸³ The Sharpe ratio is the mean value of a bank's return on equity (RoE) divided by the standard deviation of the RoE (Sharpe, 1966).

more than offset (De Nicoló, 2001) depending on the type of banking activities that the growing bank tends to engage in. Demirgüç-Kunt and Huizinga (2010) assert that certain non-traditional banking activities of the universal banking model, such as those contributing to non-interest income sources, introduce greater risk.

While it is tempting to accept this conclusion that bank size and bank risk are positively related, and thus larger banks are potentially more unstable than smaller banks, there are good reasons to be cautious about leaping to this generalization. Factors such as institutional differences and how they influence banking sector development throughout history may explain cases where banks have become more stable as they have become larger. A good illustration is the comparison of the US and Canadian commercial banking systems. A distinct contrast is evident looking at number of banks and number of bank insolvencies for the two nations over the 1934 -1971 period.

Looking at the US (see Figure 4 below), one observes a large set of commercial banks active during this period, numbering in the thousands, reflecting its dual banking system where both federal and state governments have shared in commercial bank regulation. Restrictions on interstate and intrastate branch banking across states led to the system's overall fragmentary nature. The number of active banks has also fluctuated over this period, reflecting the entry and exit of banks. The decline of about 800 active banks in the 1934-1942 period can be attributed to the high frequency of bank

insolvencies in the wake of the Great Depression. Although much lower, bank insolvency continued to be a feature in the 1942-1971 period.

Figure 4. US banks: number of bank and bank insolvencies, 1934-1971

Source: Federal Deposit Insurance Corporation

Canada, on the other hand, exhibits a stable and small number of commercial banks between the end of World War II and 1970, between eight and eleven (see Figure 5). Banking regulation in Canada has been exclusively in the federal jurisdiction, allowing a nation-wide branch banking system to become established in the 19th century. The number of commercial banks active in

Canada peaked at 51 in 1874 and had fallen to 11 by 1925 (Neufeld, 1972, pp. 77-80), mainly through bank mergers. Another important difference in the complete absence of any Canadian bank failures from 1934 to 1971.

Figure 5. Canada: number of banks and bank insolvencies, 1934-1971

Source: Neufeld, 1972.

This pattern in Canada of a small number of commercial banks (suggestive of a stable concentrated market structure) and the relative absence of bank insolvencies (implying relative stability) continued into the 1972-2006 period⁸⁴. Over this same period, the United States experienced a dramatic shift (see Figure 6). The 1980s and 1990s were an era of bank deregulation, which included loosening restrictions on interstate and intrastate banking. The sharp fall in the number of active commercial banks beginning in the mid-1980s suggests significant bank consolidation took place. The era also corresponds with a sharp rise in bank insolvencies, peaking at 280 in 1988⁸⁵, and then flaring

⁸⁴ The exception to this was the failure of two regional banks, Northlands Bank and the Canadian Commercial Bank, in 1985.

up again in the 2008 crisis. This historic period 1980-2006 marks a period of upheaval in the market structure of US commercial banking. One may deduce that the average size of US commercial banks grew through the reduction in the number of banks (either through insolvency or consolidation) alongside continued growth in economy-wide bank assets. Bank insolvencies, always present, spiked during financial crises (the late 1980s saving and loan crisis and the 2008 crisis). This contrasts with the Canadian market structure, which remains relatively unchanged while the average size of banks increases with growth in total bank assets. Apart from two bank failures in 1985, insolvency is notably absent.

Figure 6. US banks: number of bank and bank insolvencies, 1972-2006
Source: Federal Deposit Insurance Corporation

The Canadian case offers a counter example that suggests growth in bank size, and corresponding growth in bank risk, does not necessarily lead to an increased incidence of actual bank failure. Two lessons follow from this. First, empirical research that tests for a generalization between bank size and risk across nations should strive to account for intervening variables describing regulation and market structure, variables which describe the properties of the national banking systems of the banks represented in the sample. This should aid in the task of disentangling causality between size and risk. De Nicoló (2001) controls for such national differences by computing estimates for sub-sample groups by country (US, Japan, European Union). The second lesson is that analysis at the level of industrial organization, with its themes of market structure, competition, stability and regulation, would be fruitful in a wider analysis. However, this is beyond the scope of this essay. See Textbox 3 below for a brief overview of the industrial organization of banking.

Textbox 3: Industrial organization of banking

A wider analysis of bank behavior should take into consideration the influence of a bank's environment on its overall behavior, taking the analysis to the level of industry. Changes in the scale and scope of an individual bank's operations, such as those resulting from a merger, can impact wider market dynamics. This turns to the subdiscipline of the industrial organization of banking, with its themes of industry structure, market competition, and regulation. Here, questions of how market discipline and market power may affect bank behavior may be addressed. At a time when many of the proposed financial reforms since the 2008 crisis seek to limit the scale and scope of financial institutions (Tarullo, 2012) to assure greater bank stability, academic research has not yet identified robust empirical generalizations about the relationship between industry competition, efficiency and stability in the banking sector that are applicable across time and geography (Van Hoose, 2010).

Competition-Efficiency

One question that ties into the competition-efficiency relationship attempts to determine if the merging of banks, thus increasing the size of some banks as well as concentration in banking markets, yields efficiency gains (boosting consumer welfare) or leads to increased market power by banks (diminishing consumer welfare). In his review of the literature, Van Hoose finds that "empirical research on impacts of mergers suggest that gains in both cost efficiency and market power do often arise simultaneously, implying that the social welfare effects of specific bank mergers or acquisitions must be evaluated on a case-by-case basis" (p. 90). In other words, the identification problem introduced by these simultaneous effects complicates the use of statistical models to reveal common underlying relationships.

Competition-Stability

Research into competition and stability examines how banking regulation, which include restrictions on entry, exit and consolidation, as well as requirements for bank balance sheet management, affects bank size and behavior and industry structure and stability. The complexity of the real world in terms of the nature of banking rivalry, the extent of product differentiation, and variations in asset price and return distributions, present challenges to the research program. This may explain why "empirical evidence regarding the real-world relationship between competition and stability in banking is decidedly mixed, with various studies suggesting evidence of negative, positive, or U-shaped relationships between the degree of competition in banking markets and the stability of the banking industry" (p. 137).

2.1.4. Other intervening factors in bank risk-taking

Becoming larger may afford the economies of scale necessary to pursue certain financial activities such as derivative trading and large commercial lending (Demsetz and Strahan, 1995, pp. 18-19). While scale enables riskier activities, it does not necessarily determine their adoption. The following discusses five general categories of intervening factors identified in the literature that explain variation in the decisions of banks to pursue riskier activities.

- **Franchise value and (dis)incentives for risk-taking**

Variation in risk behavior among banks, specifically through their efforts at self-management, is also a function of the regulatory and market conditions in which the bank operates. Marcus (1984) argues that public regulations can support a relatively high market value of a banking firm, or franchise value, due to the limits on competition or due to insurance against instability that these regulations provide. The franchise value of a bank is related to its market power, its ability to earn economic rents enabled by restrictions on competitive forces, such as barriers to market entry. If these economic rents take the form of stable earnings performance by the bank (Stiroh, 2015, p. 225) and shareholders prefer stable earnings flow to a more volatile flow, this preference reflects in a relatively high market valuation of the bank. As the firm's market value is an expression of investor sentiment towards the firm, franchise value is a manifestation of market discipline.⁸⁶ Likewise, the "costs of financial distress such as bankruptcy costs,

⁸⁶ The potential disciplinary power imposed by shareholders may be extended to other stakeholders. Stiroh (2015) argues that a bank's borrowers may voice their preference for bank prudence to ensure the

loss of value during asset sales, and search costs for new management” may impel shareholders to signal their preference for prudence to bank managers (p. 225). Assuming an alignment of interests between owners and managers, managers have an incentive to preserve franchise value by being relatively risk averse.

However, if a bank’s source of franchise value were to be undermined, say through removal of barriers to competition or through a technology shock, the bank may choose a strategy with greater risk to recover diminished franchise value, putting the bank at greater insolvency risk. In observing the rise of insolvencies among US banks and near-banks in the 1980s that followed deregulation, Keely (1990) explores the relationship between increased competition (such as that induced by deregulation) and incentives faced by banks that increase the risk of insolvency. One tactic that raises the risk of insolvency is for the bank to become more leveraged; that is, to increase the proportion of debt relative to shareholder equity to fund assets. This reduces the relative size of the cushion that shareholder equity provides against losses and asset price declines⁸⁷. Another tactic is to create or acquire assets promising higher return yet with higher risk. Demsetz, Saidenberg and Strahan (1996) test the role of a bank’s franchise value as a factor in stability among US bank

long-run viability of their lenders if their lending relationships are built on private information and longer-term relationships (p. 225).

⁸⁷ Increasing leverage raises a bank’s liability obligations to debtholders relative to shareholders. With debt holders having priority over shareholders in the event of settling claims during a bank’s liquidation, shareholder equity is the first in line to suffer losses. Thus, shareholder equity acts as a cushion against losses suffered by creditors (and deposit-holders). However, this cushion becomes relatively smaller as the bank becomes more leveraged.

holding companies during the 1986-1994 period. As “the present value of a firm’s future profits”, franchise value is measured as the difference between a firm’s market value and its replacement cost (p. 6). The authors find that “banks with more franchise value hold more capital and have less asset risk than banks with less franchise value.” However, there is one caveat: once a bank has high franchise value, there is incentive to preserve it. If, however, a bank does not have it, especially during a period of economic distress, there are strong incentives for banks to “increase risks and go for broke” (p. 12).

- **Regulatory complexities**

Extending from the above discussion about how external relationships can influence the risk behavior of banks are the complexities of a bank’s relationship with its regulator. Bank supervisors tend to be interested in the total risk faced by each individual supervised firm (that is, the sum of both bank-specific idiosyncratic risk and industry-wide systematic risk), rather than just the idiosyncratic risk of banks (Stiroh, 2015, p. 225). This adds to the perception of risk faced by banks and thus contributes to the intensity of supervisory oversight. From the point of view of the public regulator, the high cost of individual bank failure necessitates individually focused supervisory relationships with banks. This provides a channel for the influence of the supervisor’s preferences toward bank risk, another form of discipline.

Yet, the ability of the regulator to direct or influence bank risk behavior may be complicated by several factors. The larger regulatory framework may

feature contradictions that create conflicting incentives to diversify or concentrate bank activities (Stiroh, 2015, p. 225). Regulatory capture may lead to regulations that are conducive to risk taking. Also, excessive risk-taking may be the unintended consequence of regulatory policies designed to protect the public interest, as in the case of the “too big to fail” problem.

- **The “too-big-to-fail” incentive for risk-taking**

The “too-big-to-fail” (TBTF) problem arises when banks can exploit an implicit government policy to rescue such banks if they succumb to the downside of risk. The power to exploit this rescue policy is associated with becoming sufficiently large and/or systemically important through its connections in financial markets to be “too big to fail”. The root of the problem is the possibility that the government fears the failure of such a bank in distress may spill over and affect the stability of other financial institutions as well as the wider economic system. Seeing this not to be in the public interest, the government may intervene and support the distressed financial institution, protecting its creditors and depositors (above the deposit amounts insured through deposit insurance). This “bail-out” support may be in the form of a capital injection (which is tantamount to partial or full nationalization) or an implicit guarantee of present debt or future borrowing, among other measures. This public intervention is informal and discretionary, adding an element of policy uncertainty. If the government chooses to intervene, it rescues a bank that may otherwise fail under the pressure of market forces and exit as a weaker, less fit business. The bank, suspecting the possibility of a public bail-out, may choose to be less prudent in its risk behavior, giving rise to a

moral hazard problem. “TBTF reduces the incentives for individual banks to make the best decisions they can about risks and rewards and encourages banks to seek high-profit high-risk activities because they do not have to worry about the application of market discipline by creditors” (Goodlet, 2010, p. 7). Thus, the government and the TBTF bank enter a vicious cycle leading to repeated public bail-outs, unless the moral hazard potential is mitigated through other policy design.

- **Structure of corporate governance**

Another explanation of variation in risk-taking focuses on the relationship between bank owners and managers. In asking whether there are agency problems between owner and managers, the issue of incentive alignment between these two parties must be investigated. For example, managers may be incentivized to be risk averse compared to shareholders if their wealth is tied up with the bank. Yet the structure of the relationship could also cultivate a culture of empire building, hubris and self-interest among management, which could encourage risk-seeking behavior (Stiroh, 2015, p. 225). In conducting a pioneering empirical test of theories combining bank risk-taking, bank ownership patterns and public regulations, Laevan and Levine (2009) extend research into the impact of regulations on bank risk-taking to include the influence of bank ownership structures. The authors assume potential conflict between bank owners and bank managers with respect to the degree of risk accepted by the bank. Variation in bank ownership is described in terms of whether there is a dominant shareholder among a bank’s owners present (defined as a shareholder

who owns a minimum of 10% of the common shares of the bank). The authors test three theoretical predictions: 1) that dominant shareholders tend to pursue more bank risk-taking than debt holders and managers, 2) regulations influence the risk-taking incentives of diversified dominant shareholders differently from those of debt holders and non-shareholder managers, and 3) corporate governance structure influences the ability of owners to influence risk (Laevan and Levine, 2009, p. 260). The empirical test is a cross-section analysis of 270 banks across 46 countries, both industrialized and developing, in the year 2001. The evidence supports the view that risk-taking varies positively with the relative power of shareholders vis-à-vis non-shareholding management and debtholders, with shareholder power proxied by the presence of a dominant shareholder. Further, the evidence upholds the view that the effect of banking regulations (e.g., deposit insurance and capital regulations) on bank risk-taking depends on a bank's ownership structure, such that the "same regulation has different effects on bank risk taking depending on the bank's corporate governance structure" (p. 259).

- **Search for competitive advantage**

A fifth explanation of why banks may vary in their risk behavior is that it is the consequence of a bank's search for sustainable competitive advantage over its industry peers and therefore profits above the industry average. Beinhocker (2006), drawing on strategic management theorist Michael Porter, sees "the only means to earn profits above the bare minimum is to create sources of

competitive advantage that (legally) reduce competition and increase the market power of the company” (p. 325). Note how this relates with the role of franchise value discussed above. Sources of competitive advantage include exploiting “economies of scale and scope, barriers to competition, privileged relationships and core competencies” (p. 329). It logically follows that in differentiating its overall business strategy vis-à-vis its competitors, a bank may choose a risk-return appetite different from its industry peers in order to profit and survive in the long run. This tendency of individual banks combines to create emergent conditions of monopolistic competition at the industry-level. Darroch (1994) employs Porter’s framework to study the competitive strategies of four large Canadian banks (Royal Bank, Bank of Nova Scotia, CIBC and Bank of Montreal) that led them to rank among the top ten largest banks (by total assets) in North America in 1992 (p.3). Ironically, he finds that there has been a “trend toward greater strategic homogeneity among the banks” as the “breakdown in barriers among different national capital and product markets within and among nations has altered the range of viable strategic niches or positions” (p. 214).

2.2. Bank mergers

The previous section examines studies that investigate the relationship between bank size and risk behavior, studies that often draw on portfolio theory to predict that larger banks should have lower risk than smaller banks as their size difference signifies the greater ability by larger banks to diversify their balance sheets and reduce risk. The evidence offered by these studies suggest

that larger banks offset their diversification advantage by taking on further risk. However, as a historical comparison of the banking industry dynamics of Canada and the US suggests, the presence of intervening factors exist at the industry or national level, factors which may complicate identifying a clear empirical relationship between bank size and risk behavior. Key to a fuller understanding of change in risk behavior in the context of bank growth is to examine these intervening variables.

Given the focus on this bivariate relationship, I now turn to the literature on bank mergers and acquisitions, where banks acquire the existing business operations of other banks. This is one of two ways banks can grow, the other being through organic growth, where firms expand their balance sheets or revenue flows through existing or new business activities. This essay is principally interested in whether a particular type of merger transaction, the merger of equals, contributes to riskier behavior by the consolidated banks, all other factors being equal. This section will introduce key findings about mergers and acquisitions in general before turning to the literature on bank mergers, and on mergers of equals in particular.

2.2.1. Mergers and acquisitions in general

Mergers and acquisitions (M&A) between business corporations is the subject of multidisciplinary study in industrial organization, corporate finance, strategic management and organizational theory. There are two general research themes that preoccupy scholars in these fields. One is whether the

consolidation of two business firms leads to greater overall efficiency in terms of cost or profit. The other is shareholder value and whether the transactions leads to an increase in shareholder value and how are these gains, if any, are distributed.

The accumulation of empirical research into M&A activity across industries offers the following insights. Mergers tend to occur in waves. The frequency of M&A activity tends to cluster in distinct time periods. Also, these waves of M&A activity are not evenly distributed across all industries but tend to be concentrated in a few specific industry groups unique for that historic period. The impetus behind the waves is often an industry-level shock, such a technological shock, a deregulatory move, a financial innovation or the threat of foreign competition (Andrade, Mitchell and Stafford, 2001, pp. 103-104). The 1990s merger wave in the US (as distinct from the waves in the 1970s and 1980s) was dominated in part by mergers in the banking industries (p. 107). In the case of the US banking industry, the 1990s merger wave was likely precipitated by a number of regulatory shocks, such as the 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act, which effectively repealed restrictions on branch banking across state lines (Calomiris and Karceski, 200, p. 97).⁸⁸ The bank merger wave in Europe was precipitated by the creation of the European Union in 1992, which formed a continent-wide financial services market, as well as the introduction of the single currency euro zone in 1999 (Altundas and Ibáñez,

⁸⁸ It could be argued that the mergers proposed by four Canadian banks in 1998 were a response to the perceived threat of foreign competitors in both the Canadian domestic and foreign markets, competitors who had been strengthened through recent prior mergers.

2004, p. 7). Such institutional shifts create a deregulatory window in which firms respond, adjusting their business strategies, including growth through merger to take advantage of new profit opportunities or simply to survive.

Empirical investigations into efficiency gains tend to use cost ratios or other accounting-based variables to measure the effects of mergers on efficiency (Akhavelin, Berger and Humphrey, 1997, p. 99), using these variables in a comparison of pre-merger and post-merger performance. Another method is estimating an econometric model specified along a firm's cost, revenue or profit function (Allen and Liu, 2005). Research into whether mergers lead to gains in shareholder value tend to take one of two approaches: event studies and performance studies (Kaplan, 2000). Both rely on market-based indicators, often stock returns. Event studies in M&A tend to focus on the days leading up to and after a merger announcement, where impacts on shareholder value are measured through stock price movement (taken as a proxy for investor reaction to the announcement). Performance studies take a longer view, examining post-merger shareholder returns and accounting indicators three to five years after the merger completion (Andrade, Mitchell and Stafford, 2001, p. 112). For example, the presence of negative abnormal returns (that is, returns that differ from the expected rates of return for an industry) for merged firms five years into the post-merger integration period would cast doubt on the predicted benefits of the merger to shareholders.

2.2.2. Bank mergers and acquisitions

Most M&A studies on the banking industry tend to focus on the effects of merger on efficiency and shareholder value, with less emphasis on the impact of mergers on bank stability. For example, Houston and Ryngaert (1994) take the event study approach to assess any shareholder gains in a sample of 153 US bank mergers in the 1985-1991 period. Among their results, they find that overall gains to the shareholders of the bidder bank and target bank are slightly positive but statistically insignificant from zero. Akhavelin, Berger and Humphrey (1997) ask if there are any gains in profit efficiency⁸⁹ that arise in a sample of 69 US bank “mega” mergers (that is, where the bidder and target banks have a minimum of \$1 billion in assets) that take place in the 1981-1989 period. Instead of using market-based indicators such as share returns, the authors used accounting-based measures of profitability, such as return on equity (RoE) and return on assets (RoA). They find that “merged banks experience a statistically significant sixteen percentage point average increase in profit efficiency rank relative to other large banks” and “most of the improvement is from increasing revenues, including a shift in outputs from securities to loans, a higher-valued product” (p. 95). This last finding may be interpreted as evidence of a tendency of banks to diversify their business activities following a merger.

While these two research strands may reveal aspects of the impact of mergers on bank behavior and performance with respect to bank efficiencies and shareholder value, they do not say much about the impact of mergers on bank

⁸⁹ Profit efficiency is an efficiency measure that includes the revenue as well as the cost effects associated with changes in output scale and scope (Akhavelin, Berger and Humphrey, 1997, p. 101).

risk. This is notwithstanding the conclusion by Van Hoose (2010, p. 137) that efforts to identify the relationship between competition and stability have yield mixed results (see Textbox 2 above). The level of analysis in Van Hoose is at the industry level, rather than the firm level. One study that considers bank risk is Hughes, Lang, Mester and Moon (1999), which searches for evidence of net benefits accruing to US banks who take advantage of the opportunities for consolidation afforded by deregulation (p. 293). Using information from an original sample of 441 bank holding companies (BHCs) in 1994, the authors test “how consolidation affects expected profit, the riskiness of profit, profit efficiency, market value, market-value efficiencies, and the risk of insolvency” (p. 291). Hughes et al. combine production-based methods (using accounting data) and market-value methods (using financial market data) to analyze the performance of US banks who have had a history of consolidation activity. As a measure of insolvency risk, the authors use the accounting-based z-score. Hughes et al. find evidence that banks that have pursued interstate mergers, especially ones that have increased the amount of the banks’ macroeconomic diversification (that is, diversification of activities in local and regional economies whose business cycles have relative low correlation), “improve market-value efficiency and production efficiency and reduce BHCs’ insolvency risk” (p. 294). This study provides an empirical demonstration of diversification behavior, in this case geographic diversification, amid bank growth.⁹⁰

⁹⁰ However, DeLong’s 2001 study of 280 US bank mergers announced between 1988-1995 using the event study method (described above) finds that “mergers that focus both activity and geography enhance stockholder value” while other bank mergers that diversify in either the dimensions of business activity or geography (i.e. branch out from markets where the banks are already established) do not create value (p.

2.2.3. Mergers of equals among banks

In general, there are two types of merger and acquisitions. The more frequent of M&A transactions involves a larger firm (the bidder) purchasing a smaller firm (the target) using cash or stock, where the management of the bidding firm offers shareholders of the target a premium to purchase their shares. The less frequent M&A transaction is the “merger of equals” (MoE)⁹¹. A merger of equals is commonly understood to involve two firms of relatively similar size that are often in the same industry, and can be competitors. Due to the problems experienced in several high profile “mergers of equals”, such as Daimler and Chrysler in 1998 and Time Warner and AOL in 2000, the popular wisdom is that merger of equals are largely unsuccessful in terms of efficiency gains or adding to shareholder value (Economist, 2014; Brew, 2014). Nonetheless, this special case of the M&A transaction is relevant to the dynamics of banking systems in part because the highly visible MoE transaction creating a corporate giant and a more concentrated banking ecosystem, may also introduce moral hazard problems if the resulting consolidated bank is deemed “too big too fail” (TBTF) by the government. Furthermore, with the general trend of banking industry consolidation in several national jurisdictions reducing the number of active banks that are available for M&A, the MoE as a strategic choice for banking firm

221). This suggests that shareholders, at least in the immediate term, discount or do not recognize the stability enhancing effects of diversification through bank mergers.

⁹¹ Drawn from the SDC Platinum data base, the count of merger of equals transactions involving banks in developed economies between 1980 and 2007 was 95, less than 1% of the total sample of bank merger transactions of 37,659 during this period.

looms larger, increasing the probability that banks will consider a merger of equals.

The infrequency of bank mergers of equals may explain the small academic literature. Apart from some business case studies (Chang, O'Reilly and Pferrer (2004) on the 1998 Wells Fargo-Norwest merger; Taliaferro (2009) on the 2007 Bank of New York - Mellon Financial merger), the 2006 study by Bae, Aldrich and Yi offers one examination of MoE bank transactions in the US banking industry. As drawing a large sample of MoE transactions is difficult given their infrequency, the authors instead do a comparative analysis of eight MoEs selected from the 1987-1996 period. They use a comparative performance analysis approach where post-merger performance is observed three years after merger completion and is measured using both accounting-based indicators such as return on assets (ROA) and efficiency ratio as well as market-based stock returns. The authors adopt the definition of a MoE transaction used by Houston and Ryngaert (1994), where the smaller of the two banks involved must have pre-merger assets (or equity) no less than 75% of the value of the pre-merger assets (or equity) of the larger bank, and the new board of directors of the consolidated bank features an equal number of directors from the two banks (p. 1159). In addition to compiling measurements for each of the eight cases, measurements are gathered for two peer groups (large national banks and super regional banks) for performance comparison. Bae et al. find that only 3 of the 8 sampled resulting bank consolidations, less than half, outperformed their peer groups of banks three years after transaction completion, leading the authors to conclude

that “not all mega-mergers of equal banks in the U.S. banking industry are perceived by the market to have the benefit of creating a large-scale bank” (p.63), casting doubt on the efficacy of this special type of merger.

2.3. Hypotheses about the behavioral effects of merger of equals between banks

With the knowledge that MoE transactions involving banks tend to be rare and not likely not to lead to gains in efficiency and shareholder value, I am able to combine these empirical insights with the above claims about bank size and financial risk to synthesize a set of hypotheses about how a “mergers of equals” transaction may contribute to riskier behavior by the consolidated banks. In general, banks that are considering merging seek to persuade their shareholders of this strategic decision by emphasizing that the consolidation will result in efficiency gains (cost and/or profit efficiencies enabled by economies of scale) and/or added market power.⁹² Some examples of cost and profit efficiencies include synergies between existing business activities, finding new opportunities to diversify business and realize cost efficiencies through reduction of redundancies. The claim is that these professed gains will reflect in added shareholder value, and this will be reflected in the market value of the resulting banks. However, as research has found mixed evidence on whether such promised benefits are realized by the resulting consolidation, there is an element of risk that proposed mergers will not meet their strategic objectives.

⁹² The promise of gains in market power would not likely be explicitly publicized by bank managers and directors as its detrimental effect to consumer welfare would attract the scrutiny of public regulators.

Adding to the risk faced by all M&A transactions, the merger of equals transaction poses additional risk. This is best understood by separating the internal governance of the consolidated bank from the relationship of the consolidated bank to its external stakeholders, specifically to its shareholders. With respect to internal governance, the power-sharing arrangement often featured in proposed MoE transactions adds uncertainty about the successful functioning of the resulting bank's governance and management. This uncertainty lies in the possibility of conflict between vested interests brought together under the same organization, such as new senior management team created out of managers from the two organizations. Struggles over governance and managerial control can undermine the execution of the consolidation strategy, exacerbating risks already associated with post-merger integration of two organizations. These include the risk that two different organizational cultures are unable to integrate without dysfunction. There is also the risk that the proposed synergies of combined business activities are not realized as expected or the risk posed by an overall strategic vision of a new banking entity that is either vague or incoherent. These risks could work to undermine the expected profitability of the new banking organization as it moves through its reorganization phase, during which it is under the scrutiny of shareholders in a competitive marketplace for bank ownership.

Turning now to the relationship between the bank and its shareholders, recall that a decision to merge may be a response to the actual or possible future loss of a bank's franchise value (induced by some industry disruption such as

deregulation or financial innovation). The decision to merge may be an attempt to maintain an existing level of franchise value or build further value. In response to an industry disruption, two banks may choose to undertake firm-level disruption by combining their businesses. Shareholders are presented with this plan for creative destruction and absorb this information into their value assessments of the proposed new organizations, holding the consolidated bank to account through market discipline. The plan to perform over a defined transition period⁹³, creates an external pressure on bank managers to perform according to shareholder expectations. Assuming that shareholders are more concerned with the bank's returns than risks, bank managers may choose bank activities promising a higher return (along with higher risk) to ensure it meets shareholders' profit expectations.

Therefore, given the additional uncertainties facing business integration following a merger of equals transaction, uncertainties that could undermine bank profitability and franchise value, managers of the new consolidated bank may have additional incentive (above and beyond those of managers of non-MoE banks) to choose business activities of higher return and risk in the post-merger period.

⁹³ Neither the academic literature nor the business press offers any consensus view on what is the normal time length for post-merger business integration. However, merger performance studies tend to observe the performance of consolidated firms five years after the merger event to detect any abnormal returns. One may assume that integration should be complete well before the five-year mark.

3. Research Design

With a set of tentative hypotheses about the behavioral effects of merger of equals between banks, I turn to the design of the empirical test of the essay's principal hypothesis, which relates prior mergers of equals between banks to bank performance during the 2007 financial crisis. This empirical assessment will be made by observing indicators of bank performance. The following begins with a discussion of a general theoretical model, which provides the foundation of an operationalized empirical model that can be estimated. This leads into a description of the sample, the selected variables and data source, and the methods of analysis. The section finishes with a discussion of some issues of causal inference related to this research design.

3.1. General theoretical model

The empirical analysis grows from a general theoretical model implied in the literature review above. There are two levels of analysis in this general model: the level of the organization and the level of the individual agent.

At the level of the organization, the literature treats the bank and other organizational actors as unitary atomistic agents. The interests and interactions of employees and managers are not observed. Therefore, the literature speaks as if the performance of an individual bank, bank_{*i*}, is a function of its behaviors determined by its bank type (e.g. traditional versus universal bank, unit versus branch bank) and the business decisions made by the bank. Recognizing that bank *i* interacts with other external actors (e.g. borrowers, depositors, investors

and so on) in an economic environment and that these interactions influence the outcomes of the bank's intentional actions, the forces of market discipline and industry structure are included as well as those of public regulation. The complex interactions between the bank and these external actors give rise to such emergent phenomena as sources of franchise value as well as the unintended consequences of public regulation. Bank performance may be explained by the following functional form, treating "the bank" as the unit of observation but leaving the independent variables as unobservable theoretical constructs:

$$\text{Performance of bank } i = f(\text{bank type } i, \text{bank decisions } i, \text{market discipline } i, \text{industry structure } i, \text{regulation } i)$$

Alternatively, if one moves below the level of the organization to the levels of the individuals who act within these organizations, then bank performance may be understood as the product of the decisions and actions of the individuals composing these organizations. These actions are steered by the preferences (including risk preferences) of these individuals. Institutions describing rules of interaction mediate the actions of individuals. The outcome of these interactions is bank performance. At this level of analysis, the theoretical model has a different functional form:

$$\text{Performance of bank } i = f(\text{preferences (manager } j, \text{director } k, \text{owner } l, \text{regulator } m, \text{borrower } n, \text{depositor } p, \dots), \text{institutions of interaction})$$

These two theoretical models feature several unobservable theoretical constructs, particularly in the second model where agent preferences are included. Can either of these theoretical models be operationalized to measure the empirical impact of the mergers of equals on the performance of the consolidated bank? Analysis in this study will be at the level of the organization, therefore I look to the first theoretical model for direction. Data constraints mean that this study must leave aside some of the theoretical explanatory factors, namely the factors of market discipline, industry structure, and regulation. Inclusion of these factors may be the subject in future research.

Therefore, bank decisions are the explanatory variables of focus. Among these variables, the prior merger of equals indicator is of primary interest. As bank decisions are difficult to observe, their proxy indicators are their resulting behavioral effects. Patterns in bank behavior may be measured using several accounting-based indicators derived from bank financial information. Two recent studies that examine bank performance during the recent financial crisis use such indicators, thus providing examples of how to operationalize theories of bank behavior for empirical assessment.

In seeking to understand the “key sources of Canada’s resilience to the ongoing turmoil” of the financial crisis, Ratnovski and Huang (2009, p. 3) conduct a two-part study, featuring both a statistical analysis of a sample of banks drawn from several developed economies as well as an institutional description of some of the regulatory and structural factors explaining the relative strength of the Canada’s banks during the crisis. In their statistical analysis, they use a sample

of 72 banks each having at least at least 100 billion euros in total assets as well as being headquartered in OECD countries. Their analysis begins with a comparison of the banks in their sample, using descriptive statistics and is followed by multivariate regression analysis to test the robustness of results of the simple comparisons. To the test the sensitivity of their results to their choice of dependent variable, Ratnovski and Huang (2009) use three different indicators: 1) change in bank share price during the crisis (measured January 2007-January 2009), 2) a 0-1 categorical variable describing the degree of share price decline (large decline versus extraordinary large decline), and 3) a 0-1 categorical variable indicating a bank's need for public support during the crisis. The authors employ four explanatory variables to explain bank performance during the crisis: capital ratio (total equity over total assets), balance sheet liquidity (measured as liquid assets⁹⁴ over total debt liabilities), funding structure (measured as deposit liabilities to total assets) and bank size (measured as the natural logarithm of total assets) (pp. 8-12). The authors find that across the different indicators of crisis performance for this sample of banks, the funding structure variable was the most robust predictor of performance (in terms of statistical significance), while the capital ratio and bank liquidity were less so (p. 4).

Arjani and Paulin (2013) build on Ratnovski and Huang's 2009 study, asking "why ... some global banks performed better than others during this

⁹⁴ Ratnovski and Huang (2009) use the database BankScope's measure of liquid assets, which includes cash, government bonds, short-term claims on other banks (including certificates of deposit), and where appropriate the trading portfolio (p. 8).

(crisis) period” (p. 8). The authors draw a similar cross-national sample of 78 banks from 30 OECD countries, each having a minimum of US \$100 billion in total assets at year-end 2006. Arjani and Paulin use just one indicator of bank performance as their dependent variable, a binary variable that indicates whether the bank received a public bail-out (1) or not (0).⁹⁵ As their independent variables, the authors measure ten accounting-based behavioral indicators at year-end 2006 (the eve of the crisis). They split the sampled banks by bailout status and compare the descriptive statistics of the two groups. They follow this with the estimation of a multivariate logistic regression model to test the robustness of their results. Arjani and Paulin find that the significant determinants of whether a bank was “bailed out” in the crisis were a bank’s pre-crisis business model, funding model and balance sheet liquidity⁹⁶. Among the explanatory variables found to be statistically or substantively significant were regulatory capital level, risk appetite, balance sheet leverage and cost efficiency (pp.16-18). The authors recognize the role of regulatory structures (operationalized, for example, by minimum capital requirements and limits on leverage), housing and mortgage market institutions and even historical factors (such as learning from recent crises) (pp. 23-28) that may have also contributed

⁹⁵ A bail-out is defined here as the experience of one or more of these three events during the 2008-2009 crisis period: 1) bankruptcy, 2) private acquisition or government nationalization, 3) receipt of capital support from government (Arjani and Paulin, 2013 p 10).

⁹⁶ For their business model variable, Arjani and Paulin (2013, pp. 12-15) use the ratio of trading account profit to total net revenue. For funding model, they use the ratio of short-term funding liabilities to total funding liabilities. For balance sheet liquidity, they use the ratio of liquid assets to short-term funding liabilities, where their measure of liquid assets is taken from Bankscope (see footnote 31 above). Please note the subtle differences between Ratnovski and Huang (2009) and Arjani and Paulin (2013) in definitions of funding and balance sheet liquidity indicators. For example, the former defines funding as deposit liabilities to total assets whereas the latter defines funding as short-term funding liabilities to total funding liabilities.

to bank performance during the crisis, although these factors were not explicitly included in their statistical analysis. The model estimated in this essay is based on that used by Arjani and Paulin (2013), hereafter referred to as AP, with the addition of a past “merger of equals” variable (with the values of 0 and 1) added to the set of independent variables. Specific definitions of the variables appear below.

3.2. Sample

This study uses AP’s sample of 78 bank holding companies (BHCs)⁹⁷ from 20 developed economies in North America, Western Europe and East Asia (see Appendix C). This sample features the largest BHCs in their respective countries. The banks in this sample are almost evenly split between banks that experienced a bail-out in the crisis and those that did not. Another advantage is that it offers a broad cross-country representation of banks, allowing the possibility to control for industry-level effects (e.g. degree of concentration) and national system-level effect (e.g. regulation). To test for sensitivity to the national system-level effects, a regulatory indicator will be included in the estimation process.

3.3. Selected variables and data sources

Here we have a good illustration of the movement from the general theoretical model to an operational model capable of measurement. Recall that

⁹⁷ The choice to sample bank holding companies (BHC) reflects the assertion made above that researchers should focus analysis on the highest level of the banking organization to capture all financial activities of the BHC, not just traditional financial intermediation.

the general theoretical model is an abstract mental construct relating the dependent variable “bank performance” to several explanatory variables, many which are unobservable. Managerial decision-making is an example. Even the dependent variable “bank performance” is an abstract concept. To make it capable of measurement, I need to choose a concrete indicator that we believe best represents bank performance. In this study, we choose an indicator that measures bank performance (at least from one perspective) during the financial crisis between July 2007 and June 2009. Named BAILOUT, it is a categorical variable, where a bank is assigned a value of 1 if it experienced a bail-out or 0 if not. A bailout is defined here as the experience of one or more of these three events during the 2008-2009 crisis period: 1) bankruptcy, 2) private acquisition or government nationalization, 3) receipt of capital support from government (Arjani and Paulin, 2013, p. 10).⁹⁸ Both this performance indicator BAILOUT, its definition and the measurements of BAILOUT gathered by AP have been adopted here, in part to build on the results of AP.⁹⁹ This is not to suggest that this is the only indicator for bank performance. Other candidates for a bank performance variable for this period include the proportion of asset write-downs to total assets over this period as well as the change in a bank’s stock returns. The latter is a market-based indicator and is used by Ratnovski and Huang

⁹⁸ Other candidates for a bank performance variable for this period include the proportion of asset write-downs to total assets over this period as well as the change in a bank’s stock returns over this period. The latter is a market-based indicator and is used by Ratnovski and Huang (2009).

⁹⁹ I made one correction. Although originally measured by AP (2013) as non-bailout, I found that Denmark’s Danske Bank did in fact receive a bailout. Source: <http://danskebank.com/en-uk/ir/regulation/pages/bank-packages.aspx>.

(2009). Further research beyond this essay could substitute in these two other indicators of the dependent variable and assess their relative statistical behavior.

I now turn to the explanatory variables of bank performance. As described the theoretical estimating model above, several factors are believed to explain bank performance (for example, corporate governance, regulatory institutions, and market discipline). In this essay, I focus only on bank behavior, as indicated by the observable actions of the firm that follow from managerial decisions. Here, eight indicators are adopted from the ten used in AP in the belief they measure different aspects of a bank's actions and in the hope that they provide insight into the inner workings of how bank management approaches risk. All are accounting-based measures using information from a banks' balance sheets and income statements. As the indicators are measured in this study at a moment in time, year-end 2006, these measures represent the structural conditions of a bank's overall business strategy on the eve of the financial crisis.

The ninth explanatory variable used in this study is a past merger of equals (MoE) transaction, represented as a categorical indicator signifying whether a bank features a MoE event in its corporate history over the period 1990 to 2007 (capturing banks involved in the 1990s bank merge wave). In this way, it differs from the eight accounting-based explanatory indicators. All nine indicators will be explained below.

Data for the independent variables were gathered from the financial statements of each bank available through the Bloomberg data service. Bloomberg's data menu does not feature certain indicators used by AP, who also

drew upon the Bankscope data service. As Bankscope was not available for this study, reasonable approximations for AP's measures of the BUSMODEL and LIQUIDITY variables were sought. The following provides definitions of the nine independent variables.

- Business model (BUSMODEL) is the ratio of non-interest revenue to net revenue.¹⁰⁰ This indicator intends to measure the extent to which overall bank revenue relies on non-interest sources of revenue, including fees and commissions earned from off-balance sheet business activities such as investment fund management and securitization. This indicator shows the extent to which a bank's overall business model has moved away from traditional financial intermediation where the principal source of revenue is net interest income. As an indicator of a bank's overall business model, it is a somewhat crude measure as it aggregates the revenue streams of many different non-traditional banking activities.¹⁰¹ Those activities may vary in terms of the revenue risk they expose to the bank's bottom line; for example, proprietary trading profits versus fees earned from dispensing financial advice. Nonetheless, for the purposes here, an increase in BUSMODEL is interpreted as an increase in higher risk business activities, contributing to the probability of being bailed out.

¹⁰⁰ Due to data source limitations, the measure used by AP is not used. AP feature trading account profits in the numerator of BUSMODEL, where trading account profits is just one component of non-interest revenue. Trading account profits are the revenue earned through the bank's proprietary trading and can be a relatively volatile revenue stream, especially during a market downturn.

¹⁰¹ Nonetheless, it used elsewhere in the literature. See Demirgüç-Kunt and Huizinga (2010).

- Funding model (FUNDMODEL) is the proportion of short-term debt liabilities to total funding liabilities. Total funding liabilities is the sum of short-term debt, long-term debt and deposits, the three major liability categories on a bank's balance sheet. FUNDMODEL measures the degree to which a bank relies on short-term funding in the wholesale debt market, where debt instruments have a maturity less than one year. A bank that is heavily reliant on wholesale market for its liability funding is vulnerable to disruption in this market, such as the freezing of short-term credit supply observed in August 2007. A relatively high FUNDMODEL value is interpreted as a bank's relative large exposure to the risk of short-term funding impairment, and thus the risk of insolvency.
- Balance sheet liquidity (LIQUIDITY) is the ratio of a bank's liquid assets to its short-term funding liabilities. A bank facing difficulty in raising short-term funding may be forced to sell assets to raise funds. If these assets are relatively illiquid (where there is an absence of active markets that price and exchange these assets), then the bank may face having to sell these assets at a sharp discount or not being able to sell them at all. The availability of liquid assets relative to short-term funding needs indicates a bank's ability to liquidate assets in the event of a funding short-fall. A decrease in LIQUIDITY is interpreted as a rise in a bank's vulnerability to a cash crunch, where the bank cannot convert sufficient resources to meet

its external obligations. For the numerator “liquid assets”, AP use a measure available through the Bankscope database that includes 1) trading securities and other securities marked at fair value, 2) loans and advances to other banks, 3) reverse repurchase agreements and cash collateral, 4) cash and deposits due from banks. Bloomberg does not feature a similar composite measure of liquid assets nor does it offer a breakdown of asset categories by the degree to which they are readily convertible into cash. Therefore, this essay uses an indicator of LIQUIDITY that only features “cash and cash equivalents” in the numerator, likely understating the amount of available liquid assets.

- Leverage (LEVERAGE) is the ratio of a bank’s total assets to its shareholder equity, and is expressed as a multiple that is greater than one. Recall that total assets are the sum of total liabilities and shareholder equity. A bank that increases the amount of debt it uses (represented on the balance sheet as an increase in debt liabilities, a subcomponent of total liabilities) relative to the amount of funds it has raised through share issuance (represented as an increase in shareholder equity) is said to have become more leveraged. A highly leveraged bank is more vulnerable to the risk of not having sufficient shareholder equity to act as a cushion and absorb any sharp income loss and/or asset price decline during a market downturn. In such a situation, the bank is vulnerable to being unable to meet its obligations to its creditors and depositors,

rendering it insolvent. An increase in LEVERAGE is interpreted as an increase in riskier bank behavior.

- Regulatory capital adequacy (REGCAPADEQ) is the Basel Tier 1 capital ratio. This indicator is similar to the leverage ratio above (total assets / shareholder equity) in that it is a variation of the balance sheet identity “total assets = total liabilities + shareholders equity”. However, a key difference in REGCAPADEQ is in the narrower definition of shareholder equity (or capital) used in the numerator and the different measurement of total assets in the denominator. The Basel Committee on Banking Supervision, an international regulatory standards body, defines the numerator as composing shareholder equity that conforms to its Tier One definition of capital (that is, the sum of the bank’s common shares and disclosed reserves, and sometimes non-redeemable, non-cumulative preferred shares)¹⁰². The denominator is the sum of a bank’s risk-weighted assets (RWA), where the different assets on the balance sheet are weighted by a value between 0 and 1 according to a regulatory schedule of weights by asset category.¹⁰³ This ratio measures indicates the adequacy of a bank’s capital resources, its equity cushion, to absorb large credit and trading losses. The higher the capital ratio, the greater the safety cushion in the event of a sharp downturn. Often, banks are

¹⁰² For a more precise definition, see the Bank of International Settlement’s 1998 press release “Instruments eligible for inclusion in Tier 1 capital” (accessed at: <http://www.bis.org/press/p981027.htm>).

¹⁰³ Riskless assets, such as cash, have a risk weight of 0 while other asset classes featuring some risk (for example, government securities and mortgage loans) have non-zero weight values (Siklos, 2001).

headquartered in national jurisdictions which set a minimum regulatory capital ratio. The extent to which a bank maintains a capital ratio over and above the regulatory level may indicate the relative risk aversion of a bank's management.

- Risk appetite (RISKAPPETITE), the risk preference of a bank, is proxied by the ratio of the sum of a bank's risk-weighted assets (RWA) to total unweighted assets held on its balance sheet. It is an informal measure of portfolio risk (AP, 2013, p. 14) on the asset-side of a bank's balance sheet. Recall from REGCAPADEQ's definition above that the schedule of risk weights begins with the value of zero for riskless assets, such as cash, and steadily increases towards the value of one for categories of assets featuring progressively larger risk. For example, commercial loans, with a higher probability of default than national government bonds, would have a higher risk weight. If a bank's risk appetite is relatively strong, this may reflect in the bank holding a large amount of assets with relatively higher risk weights compared to the lower risk assets held by a more risk-averse bank, and this would reflect in a higher ratio for the former compared to the latter. An increase in the RISKAPPETITE ratio is interpreted as an increase in overall bank risk.
- Cost efficiency (COSTEFFIC) is a measure of a bank's operational efficiency and is defined here as the ratio of total non-interest expenses

(i.e. including cost items such as employee salaries and benefits and equipment and property leases but excluding interest paid on liabilities) to net revenue. AP suggest that less cost-efficient bank operations, signified by having relatively high COSTEFFIC ratios, may be more vulnerable to a rise in borrowing costs (such as that observed during the crisis) by virtue of having a higher non-interest cost threshold compared to average revenue flow (i.e. a narrower margin between revenue and expenses). Thus, COSTEFFIC may be interpreted as indicator of profit risk (i.e. the risk of sustaining a loss if costs rise). However, they note one drawback of this indicator, that a low COSTEFFIC ratio maybe the result of relatively high net revenue flows (the denominator) driven by higher risk business activities, such as proprietary trading (2013, p. 15).

- Bank size by convention is measured as total assets, although alternatively it could be measured as total revenue, market capitalization, number of employees or branches.¹⁰⁴ This essay follows the “total assets” convention. The indicator is denoted as BANKSIZE, or LOGSIZE if the natural logarithm of total assets is used. As discussed above in the literature review, there is evidence that suggests that a rise in bank size may correspond to a rise in bank risk, as any diversification benefits gained through an increase in bank scale may be offset by the shift towards banking activities with greater risk (Demsetz and Strahan, 1995;

¹⁰⁴ Further to this, the bank size indicator could be normalized for the economy where it is headquartered by dividing a bank’s total assets by GDP or total economy-wide banks assets.

De Nicoló, 2001). Further, the logic of the “too big to fail” moral hazard problem suggests that banks may be less prudent in their risk management if they suspect that public authorities will bail-out them due to their relative size. Therefore, it is expected that bank size is positively contributes to the probability of being bail-out during the crisis.

The ninth explanatory variable, MERGER, is a categorical variable signifying if a bank has experienced a merger of equals (MoE) between 1990 and 2007 (1 if yes, 0 if no). This time period allows capturing banks that would have merged during the 1990s bank merger wave.¹⁰⁵ MERGER is not an indicator of bank behavior as is BUSMODEL or FUNDMODEL. Rather, it is indicative of an event in a bank’s organizational history (here limited to the 17 years leading up the financial crisis) that is hypothesized to contribute to riskier behavior, *ceteris paribus*, by the resulting consolidated bank. As above, the additional uncertainties facing business integration following a merger of equals transaction can pose risk to bank profitability and franchise value in the post-merger period, giving bank managers incentives (above and beyond those of managers of non-MoE banks) to choose business activities of higher return and risk in the post-merger period. There is no shared definition of what constitutes a merger of equals transaction. For example, Houston and Ryngaert (1994) define it as a transaction where “either the assets or the equity value of the smaller firm would

¹⁰⁵ Having a relatively long “past” period (seventeen years prior to crisis event) introduces the possibility of diminishing merger effects as the merger event becomes more distant from the crisis event. One way to control for this possible effect is to introduce weights, where larger weights signify more recent mergers and smaller weights more distant mergers.

constitute over 45% of the combined assets or equity value of the two firms and the board of directors of the new firm will be composed of equal numbers of directors from each firm” (p. 1159). This contrasts slightly with the definition of the MoE indicator featured in Thomson Reuters’ SDC Platinum merger and acquisition database: “the target and acquiror in a stock swap transaction have approximately the same market capitalization, and the ownership of the new entity will be owned roughly 50/50 by the target and acquiror shareholders. Both companies should also have close to equal representation on the board of the new company” (Thomson Reuters, 2016). In this study, SDC Platinum is the data source for MERGER values. See Appendix C.

To reiterate, these nine indicators drawn from the financial statements of banks are assumed to be the observable outcomes of unobservable bank decisions, providing a connection to the general theoretical model of bank performance discussed above. Further, these indicators combine to give a loose explanation of the overall asset-liability and revenue-cost management undertaken by a bank. On the asset side, SIZE and RISKAPPETITE describe both the magnitude of a bank’s asset portfolio as well as the degree of overall portfolio risk. On the liability side, FUNDMODEL reflects the bank’s decisions about sources of liability funding. Combining information from both sides of the balance sheet, LEVERAGE, REGCAPADEQ and LIQUIDITY describe the decisions about how much debt to hold relative to overall shareholder equity (or capital), the size of the bank’s capital cushion relative to its risk-weighted asset portfolio, and the proportion of these assets that are capable of being quickly

turned into cash to meet a shortfall in liability funding. Turning to a bank's income statement, BUSMODEL shows the degree to which a bank has moved away from traditional financial intermediation for sources of revenue, while COSTEFFIC is a crude measure of a bank's profit margin before interest expenses are considered. While these eight indicators can give a profile of a bank's behavior at a moment in time or how it evolves over time. MERGER is an identifier of an event in a bank's corporate history that is argued to influence managerial decisions, nudging managers to take greater financial risk (which would then reflect in the eight behavioral indicators).

3.4. Methods of analysis

3.4.1. Descriptive statistics

The two groups of banks defined by BAILOUT status will be compared by tabulating the means, medians and standard deviations of the nine explanatory variables. This helps assess success in replicating AP's results, especially in case of using alternative measures BUSMODEL and LIQUIDITY. This is followed by a cross-tabulation of the sampled banks by the BAILOUT and MERGER variables to see if there is any bivariate relationship between having experienced a bailout during the crisis period and a past merger of equals. This serves as a simple test of the essay's hypothesis.

3.4.2. Regression model

I then estimate a multivariate model, represented in Equation (1), that similar in spirit to the multivariate model estimated by AP (2013). The dependent variable is BAILOUT. Eight of the nine explanatory variables are featured in the AP model.¹⁰⁶ The ninth explanatory variable, MERGER, is added to the original model. Also, there is a disturbance term or error variable ε that adds the net effect of all unobserved variables to the linear relationship between BAILOUT and the explanatory variables. It is assumed to be randomly distributed and uncorrelated with any of the included independent variables. Regression is performed using ordinary least squares and logistic estimation.

$$\begin{aligned} \text{BAILOUT} = & \alpha + \beta_1 (\text{MERGER}) + \beta_2 (\text{LOGSIZE}) + \beta_3 (\text{BUSMODEL}) + \beta_4 \\ & (\text{FUNDMODEL}) + \beta_5 (\text{LIQUIDITY}) + \beta_6 (\text{LEVERAGE}) + \beta_7 (\text{COSTEFFIC}) \\ & + \beta_8 (\text{RISKAPPETITE}) + \beta_9 (\text{REGCAPADEQ}) + \varepsilon \quad (1) \end{aligned}$$

3.5. Issues in causal inference

The aim of this research design is to test a hypothesis, with the intention that the test results allow some causal inference to be made about the relationship between bank consolidation through merger and risk behavior, holding constant other bank behaviours. There are three issues about making causal inference in this case that need to be addressed: unit homogeneity, conditional independence and validity of measurement.

¹⁰⁶ Two indicators featured in the descriptive statistics, REGCAPADEQ and RISKAPPETITE, are excluded from regression analysis as they do not have measures for the full bank sample.

3.5.1. Unit homogeneity

Unit homogeneity is the assumption that the unit of analysis select in the research design is sufficiently homogenous in underlying properties to not introduce distorting effects into estimation and inference. King, Keohane and Verba (1994) provide a more precise definition: “if two units have the same value of the key explanatory variable, the expected value of the dependent variable will be the same” (p.116), where the unit in question here is the bank holding company. In other words, all banks in the sample should react in the same way to the same changes in the independent variables. However, any real differences between these two units could introduce distorting effects and undermine the unit homogeneity assumption and by extension the usefulness of this statistical modeling exercise. In this study, the unit of analysis is the bank holding company (BHCs), the highest level of management in complex banking organization. As the sample is drawn from 30 countries, it is possible that institutional differences (e.g. legal and regulatory) among these countries could introduce differences in the corporate structures of these BHCs affecting bank behavior. In the sensitivity analysis below, a proxy indicator for institutional difference at the national level (quality of capital regulation) is included in model regressions to control for this possible source of difference. However, a review of the sample of 78 BHCs reveals that not all share the universal bank model. Six of the banks are solely investment banks¹⁰⁷. To eliminate this source of unit

¹⁰⁷ The six investment banks in the sample are the US-headquartered Goldman Sachs, Morgan Stanley, Merrill Lynch, Bear Stearns, Lehman Brothers and France’s Natixis.

heterogeneity, estimation will be conducted with a reduced sample of 72 BHCs, having dropped the six investment banks.

3.5.2. Conditional independence

Conditional independence is the assumption that “values are assigned to explanatory variables independently of the values taken by the dependent variables” (King, Keohane and Verba, 1994, p. 94), or in other words, causation runs in one direction from independent to dependent variable. This assumption is violated if there is reason to believe that the explanatory variables are in some way caused by the dependent variable, that there is a problem of endogeneity between the two variable categories. Violation of this assumption is less likely to be an issue in this research design as the explanatory variables are measured at year-end 2006, a year before the measurement of the dependent variable BAILOUT during the crisis period. Future yet-to-be-realized performance does not influence present behavior.

3.5.3. Validity of measurement.

Validity of measurement is the assumption that we are “measuring what we think we are measuring” (King, Keohane and Verba, 1994, p. 25), or in other words, there is no ambiguity or distance between what one measures and what one intends to measure. This is not an issue if the two are the same, say measuring height with a metre stick. Problems with validity may arise, as they arise here, when a certain measurement is intended to be a representation or an indication of something that is complex or unobservable. Classic examples in social science include intelligence and socio-economic status.

In testing the hypothesis that a *merger of equals contributes to riskier behavior by the consolidated bank*, a potential issue of validity may arise when employing the statistical framework described above. Recall the general theoretical model above asserts that bank performance, the dependent variable, is explained as a function of bank decisions and other factors. Limiting explanation to bank decisions, the empirical model features operationalized versions of these variables. The performance variable BAILOUT is a binary categorical variable that measures whether a sampled bank experienced at least one of three events (bankruptcy, distress-induced acquisition or public capital support) during a discrete historical period. MERGER, one of the explanatory variables, is also a binary variable measuring the occurrence of a past event. The other explanatory variables in the model represent unobserved decisions through measurements of a bank's financial indicators, believed to reflect the outcome of the business strategy pursued by its managers. Babbie (2007, pp. 146-148) argues that the validity of measurement really comes down to agreement among researchers about what are acceptable empirical measures. There are at least four criteria, Babbie argues, that may be used to assess the validity of measures. In terms of face validity, or what seems as reasonable measures (at least on the surface), all variables used here meet this. Independent of academic researchers, the concepts implied by each variable are used by financial actors. Both BAILOUT and MERGER measure recognized business events in the lifecycle of financial organizations. The eight other

explanatory variables, such as LEVERAGE and RECAPADEQ, are all drawn from accounting definitions.

Criterion-related validity and construct validity tie into the logic of the relationship between the variables (Babbie, 2007, p.147). The believed relationship or mechanism is that if sampled banks are organized into two groups by the value of BAILOUT and that these two groups are compared by each explanatory variable, including MERGER, any significant difference between the groups by variable would be interpreted as evidence of a factor explaining difference in performance; in other words, why some banks were bailed out during the crisis while other were not. If banks that experienced one of three negative business outcomes during the crisis tended to display average financial indicators different from banks that did not experience one of these outcomes, then we may infer some causal association between these behavioral indicators and this category of bank performance. Logically consistent, this association conforms to what I expect between behavior and outcome, that there is some difference in behavior between banks were bailed out and those that were not, that these behaviors are more likely to contribute to higher risk of negative business outcomes.

The last criterion, content validity, “refers to how much a measure covers the range of meanings included within a concept” (Babbie, 2007, p. 147). The variables used here, with their specific definitions, may be sufficient for the hypothesis test here but are admittedly partial. BAILOUT, for example, is meant to represent bank performance. Yet it is a discrete variable, limited to two values,

measured only during a specific historical period (August 2007 to September 2009) and confined to three negative business events. If the validity of BAILOUT is disputed, one response would be to test alternative measures of bank performance during the crisis; for example, continuous variables such as share price, bank earnings and asset value write-down. However, this does not invalidate the use of BAILOUT, as well as the other variables used here, given their overall strength in terms of face validity and criterion-related/construct validity.

4. Analysis of empirical results

4.1. Comparison of BAILOUT groups by explanatory variable

In this section, I test the hypotheses that the mean values of the explanatory variables differ between bank holding companies that were bailed out in the 2007 crisis and those that were not. Using t-tests for the null hypothesis that the two population means are equal, I replicate the results of AP (2013) as well as test the hypothesis of equal means for the added MERGER variable. See Table 1 below.

As in AP (2013), there is a strong and statistically significant difference in FUNDMODEL (the proportion of short-term debt liabilities to total funding liabilities) between bailout banks (31%) and non-bailout banks (20%). The difference in the two means for the LIQUIDITY variable is statistically significant but only at the 10% level while AP found it to be significant at the 1% level. This difference may be due to the difference in the measurement of the variable, as

this study only features “cash” in the numerator. Difference in measurement may also explain why the difference between the two means for BUSMODEL (which uses non-interest income in its numerator) is not significant in this study. The regulatory capital adequacy variable REGCAPADEQ is significant at the 10% level, while it is insignificant in AP. This change is perhaps owing to the omission of six investment banks from the original sample. None of the investment banks featured a value for this variable. Concerning the remaining variables featured in both studies, the results of the statistical tests are similar.

Table 1: Comparison of bail-out and non-bailout bank groups by explanatory variable¹⁰⁸

Variable	Data availability	Bailout (n=34)	No bailout (n=38)	Total (n=72)
BUSMODEL (%)	72/72	51.6 (16.8)	46.6 (17.9)	49.0 (17.5)
FUNDMODEL (%)	72/72	31.8 (17.6)	19.8*** (9.0)	25.5 (14.9)
LIQUIDITY (%)	72/72	12.4 (16.0)	23.0* (44.2)	18.0 (34.1)
LEVERAGE (multiples)	72/72	23.6 (12.1)	21.1 (7.7)	22.3 (10.0)
REGCAPADEQ (%)	71/72	8.2 (1.1) Note: n=33	8.8* (1.9)	8.5 (1.6)
RISKAPPETITE (%)	65/72	56.3 (24.3) Note: n=28	51.8 (14.3) Note: n=37	53.8 (19.2)
COSTEFFIC (%)	72/72	57.7 (8.0)	57.2 (10.5)	57.5 (9.4)
SIZE (US \$mn)	72/72	695,184 (596,523)	619,292 (537,736)	655,130 (563,503)
MERGER (count)	72/72	See Table 2		
	Test of means (t-test) results: *** significant at 1% level; **at 5% level; * at 10% level			

¹⁰⁸ Reduced sample: n=72. Replication of Table 2 in descriptive statistics in Arjani and Paulin (2013) Displayed as means, with standard deviations in parentheses.

With respect to the MERGER variable that measures whether a bank experienced a past merger-of-equals (MoE) event, the observed frequency of this event across the two groups (Table 2) may suggest that bailed-out banks in the financial crisis were more likely to have experienced a past MoE event than a non-bailed bank. Among banks that were bailed out, 7 of 34 (21%) had experienced a past MoE, while only 3 of 38 (8%) of non-bailout banks had experienced one. However, a chi-square test of association does not find any significant statistical association between BAILOUT and MERGER.¹⁰⁹

Table 2. Cross-tabulation of bank sample across BAILOUT and MERGER variables.

	Merger (M)	No Merger (NM)	Total
Bailout (BO)	7	27	34
No Bailout (NBO)	3	35	38
Total	10	62	72

4.2. Regression Results

Following AP (2013), I now estimate a multivariate regression model and examine the resulting estimates and statistics for evidence testing the essay's principal hypothesis. This is in addition to the bivariate comparison of means in Table 1 above. Unlike AP, the model specified in this essay does not exclude RISKAPPETITE and REGCAPADEQ. These two variables feature missing values for seven observations. In the preferred estimated model discussed here, these seven observations are omitted, reducing the sample size to 65. The descriptive statistics for the regression model are displayed below in Table 3.

¹⁰⁹ The chi-square statistic is 2.417 with 1 degree of freedom. The p-value = 0.1199.

The regression model was estimated using both ordinary least squares (OLS) and logit estimation. See Table 4 below for results. Performing OLS estimation on a model where the dependent variable is a dichotomous categorical variable introduces a few possible technical problems including non-normality and heteroscedasticity of the residual errors, the possibility that a point estimate of the dependent variable BAILOUT lies outside the range of [0, 1], and that this estimation tends to result in lower correlations of determination (R^2) values. Furthermore, there is the issue of whether it is realistic to assume that the probability of being bailed out during the financial crisis is a linear (versus nonlinear) function of the explanatory variables (Gujarati, 1995, pp. 552-553). Nonetheless, I include the results here, in part to see how they compare with those of the logit estimation. The overall adjusted R^2 is 0.302, suggesting that this model explains 30% of the variability of the bank performance, as proxied by BAILOUT, during the crisis. While the sign of the estimated coefficient for MERGER is positive, which is what was expected, the coefficient is statistically insignificant with a p-value of 0.139. The two explanatory variables that are statistically significant (both at the 1% level) are FUNDMODEL and RISKAPPETITE. The six other explanatory variables are statistically insignificant.

Turning to the results of the logit regression, the pseudo coefficient of determination is 0.379, suggesting that the model in logit form explains 38% of the variance in dependent variable. The coefficient of MERGER, again with a positive sign, is statistically significant at the 10% level (the p-value is 0.080). However, the insignificant coefficient estimate in the OLS model, as well as the results of the test of association above (Table 2) suggests this is not a robust result and that one should be cautious about concluding that merger of equals contributes to a greater chance of being bailed-out during the financial crisis.

Again, FUNDMODEL and RISKAPPETITE are statistically significant at the 1% level and both have positive signs as expected. Given that RISKAPPETITE was excluded in AP's model, its inclusion here has revealed it to be a highly significant predictor of bank performance during the crisis, making it a new finding. The coefficient results for both variables can be given the following interpretations: 1) a one percentage point increase in a bank's reliance on short-term funding (FUNDMODEL) gives a 5 percentage point increase in the probability that the bank would have experienced either bankruptcy, private acquisition amid distress or public rescue during the financial crisis; 2) a one percentage point increase in a bank's portfolio risk among its assets (as measured by RISKAPPETITE) gives a 4 percentage point increase in the probability that the bank would have experienced a bail-out.

As with the results of the OLS models, the estimated coefficients of the other six explanatory variables were statistically insignificant. Notable among them were BUSMODEL and LIQUIDITY, which AP found to be statistically significant along with FUNDMODEL. This is likely explained by the difference in definition and measurement of these two variables used in this study. The estimated coefficient of LOGSIZE is interesting. Although statistically insignificant, its sign is negative, not positive as expected. This would suggest that an increase in size is associated with a decrease in the probability of being bailed out during the crisis. Holding constant bank activities associated with size, being relative larger does not necessarily increase the chances of acute bank distress in the 2007-09 period.

To summarize, the results of estimating a multivariate regression model on bank performance finds MERGER is not a statically significant predictor of bank bailout. Two variables are significant predictors: one from the liability side of a bank's balance sheet (FUNDMODEL) and the other from the asset side (RISKAPPETITE).

Table 3: Descriptive statistics for regression analysis

	Mean	Standard Deviation	Median
Dependent variable			
BAILOUT	0.431	0.499	0.000
Independent variables			
MERGER (proportion)	0.154	0.364	0.000
LOGSIZE	13.055	0.903	13.034
BUSMODEL (%)	48.709	16.961	49.30
FUNDMODEL (%)	24.128	14.044	22.98
LIQUIDITY (%)	19.440	35.621	5.19
LEVERAGE (multiple)	21.182	9.178	19.157
COSTEFFIC (%)	57.893	8.972	57.64
RISKAPPETITE (%)	53.752	19.231	51.98
REGCAPADEQ (%)	8.579	1.625	8.39
Sample size: n=65			
Note: see above for variable definitions			

Table 4: Multivariate model regression results

Explanatory Variable	Model 1: Ordinary Least Squares (standard errors)	Model 2: Logit Regression (standard errors)
Constant	-2.088 (1.590)	-14.585 (10.050)
MERGER	0.234 (0.156)	1.675* (0.957)
LOGSIZE	-0.036 (.082)	-0.425 (0.530)
BUSMODEL	0.00001 (0.005)	0.018 (0.032)
FUNDMODEL	0.027*** (0.006)	0.196*** (0.056)
LIQUIDITY	0.001 (0.002)	0.010 (0.022)
LEVERAGE	0.014 (0.011)	0.090 (0.073)
COSTEFFIC	0.008 (0.008)	0.052 (0.048)
RISKAPPETITE	0.021*** (0.007)	0.142*** (0.048)
REGCAPADEQ	0.041 (0.043)	0.126 (0.293)
Observations	65	65
Adjusted R Square	0.302	--
Log likelihood	--	-27.598
Pseudo R2	--	0.379
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level		

4.3. Sensitivity Tests

4.3.1. Multicollinearity

Multicollinearity is the presence of high correlation among explanatory variables in a multivariate regression model. While not distorting the predictive power of the overall model, multicollinearity can distort the estimated coefficients of the explanatory variables, as small change in the data set can cause a larger change in the estimated coefficients. Given that most of the explanatory variables featured in the model are derived from bank's balance sheet and income statement, the possibility of multicollinearity is expected. One diagnostic test is to compare the correlation values of the explanatory variables and search for values greater than 0.80. See Table D1 in Appendix D. The correlation of 0.77 between RISKAPPETITE and LEVERAGE suggests possible multicollinearity. A remedial measure is to drop one of these variables. LEVERAGE is dropped from the regression model. The results (see Table D2 in Appendix D) do not alter the earlier regression findings with respect to the explanatory power of the model and the explanatory variables with estimated coefficients that are statistically significant.

4.3.2. Imputed values

As discussed above, I decided to maintain the nine explanatory variables in the regression model rather than drop RISKAPPETITE and REGCAPADEQ due to missing values. In the model estimation above, the observations with missing values were dropped, reducing the sample to 65. To test the sensitivity of these results to dropped observations, an alternative sample is used for model

estimation where the missing values are imputed using the means of variables calculated with the sample of 65. This expands the sample to 72. The resulting model estimates and statistics are displayed in Table D3 in the Appendix D.

Including observations with imputed variables slightly improves the overall explanatory power of the regression as measured by R^2 or pseudo R^2 . In terms of specific variables, the estimated coefficients for FUNDMODEL and RISKAPPETITE remain statistically significant. Further, LEVERAGE becomes statistically significant, at the 5% level in the OLS regression and at the 10% level in the logit regression. MERGER remains statistically insignificant as do the other six explanatory variables. Thus, neither the use of imputed values nor the inclusion of omitted observations affect the results of regression estimation.

4.3.3. Alternative measurement of MERGER

The description of the MERGER variable above notes that there is no single commonly accepted definition. The preferred estimated model above uses measures of merger of equals involving banks from the SDC Platinum database. Having a relatively narrow definition of this transaction, the database identifies ten banks in the sample here as having had a past merger of equals. The results of model estimation find that MERGER is not statistically significant as a predictor of bank performance during the financial crisis. To test the sensitivity of model estimation to this definition and measurement of MERGER, an alternative measurement of MERGER is substituted into the estimation process (MERGER2). MERGER2 does not measure merger of equals specifically, but megamergers more broadly. Akhavein, Berger & Humphrey (1997) define a

megamerger as any merger involving two banks each with minimum total assets of \$1 billion (p. 108). For this study, observations of past mega-mergers by the banks in the sample were gathered by browsing corporate histories on bank websites, Wikipedia entries and Swire Chin's blog List of International Banking Mergers, identifying any mergers involving two large banks (although not necessarily equal in size). See Appendix C for MERGER2.

The results displayed in Table D5 in Appendix D reveal that substituting the MERGER 2 measurements into the regression procedure does not give results very different from that of the preferred estimated model. The explanatory power of the estimated model using MERGER2 is similar and the explanatory variables FUNDMODEL and RISKAPPETITE remain statistically significant, with coefficients being of similar magnitude and sign. Estimating the model using the logit technique also gives a coefficient of MERGER2 that is statistically significant at the 10% level. However, the variable MERGER displayed similar results yet were judged not to be robust. In this study, neither a past merger of equals (MERGER) or mega-merger (MERGER2) are statistically significant in explaining whether a bank was bailed out in the financial crisis.

4.3.4. Country effect

The final sensitivity test is for the possible influence of excluded explanatory variables that approximate the influence of industry-level or national-level factors. Here, a national-level indicator of financial regulatory quality is added to the regression model. The variable CTYCAP is an index of regulatory oversight of bank capital in a country, where a scale of 1 to 5 measures the increasing

strength of oversight (Caprio, Laeven and Levine, 2007, p. 599). This indicator was chosen here as statistical estimates of its influence were found to be relatively robust among six indicators of regulatory institutions used in the model estimated by Beltratti and Stulz (2009). See Table A in the appendix for CTYCAP values by sampled bank.

However, the inclusion of CTYCAP as control variable for national level effects did not alter the pattern of regression results (see Table D6 in Appendix D). The estimate of CTYCAP was not statistically significant, although its negative sign is what would be predicted, that a higher score for capital regulation would be associated with a lower probability of bail-out. The explanatory power of the estimated was relatively unchanged and FUNDMODEL and RISKAPPETITE continue to be the only significant explanatory variables. Further experimentation with model specification could feature other indicators of both national-level and industry-level effects.

4.4. Overall conclusion of the empirical analysis

This section sought to test the following hypothesis: *do “mergers of equals” between banks contribute to riskier behavior by the consolidated banks?* It tests this hypothesis using both descriptive statistics and an econometric model. The econometric model estimates are not definitive in showing whether to reject the principal hypothesis that a past merger of equals has any statistical significance in explaining performance during the 2007-2009 financial crisis. The hypothesis test as it is constructed here is inconclusive. This analysis, however, affirms the earlier findings by Arjani and Paulin (2013) that a bank’s liability funding model is

a statistically significant explanatory variable of bank performance. Further, a bank's risk appetite is also found to be a significant predictor of bank performance.

5. Conclusion

The question asked in this essay is if a mergers-of-equals transaction between banks contributes to riskier behavior in the consolidated banks. It tests this hypothesis primarily by estimating an econometric model that includes as explanatory variables several accounting-based indicators of the risk preferences of the bank managers. The data used for estimation is gathered from a cross-country sample of bank holding companies. In terms of methodology, the model builds on the study by Arjani and Paulin (2013). This study extends their model by including an explanatory variable that indicates whether a bank holding company had experienced a merger-of-equals transaction in its recent corporate past (1990-2007)

This study situates itself in the research program on bank behavior and performance that has followed the deregulatory actions of the early 1980s in such countries as the US and the UK. These deregulatory moves are credited with launching the bank merger waves observed in the US and Europe in the later 1980s and 1990s. A key theme in the research program is bank behavior toward financial risk and how this behavior may be transformed as banks become larger and more complex in the scope of their activities. Stiroh (2015) explains how growth in size and the resulting diversification potential by banks

enables choice for bank managers to either reduce overall risk or pursue added risk, depending on the risk preferences of managers. Demsetz and Strahan (1995) and De Nicoló (2001) find evidence supporting a positive relationship between bank size and measures of bank risk, a tendency in bank behavior that applies across developed economies. As bank mergers result in new larger banking entities, a question that naturally follows is the consequence of the event on resulting bank behavior. This resulting behavior may be assessed by observing bank performance. This study looks at the impact of a specific type of merger transaction, the merger of equals, on consequent performance during a specific historic episode of widespread financial distress, the 2007 financial crisis. A merger-of-equals is a relatively rare transaction among bank mergers where the two merging banks are of similar size and where there is a power sharing agreement between the managers and directors of the two banks in the consolidated bank. It is predicted that given the uncertainty surrounding gains in efficiency and shareholder value for the new bank created through a merger of equals, directors and managers of the consolidated bank have additional incentive, *ceteris paribus*, to pursue riskier bank strategies in order achieve these efficiency and value gains.

Yet, the empirical tests here did not find any significant evidence supporting the principal hypothesis of this study. The evidence is weak that a past merger-of-equals transaction contributed to the probability that a bank would be bailed out during the 2007-2009 financial crisis, holding constant other

features of bank behavior hypothesized to contribute to experiencing severe financial distress.

The study here did find evidence supporting the findings of Ratnovski and Huang (2009) and Arjani and Paulin (2013) that banks that tended to be heavily dependent on short-term finance markets relative to the other banks on the eve of crisis were more likely to be bailed out during the crisis. This result was found to be relatively robust across a number of sensitivity tests. Also, this study used alternative measurements of the business model and balance sheet liquidity variables. While Arjani and Paulin found these variables to be statistically significant, the alternative measurements used here did not give significant estimates, suggesting these variables are sensitive to operational definition.

One new result revealed in this study is the strength of the risk appetite variable in explaining the probability of a bank bailout. Arjani and Paulin (2013) had chosen not to include it in their regression model due to missing values. Rather than omitting this variable, the problem of missing variables was addressed by either omitting the incomplete observations (reducing the sample) or imputing values for these observations (giving a full sample). Estimation using both tactics found that the risk appetite variable was statistically significant. Based on the empirical analysis here, risk appetite and funding model are the strongest predictors of whether a bank holding company was bailed out during the 2007 financial crisis.

In terms of the originality and value of this study, it helps build the small literature on the performance of banks that undergo merger-of-equals transactions. The performance of new corporate entities resulting from merger-of-equals is often studied in terms of efficiency or shareholder value. This study may be the first to explore any relationship between this transaction and resulting risk behavior and stability. As several banks who received public support during the financial crisis were the product of past mergers-of-equals (e.g. Citigroup, Bank of America and Wachovia), the question naturally follows of whether mergers-of-equals among banks create financial firms that are “too big too fail”, as observed in the crisis. While the findings of this study do not find any statistical evidence of such a relationship, the study itself does lend ideas for further research into this question and the wider research theme of bank behavior and stability.

Essay Three. If four Canadian banks had merged in 1998, would they have faced a greater risk of failure in 2008?

Introduction

A merged Canadian institution would have a market capitalization of over \$50 billion US. It could comfortably buy Bank of New York, National City, Sun Trust, PNC, KeyCorp, South Trust or M&T Corp., all excellent institutions, among others. Or they choose to buy Lehman Brothers or Bear Stearns to achieve critical mass in investment banking (Stanley Hartt, 2004)

Had Royal and BMO closed, would they have gone and bought Lehman Brothers? ... And had they done that, would they have had the discipline to say to those guys, 'no, no, no, to heck with this 40 times leverage? And don't take all those risks!'" ... Maybe history would have been different. (Stanley Hartt, quoted in Toronto Star, 2009)

These two quotes above from Stanley Hartt¹¹⁰, one shortly before the 2007 financial crisis and the other shortly afterward, serve to illustrate an about-face by a Canadian policy leader on the merits of mergers between the Royal Bank of Canada (RBC) and the Bank of Montreal (BMO) and between Toronto Dominion (TD) and the Canadian Imperial Bank of Commerce (CIBC). Mergers proposed in 1998 involving these four banks were blocked by the federal government for reasons of competition. The 2004 quote is taken from an opinion piece where Hartt makes the case for allowing mergers between large banks, arguing that only then would a Canadian bank have sufficient resources to

¹¹⁰ When Stanley Hartt wrote his 2004 policy opinion, he was Chairman of Citigroup Global Markets Canada. In 2009, he was serving as chairman of Macquarie Capital Markets Canada. Mr. Hartt is a former deputy minister of finance in the federal government (1985-1988) and former Chief of Staff for Prime Minister Brian Mulroney (1989-1990).

expand into the United States by acquiring a large regional commercial bank or a Wall Street investment bank. This was published four years prior to financial instability that featured the collapse of both Bear Stearns and Lehman Brothers as well as the bail-out of several of these commercial banks mentioned in the quote above as candidates for acquisition by this imagined Canadian megabank. While several American and European financial institutions either collapsed or were rescued by public authorities during the financial instability of 2007-2008 crisis period, Canadian banks managed to move this period relatively unscathed with few overall losses and no need for recapitalization by the government.

Unlike the confident predictive tone of the earlier quote, the 2009 quote by Hartt is reflective, asking what would have happened if two of the banks, RBC and BMO, had merged, would they then have acquired Lehman Brothers? And if they had, would this Canadian parent bank have dampened the aggressive risk strategy of their Lehman subsidiary, behavior that ultimately contributed to the investment bank's bankruptcy in September 2008? Had these events, which are counter to the facts, actually happened, would history be different?

Together, these two quotes help illustrate counterfactual thinking in history: what would have happened *if* things were different. It is this sort of counterfactual question that is the focus of this essay. This essay tests the following hypothesis:

If these four Canadian banks had merged in 1998, would the resulting merged banks have faced a greater risk of failure in 2008?

Up to now, the puzzle of Canadian bank resiliency during the 2008 financial crisis has been investigated from a factual angle. It is the approach followed in the first of the three essays in this larger dissertation. However, this puzzle may also be explored by counterfactual analysis. By suspending one fact from a set of facts asserted to combine and give a certain outcome, and replacing it with its opposite, one hopes to gain insight into the causal significance of that fact in producing the outcome of interest.

While posing a counterfactual question is relatively easy, providing an answer that is both feasible and plausible is less so, making this choice of research less popular among researchers in history and the social sciences. Nonetheless, these disciplines offer a variety of approaches to counterfactual analysis. For example, the contributors to *Virtual History* (1997), a collection of counterfactual accounts of key moments in world history, all use historical narrative to display evidence and argument. Economic historian Robert Fogel, on the other hand, draws on statistics and econometric analysis to make his counterfactual argument about the contribution of railroads to 19th century American growth. Both kinds of practitioners use theory in their analyses, although the meaning of theory can vary and its use in analysis can be implicit as well as explicit. A key test in the exercise is whether the counterfactual argument is persuasive. The counterfactual exercise is a simulation and does not have the advantage of being tested with empirical evidence. Instead one needs to understand how the simulation is built and pass judgement on the quality of the

simulation and the results it provides. The quality or meaning of a counterfactual argument is contingent on its construction.

This essay is the first attempt in scholarship to provide an organized, rigorous analysis of this counterfactual question “if these four Canadian banks had merged in 1998, would the resulting merged banks have faced a greater risk of failure in 2008 than the four unmerged banks actually faced?” This analysis employs two quantitative methods: a simulation of financial time series data for the two fictitious consolidated banks over 1998-2007 period, and a stress test to simulate how these two merged banks would have performed if subject to financial shocks similar in magnitude to those observed during the 2008 crisis.

Theory is understood here as a set of general statements that explain something. Elster (1979) believes a legitimate counterfactual must have the antecedent clause and consequent clause linked by theory. Other than allowing theory in this case to be either static or dynamic, Elster does not give any other hints about what theory should be in the counterfactual analysis. The data simulation and stress test methods do constitute theories, that is set of general statements, about 1) how a merged bank might combine and be reflected in balance sheet financial data, and 2) how a bank reacts to an exogenous shock (such as those introduced in the stress test) and how this reaction is manifest in financial indicators.

However, there are additional theories that are drawn upon in the counterfactual analysis here, and they are found in the conclusions of the other two essays that compose this dissertation. The first essay is an historical

narrative that traces out the historic evolution of the relationship between large Canadian banks and their public regulators, emphasizing the consequences of public policy on bank behavior, and how this contributed to the observed stability of these banks during the financial crisis. The second essay conducts a quantitative analysis to test whether a bank's behavior becomes less risk averse as a result of having experienced a merger of equals with another bank in the recent past. The type of merger proposed by the four Canadian banks in 1998 was a merger of equals¹¹¹. Using a sample of banks from advanced industrial economies and organizing them in two groups - banks that failed during the 2007 crisis and banks that did not fail - the analytic framework seeks to identify the behavioral characteristics of banks that tended to fail during the crisis. While the analysis did not find any evidence suggesting that a past merger of equals between banks contributes to riskier behavior by the consolidated banks, it did reproduce results of earlier studies. The conclusions of these two essays serve to provide the historical account of what happened leading up to, and during the financial crisis (together, the counterfactual period of analysis from 1998 to 2009) as well as statistically tested relationships between bank behaviors and crisis performance. The latter will help inform the specification of the stress test model while the former will be drawn upon to interpret the stress test results and assess the counterfactual hypothesis.

I attempt to answer this counterfactual question by developing a set of financial indicators of the two fictitious merged banks and see how they would

¹¹¹ A merger of equals is commonly understood to involve two firms of relatively similar size that are often in the same industry, and can be competitors.

respond if they were subject to the financial stresses that banks actually faced during the 2007 financial crisis, specifically if they faced pressure on their solvency.

Beyond the novelty of carrying out an analytic exercise involving a stress test to test this proposition about the performance of merged Canadian banks during the crisis, this essay also demonstrates that such counterfactual analysis is an example of impact evaluation in the larger discipline of public policy analysis (Pal, 2001). Counterfactual analysis assists in revealing the intended and unintended effects of policy interventions, making the implicit argument that counterfactual analysis should have a place in the policy analysis toolkit. A casual review of both the economics and public policy literatures suggests that counterfactual analysis is an exceptional method choice. This may be due to both the complexity of the subject matter and the limits of research tools. However, this essay is more than an attempt to demonstrate the utility of counterfactual analysis. Its conclusions are of interest to policy makers interested in understanding the variation in performance among national banking systems during the 2008 global financial crisis in the aim of identifying the policy institutions likely to mitigate bank instability.

The essay begins with a literature review, starting with a sketch of counterfactual thinking in the history and the social sciences. Partly in response to criticism of the practice, several thinkers have offered general principles and

guidelines to counterfactual practice. Within this, two distinct strands or approaches to counterfactual analysis are described, the strong-tight theory and the weak-loose theory approaches. These two approaches may be used to describe or classify counterfactual analysis in social sciences. Within economics, one can find both approaches. Analyses which turn wholly on formal modelling and econometric estimation are examples of the strong-tight approach while the weak-loose theory approach describes the appreciative theorizing found in certain research strands such as evolutionary economics. In political science, theory-guided process tracing is reflective of the weak theory approach. Adjacent to these general approaches to counterfactual theorizing are tools that can be employed in the analysis. Of particular relevance are simulation models, both computer- and manual-based. Financial stress test models, which have risen in prominence since the 2008 crisis, are examples of simulation models, providing the inspiration for using one in this research design.

This leads into the description of the research design. To prepare the ground for counterfactual analysis, a number of basic terms are defined, addressing how the proposed analysis aligns with the principles of counterfactual analysis discussed in the literature review. For example, is the antecedent clause in the counterfactual hypothesis “the four Canadian banks merge in 1998” both feasible and insertable? Related to this question is what theory (or theories) will be employed to when linking the antecedent and consequent clauses in the hypothesis? In adopting a loose theory approach, I see the conclusions from the first and second essays in this dissertation as the theories that will be used in the

analysis. More specifically, referring to these theories will ensure historical and statistical (factual) consistency in the analysis.

Given this, the focus of the research design is quantitative in nature, harnessing two quantitative methods. In a first step, a data simulation of the financials of the fictive banks is attempted, showing the evolution of the banks' balance sheet between the antecedent event (the 1998 merger decision) to the consequent event (the 2008 financial crisis). Using simulated measures on the eve of the crisis, I conduct a stress test of the fictive banks, using actual market conditions observed during the crisis as shock factors. More specifically, I measure the change in solvency of the two fictive banks when subject to shocks to asset values and short-term credit funding.

Part four presents the results of the stress test scenarios, the interest rate shock, the asset value shock and scenarios where the two shocks are combined, in each using different levels of shock factors. These results contribute to answering this essay's principal hypothesis: would the merged banks have failed? Under certain test scenarios involving shock factors corresponding to observations from the United States, specifically with respect to asset write-downs, the fictive banks in this simulation would have faced pressure on their solvency, as indicated by regulatory capital ratios falling below the minimum level set by the bank regulator OSFI. Under these circumstances, the merged banks would have failed, given our definition of bank failure.

However, this conclusion does not stand up under broader consideration, where either the underlying assumptions of the data simulation and the stress

test are scrutinized or we compare these stress test results (and the underlying bank behavior assumptions that they imply) with the historical theory about Canadian bank-regulator relations developed in the first essay. Stress test results supporting the hypothesis of bank failure, already limited, do not withstand this scrutiny. I conclude that the balance of the argument does not support the hypothesis: *the resulting banks would have faced a greater risk of failure in 2008?* This is a provisional conclusion, not the definitive final answer to this question. What I present here is a first contribution in a potential wider research initiative into this complex subject.

1. Literature Review

Counterfactual statements are, by definition, statements that are contrary to the facts, whether scientific or historic. If mirroring the statement “if X, then Y”, these “what if” propositions may be expressed as “if not X, then not Y”. Take for example an uncontroversial statement of a commonly known scientific relationship: *if water rises to a minimum temperature of 100°C, water boils*. The counterfactual statement would be “if not “*water rises to a minimum temperature of 100°C*, then not “*water boils*”. In this example, water temperature boiling at a 100°C is a necessary condition of the event of boiling water. Few would dispute this. However, counterfactual propositions can be controversial, especially when the context is social and complex, featuring many possible causal factors, and thus sources of indeterminacy.

This literature review begins with an examination of counterfactual thinking in history and the social sciences. Given its controversial status as a method, a set of normative guidelines suggested by scholars who have thought seriously about counterfactuals are summarized. This leads to the distinction between the strong theory and weak theory approaches to counterfactuals in the social sciences, such as in economics. An argument is made in favour of the weak theory approach, with the method of theory-guided process tracing providing an illustration. Theory-guided process tracing, it turns out, shares much with simulation methods. In either strong or weak form, theory is necessary to trace out or simulate an historical process, including a counterfactual one. Computing

the evolution of a fictive bank's balance sheet over an historical duration would be one such process simulation. The review finishes with describing a second simulation tool, the stress test, that can support counterfactual analysis along the weak theory lines.

1.1. Counterfactual thinking in history and the social sciences

In his introduction to a collection of counterfactual histories, Ferguson (1999) remarks that suspicion of the largely 20th century practice of counterfactual thinking “has the deepest of roots in the philosophy of history” (p. 20) going back at least to Greek antiquity. For Ferguson, one's position of counterfactuals can be traced to one's ontological position on the nature of reality, which may range from divine intervention to nihilistic free will, from scientific determinism to generalized uncertainty (pp. 71-90).¹¹² Yet regardless of the controversy, counterfactual thinking is shown to be ubiquitous and unavoidable. In her encyclopedia article on the subject, McCloskey (1987) cites the demonstration by Goodman (1965) that six logical statements, including the causal assertion and the counterfactual are approximately equivalent.¹¹³ Despite this, McCloskey observes that historians tend not to recognize this approximate equivalence, and instead “flee the counterfactual in terror and cling to the causal statement” (p. 701).

¹¹² As a defender of counterfactual thinking, Ferguson takes the position of a chaos theory-informed philosophy of history, which eschews a determinist view of the unfolding of history.

¹¹³ Goodman's six statements are 1) scientific law, 2) causal assertion, 3) factual conditional, 4) dispositional statement, 5) parallel worlds, and 6) counterfactual. See Goodman, 1965, p. 44.

If one needs to identify a single event in 20th century English-speaking scholarship deemed most responsible for raising the profile of counterfactual thinking in history, the social sciences and philosophy¹¹⁴, it would be the 1964 publication of Robert Fogel's *Railroad and American Economic Growth*. As an economic historian, Fogel embraced the counterfactual method to test the conventional wisdom of the day that railroad development was an indispensable condition of 19th century economic growth. He tests this "indispensability axiom" by positing a counterfactual statement (railroads did not exist as technology in 1840) and seeks to estimate what national income would be in 1890 in the absence of railroads. He finds that national income would be 5% lower (p. 223), weakening the indispensability axiom. Fogel's use of statistics and economic theory in historical research was an innovation in social scientific method, spawning the "new economic history" or "cliometrics" movement. Of note is his reliance on economic theory in his counterfactual analysis:

"In order to determine what would have happened in the absence of a given circumstance, the economic historian needs a set of general statements (that is, a set of theories or a model) that will enable him to deduce a counterfactual situation from the institutions and relationships that actually existed" (p. 653).

It is perhaps this reliance on particular economic theories (namely neoclassical marginalist theory circa 1960) that would attract criticism. In a thorough critique of Fogel's 1964 work, David (1969) asserts that Fogel's argument hinges on contestable simplifying assumptions, *ceteris paribus* analytic

¹¹⁴ An example of the philosophical treatment of the subject is Lewis's *Counterfactuals* (1973). Hawthorn explores the legitimacy of the method in *Plausible Worlds* (1991).

devices as well as generous extrapolations. In effect, he charges Fogel with committing Ricardian vice.¹¹⁵ According to David, it is Fogel's reliance on the assumption of constant returns to scale that prevents his work from addressing key issues in technical progress and economic growth (pp. 516-517). These criticisms combine to cast doubt on Fogel's conclusion that railroad services were not a necessary condition of American economic growth in the 19th century.¹¹⁶

Critiques aside, Fogel's cliometrics and his counterfactual method attained a certain level of prestige within the wider social science community, especially when Fogel received the Nobel Prize in 1993. Yet despite that prestige, the literature of deep, rigorous counterfactual studies in economic history similar to Fogel's work is relatively slim. Interspersed in the counterfactual economic history literature are examples of what could be deemed more "superficial" counterfactual exercises, such as Eichengreen and Temin's 2003 chapter "Counterfactual Histories of the Great Depression."¹¹⁷ However, elsewhere in

¹¹⁵ Ricardian vice is an expression coined by Schumpeter to describe the application of general models constructed with few propositions but many simplifying assumptions to solve practical problems (1954, pp. 472-473).

¹¹⁶ Lipsey, Carlaw and Bekar (2005) further develop this critique, viewing the railroad as a general purpose technology, a technology that interacted with other technologies in an interlocking, mutually reinforcing cluster, resulting in output gains above and beyond the contribution that could be attributed to the railroad as a single component of this cluster. To illustrate: "railways encouraged intracontinental communications through the telegraph; they led to new forms of business organization that spread to the rest of the economy; they allowed a single US market to emerge, encouraging the development of the US system of manufactures, which in the final analysis allowed the USA to overhaul their European competitors, including Britain, in the race for industrial ascendancy" (Lipsey et al. (2005), p. 196).

¹¹⁷ In Balderston's (2003) edited collection of essays on the interwar slump, Eichengreen and Temin propose four counterfactual scenarios. The fourth scenario involving Britain, Germany and the United States all devaluing in the summer or autumn of 1931, and followed by gradual policy change, is asserted to be a sufficient policy shift by "almost the entire industrialized world. Recovery would have begun almost immediately as investors and consumers realized that the policy regime had changed" (Eichengreen and Temin, 2003, p. 217).

the social sciences, such as the field of international relations, the counterfactual method is practiced. An example is Harvey's 2012 essay "President Al Gore and the 2003 Iraq War", where Harvey tests the counterfactual hypothesis "if Al Gore was elected president in the fall 1999, would he have led the United States into the Iraq War in 2003?"

1.2. Normative guidelines for counterfactual practice

The practice of counterfactual analysis in the social sciences, along with critical responses to it, has led to some reflection on counterfactual methods, specifically on what constitutes legitimate counterfactual statements and methods of confirming them. Elster (1979) addresses some of the criticisms that surfaced in the wake of the "new economic history" revolution in the 1960s, providing philosophical guidance on what constitutes legitimate counterfactual hypotheses. Elster's three conditions for legitimate counterfactual hypotheses are: (1) the antecedent must be feasible; (2) the antecedent must be insertable; and (3) the consequent must be linked to the antecedent by a theory (either static or dynamic). These three conditions support what Elster refers to as the branching method in counterfactual analysis, where once a feasible counterfactual event or condition is "inserted" in the stream of historic time, the analyst is then obliged to trace out the alternative path or paths that history may have taken from the point of the inserted counterfactual, which forms the antecedent clause. Regarding the condition that the antecedent and consequent

must be linked by theory, Elster does not take a specific position on what type of theory the researcher may employ in analysis. However, he does pose a paradox of counterfactuals that is informative: the more vague (read: abstract or nomothetic) the theory employed in counterfactual reasoning, the more likely the outcome will be absurd (p. 185).

Writing from the disciplinary perspective of international relations, Tetlock and Belkin (1996) add to Elster's guidelines by proposing six criteria for using and judging counterfactual argument in the effort to "distinguish plausible from implausible, insightful from vacuous arguments" (p. 5). The six criteria are: (1) clarity: having well-specified antecedent and consequent; (2) co-tenability: possessing logical consistency among principles or assumptions connecting the antecedent and consequent; (3) historical consistency: minimal "re-write" of facts to help ensure consistency with well-established historical facts; (4) theoretical consistency: consistency with well-established theoretical laws¹¹⁸; (5) statistical consistency: consistency with well-established statistical generalizations; (6) projectability: extending the implications of the argument to other hypotheses and testing the hypotheses empirically (pp. 16-31).

¹¹⁸ It is, of course, contested among social scientists that such theoretical laws are possible in social science. See Reiss (2012, p. 165).

1.3. Counterfactual methods and different schools of thought

As Tetlock and Belkin recognize, there is bound to be disagreement among different disciplines, and schools within disciplines, about the legitimacy of the counterfactual method in general and what constitutes good practice (p. 17). A recent example of engagement with these questions is Cowan and Foray's 2002 examination of the compatibility of counterfactual methods with evolutionary economics. At the outset, Cowan and Foray claim that since evolutionary economics is intrinsically interested in historical processes, processes plagued by indeterminacy and display multiple equilibria or out-of-equilibrium dynamics such as positive feedback mechanisms, the approach "cannot avoid the use of counterfactual history as one of its tools of empirical analysis" (p. 539). However, in embracing this view of the reality, pursuing counterfactual analysis presents some challenges. For example, if one forms a counterfactual statement "If not X then not Y" and expects some degree of indeterminacy in the causal factor(s) linking the antecedent and consequent clauses, then this project may require a methodological orientation quite distinct from a project where one approaches the relationship between the antecedent and consequent as a determinant one.¹¹⁹ In the latter view of social reality, one assumes that events result from strong causal relations between objects, similar to what one assumes in a mechanistic Newtonian view of reality, then a theory

¹¹⁹ This possibility of indeterminacy increases as one moves from a situation where the events in the antecedent and consequent happen simultaneously to a situation with a significant historical dimension. An example is Fogel's railroad counterfactual, where the two clauses are separated by fifty years. The time dimension adds further complication as "tracing the effects of a (counterfactual) event becomes less secure as the tracing occurs over longer times" (1964, p 553).

which reflects this view of reality should provide a strong theoretical link between the antecedent and the consequent. Cowan and Foray distinguish this orientation as the strong (or tight) theory method and the former as the weak (or loose) theory method.

1.3.1. The strong (tight) theory counterfactual method

If one assumes that events happen in the social system as the result of strong causal relations between objects, as one assumes in a mechanistic Newtonian view of physical reality, then a theory which reflects this view of reality should provide a strong theoretical link between the antecedent and the consequent. This is the position held by Fogel, reflecting in his use of hypothetico-deductive reasoning and neoclassical economic theory.

To be fair, Fogel's 1964 counterfactual argument largely hinged on a quantitative exercise akin to national accounting, where he sought to calculate measures of the "social saving"¹²⁰ attributed to the railroad in the interregional and intraregional transportation of agricultural technologies in 19th century US. The extent to which Fogel used economic theory was either to supply assumptions that underpin certain measurement choices or to deduce a set of relations or conditions that support a set of estimates. In the latter case, Fogel used the theory of land rent in order to derive a boundary of feasible agriculture production on arable lands no longer serviced by the railroad (the counterfactual condition), rather only by wagon and canal. The intensity of Fogel's use of

¹²⁰ More specifically, social savings is a growth accounting method (developed by Fogel) to measure the historical implications of new technology on economic growth.

neoclassical theory is partly explained by the level of the neoclassical theory development in the early 1960s. This vintage of neoclassical theories, often articulated verbally with rudimentary algebra and calculus, are in some sense “looser” than the more formalistic theories that have been developed since Arrow and Debreu’s 1954 seminal paper¹²¹, which proved the theoretical existence of a competitive equilibrium using the more sophisticated tools of set theory and topology.

Nonetheless, there are numerous examples of counterfactual analysis in the economics and finance literature that rely on the “strong” theory approach to make counterfactual arguments. These studies tend to follow a general methodological procedure, where a theoretical model is first constructed, which then informs the specification and estimation of an econometric model. This is the textbook account of empirical procedure in economics. Once model parameters are estimated, the model is then capable of assessing a counterfactual hypothesis either by 1) altering the estimated parameters “contrary to fact” and calculating predicted values under these altered conditions, or by 2) inputting a different set of observations for the explanatory variables (contrary to the observations used in the initial model estimation) and deriving a value of the dependent variable that represents the counterfactual consequent. In other words, counterfactual analysis using an econometric model can involve altering the model structure, given the input values, or altering the input values, given the model structure, all depending on what kind of counterfactual

¹²¹ Arrow and Debreu’s 1954 paper “Existence of an equilibrium for a competitive economy” would lay the foundation of general equilibrium theory for the conventional welfare analysis framework.

hypothesis is posed.¹²² This procedure can be applied to policy evaluation, where the alteration introduced into the estimated econometric model would involve a policy variable or parameter.

Let us consider three studies that employ this “strong theory” approach to counterfactual analysis when investigating the theme of bank consolidation. All follow the procedure of first specifying a theoretical model, which is then empirically estimated. The estimated model then underpins the counterfactual analysis or simulation. McIntosh (2002) asks whether or not the mergers of Canadian banks proposed in 1998, had they actually been approved, would have not been in the public interest (i.e. result in inefficiencies in the form of higher consumer prices and/or lower bank profits). A variation of the Cournot oligopoly model of market competition¹²³ is chosen and used to specify an econometric structural model¹²⁴. The parameters of this structural model are then estimated using the general method of moments econometrics technique and time series banking data from the 1976-1996 period. To simulate the effect of various merger combinations on the price and quantity of financial services supplied by the market, as well as the profits earned by these bank firms, the model is calibrated using data from 1996 and then numerically solved, computing the simulated market equilibrium values for price, output and profit according to each

¹²² What is not clear is whether or not the choice of counterfactual hypothesis is inevitably restricted by this standard model specification-and-estimation procedure.

¹²³ The Cournot oligopoly model assumes competition between firms on the basis of output quantity supplied, in contrast to Bertrand competition, which assumes firms compete on the basis of output price supplied (Varian, 1992, pp. 285-294)

¹²⁴ Here, a structural model refers to a fully articulated model, often involving a set of system of equation-models, which may feature unobservable variables suggested by economic theory. This contrasts with a reduced form model, which represents the “reduced form” of a structural model, perhaps to a single equation-model where unobservable variables are eliminated. (Gujarati, 1995, p. 655).

merger scenario.¹²⁵ The results of the counterfactual simulation find that the price reductions predicted in all three merger scenarios are small. This evidence supports the contention that the Canadian bank mergers in 1998 would not likely have resulted in price increases that erode consumer welfare.

Barros, Bonfim, Kim and Martins (2014) confront a different historical situation. The Portuguese banking industry underwent a consolidation in 2000. The authors ask what would be the credit flows and interest rates in the post-merger period (2000-2002) if the pre-merger market equilibrium conditions continued to exist unaltered by the bank consolidation. Again, a structural model of the credit market in equilibrium is first specified and then estimated econometrically as a simultaneous equations model. The authors also derive a reduced form of the structural model and estimate it using the ordinary least squares (OLS) econometrics technique. To answer their counterfactual question, model coefficients are estimated again using just the data from the pre-merger period (1995-1999). This estimated model is then used to simulate credit flows and prices in the post-merger period (2000-2002). A comparison of these simulated values with the actual observations of this post-merger period yields an answer. Barros et al. find evidence of potential efficiency gains arising from the actual bank mergers in the form of lower interest rates, as well as improved supply of credit to firms although not to households (p. 365).

Montes (2014) faces a familiar historical situation of bank consolidation having actually taken place, in this case Spain's industry in the 2008-2012

¹²⁵ The three scenarios are A) RBC and BMO merge, B) CIBC and TD merger, C) both scenarios A and B.

period. The author asks a similar question as Barros et al. (2014): did the consolidation in Spain's banking industry in 2008-2012 lead to collusive behavior resulting in higher interest rates and reduced credit flows? Montes follows McIntosh (2002) in specifying a model of consumer-producer relations, where the producer banks compete under oligopolistic market conditions. However, Montes assumes Bertrand-style competition where firms set prices (interest rates) whereas McIntosh assumes Cournot competition, where firms set quantities. The model is estimated using both the multinomial logit and the general method of moments (GMM) econometric techniques. Again, these model estimates are used to compute counterfactual market outcomes under different market structure scenarios for the 2004-2010 period (Montes, 2014, p.132). The metrics from this competition analysis are compared to actual market indicators during this historical period. It is found that bank consolidation that took place after the 2008 financial crisis has not had a large impact on competition in the Spanish mortgage market.

There are at least two general observations that rise from these three studies that use the strong theory approach to counterfactuals. The first is that these three studies all focus their analyses of the impacts of bank consolidation on the structure/behavior of a market, the emergent effects of competing firms interacting with consumers of their services. This essay focuses its analysis at the level of the bank, assessing the impact of bank consolidation on the stability of the firm. The literature appears not to feature any previous analyses of applying the strong theory approach at the banking firm level.

At a deeper, more fundamental level, there is a methodological question about the limits of the strong theory approach. While the literature exhibits pluralism in the choice of theory and technique, the hallmark of the strong theory approach is the reliance of sophisticated formal modelling and econometric techniques. Yet, these formal models tend to rely on equilibrium assumptions, resulting in “nontransparent analyses that obscure the link between the estimated parameters and the underlying variation in the data” (Einav and Levin, 2010, p. 147). By McIntosh’s (2002) own admission, his choice of a structural model

“may not be the model that provides the best explanation of the data. However, there is a tradeoff between more time series oriented models and models based on economic theory in terms of goodness of fit. In this case the choice was fairly clear, since the objective of the analysis was to evaluate the effects of mergers which is very difficult in models that have no underlying economic structure” (p. 466).

In his view, the objective of his analytic exercise to measure the impact of bank mergers on efficiency necessitates a strong theory approach, regardless of the bias introduced by simplifying assumptions (for example, through algebraic manipulation of the formal model to assume away unobserved factor prices) and conceptual devices (like market clearing equilibrium) to make analysis tractable.

In their 2011 study, Lerner and Tufano outline a research agenda for assessing the social welfare consequences of financial innovations using counterfactuals, arguing that financial innovations are general purpose technologies that play a key role in economic growth. Implicitly using a welfare analysis framework, their intent is to quantify the impact of systemic innovations by exploring scenarios where the innovations have not been invented or adopted. The authors’ exploration of the social impact of securitization illustrates the

challenges of trying to attain a quantitative measure of complex subject matter. Compared to venture capital, private equity and money market mutual funds, securitization is a much more complex activity, involving no less than eleven separate elements (pp. 75-76). Furthermore, Lerner and Tufano recognize that “securitization was part of a larger set of innovations that constitute the so-called shadow banking system in which market-based financial intermediaries replaced traditional banking” (p. 80). Along with money market mutual funds and repo contracts, securitization is closely linked in a network of innovations, making the separation and isolation of their effects difficult, “probably thwart(ing) any definitive scientific study of the phenomenon” (p. 81). Lerner and Tufano appear to equate separability and quantifiability as requisites for science.

To summarize, the strong theory approach, with its emphasis on describing the problem in formal terms, introduces simplifying assumption that on the one hand allow tractability but may also undermine the realism of the analysis. Further, the approach, with its reliance on its ability to separate and isolate parts of the phenomena under analysis, restricts itself from application to certain types of complex phenomena.

1.3.2. The weak (loose) theory counterfactual method

Returning to Cowan and Foray’s argument, if one holds the view that “in a system as complicated and complex as any modern economy, (that) any theory that too tightly constrains what might happen will leave out very important aspects of economic activity”, then one must accept that “theory does not tell us

what will happen, it only restricts us to a set of possibilities” (2002, p. 553). Weak theory-informed counterfactual analysis limits the analyst to explaining key events and sequences of decisions related to them, which combined with knowledge of processes that magnify rather than dampen the effects of these decisions, can be understood to have contributed to reducing the number of “paths not taken” along the actual historical path (p. 554). Sets of statements that give a loose causal explanation of events and processes is what is understood here as weak theory. This approach to counterfactual analysis is justified, Cowan and Foray assert, if “there may be phenomena for which it is not appropriate (to use strong theory), and some looseness in the theory, and consequent looseness in the counterfactual empirical claims is either desirable or necessary” (p. 558).

“Appreciative theorizing” can be employed in weak counterfactual analysis to bridge the antecedent and the consequent. This method is particularly appealing given its use by some evolutionary and institutional economists as well as by theorists of long-term economic growth.¹²⁶ Nelson (1995) describes appreciative theorizing as theorizing that takes place at a lower level of abstraction than formal theory. “While starting with the empirical subject matter, the accounts put forth by economists of the development of an industry, or the evolution of a technology, focus on certain variables and ignore others, just as is the case with formal theory. Quite complex causal arguments often are

¹²⁶ Lipsey, Carlaw and Bekar list appreciative theorizing along with historical analysis, formal modelling and computer simulation as four analytic techniques they employ in their research into general purpose technologies (Lipsey et al. (2005) p. xv).

presented as parts of these accounts, if generally in the form of stories” (p. 50).

In other words, analysis and explanation of a phenomenon takes place at a certain level of abstraction but the form of the explanation is narrative, not formal.

Nelson’s appreciative theorizing is similar to a method used by institutional economists:

“A much better description of the working methodology of institutionalists is what Ward (1972, chap 12) labels storytelling, which he argues also describes much orthodox economics, particularly the applied kind. Storytelling makes use of the method of what historians call colligation, the binding together of facts, low-level generalizations, high-level theories, and value judgments in a coherent narrative, held together by a glue of an implicit set of beliefs and attitudes that the author shares with his readers. In able hands, it can be extremely persuasive, and yet it is never easy to explain afterwards why it has persuaded” (Blaug, 1992, p. 110).

Nothing overtly precludes counterfactual analysis of financial system themes using a weak theory approach. In fact, there are arguments in the literature that suggest the financial systems should be studied as evolutionary systems. The “loose theory” methods of evolutionary economics such as appreciative theorizing can be applied to financial systems.¹²⁷ The challenge is that there are no apparent examples of how to carry out such counterfactuals in financial systems study.

¹²⁷ In his 2008 popular work *The Ascent of Money*, Ferguson asserts that an evolutionary framework is the best framework to understand historical change in finance. While admitting that evolutionary natural science is an imperfect metaphor for social science (for example, humans are capable of deliberate, intelligent choice), Ferguson identifies several similarities between evolutionary natural science and evolutionary social science, including co-evolution of institutions and the endogeneity of cause and effect (pp. 348-358).

1.4. Theory-guided process tracing

Fortunately, the method of theory-guided process tracing as practiced by some political scientists and sociologists may offer some guidance in conducting weak theory counterfactual analysis. To conduct a “branching out” counterfactual historical analysis (as advocated by Elster), a counterfactual scenario is derived or traced out from a particular point in historical time where the counterfactual event is inserted (the antecedent condition) to the point in time where the consequent outcome is observed. To assist this task of identifying plausible counterfactual scenarios linking the antecedent and consequent, the analyst must have a sufficient understanding of the actual historical path between these two points in time. One method used to gain an understanding of historic processes is theory-guided process tracing (TGPT), a method which traces and compares “the sequences of events constituting the process (and) capture(s) the unfolding of social action over time with chronological sensitivity” (Aminzade, 1993 p. 18). The analyst undertaking TGPT seeks to explain “the behavior of particular actors, clarify sequences, describe structures, and explore patterns of interaction” (Bates et al., 1998, p. 10). A variation is TGPT is the “analytic narrative” method proposed by Bates et al. (1998). The method draws on narratives in that it “plays close attention to stories, accounts, and context”. It also is analytic in that “it extracts explicit and formal lines of reasoning” (pp. 10-11), possibly employing formal models. The method of analytic narratives may be seen as a two-step process where first, the researcher seeks “to understand the actors’ preferences, their perceptions, their evaluation of alternatives, the

information they possess, the expectations they form, the strategies they adopt, and the constraints that limit their action” (p. 11). Second, the research seeks to identify a higher level, more abstract explanation of the event or outcome of interest in the narrative. In this two-step process, one finds a similarity shared with Nelson’s appreciative theorizing method.

A recent example of the analytic narrative method applied in a counterfactual is Harvey’s (2012) “President Al Gore and the 2003 Iraq War” where he tests the counterfactual hypothesis “if Al Gore was elected president in the fall 2000, would he have led the United States into the Iraq War in 2003?”, challenging the “conventional” wisdom that a Democrat elected as president would not have led the US to invade Iraq. Drawing on international relations theories and varieties of data (public statements on policy vision and position, public opinion polling trends, congressional voting trends, and military intelligence), Harvey highlights the structures that constrain (and enable) policy decisions, especially sequential decision making over time. This brings to our attention the “role of path dependence and momentum as a much stronger explanation for the sequence of decisions that led to war” (p. 3). Harvey’s work provides an example of how to carry out the TGPT method in conducting a counterfactual test.

1.5. Simulation methods and stress testing

While theory-guided process tracing is a tool that uses theory to explain history, simulation is a method that uses theory to run experiments about counterfactual history. Simulation involves building a model whose components are not fixed but capable of motion and therefore can be purposefully operated or “run”. The dynamic model put into motion is a process or a simulation. Indicators of the simulation run provide information not only about the simulation itself but also about the larger system that the model represents (Orcutt, 1987, p 342). Adelman (1987), following Naylor et al. (1966), defines a simulation model as the following:

“model A to be a simulation of real system B if (1) A is a close representation of B, (2) A is used to perform ‘experiments’ that are intended to represent how B would react under the experimental conditions applied to A; and (3) digital or analog computers are used to perform the experiments (pp. 340-341).”

Whether this last point is a necessary clause to the definition of simulation is up for debate. Advances in computer technology have certainly enabled a form of simulation construction (namely those embodied in a computer program). However, simulation activities can also be in the form of an organized thought experiment (with pen and paper) or even mechanical modelling¹²⁸.

Whether describing stylized numerical models for strategic analysis or applied models for policy analysis, Adelman (1987) sees the protocol for simulation construction and operation in pluralist terms in that they can be either

¹²⁸ A rare example of mechanical modeling of an economic system is the Phillips Machine constructed by engineer-turned-economist Bill Phillips in 1949. Instead of electricity, it ran on water. See <https://www.theguardian.com/business/2008/may/08/bankofenglandgovernor.economics>.

stochastic or deterministic. While theory and econometrics are ideal guidance to simulation model building, ad hoc methods using descriptive information are acknowledged as necessary to avoid model mis-specification when theory is lacking (p. 341). The bottom line for model specification is that “a good simulation model is one that replicates history well and whose major results can be explained ex post, though not divined ex ante, in terms which are consistent with available theory and relevant stylized facts” (p. 341).

Under this general definition, one may identify a number of simulation methods used in economics. The aforementioned counterfactual method is arguably a simulation in that it is an experiment of what would have happened in history if a relevant fact were different. Other examples include the simulation of microanalytic system pioneered by Orcutt (1961)¹²⁹ and the systems dynamics model of the world economy built by Forrester (1973). Forrester’s work arguably helped lay the groundwork for the current research program of complexity economics, which relies heavily on computer simulation for its theoretical development (Beinhocker, 2007).

Stress Testing

A special category of simulation methods is stress testing. According to Cihak (2007), stress testing is a “general term encompassing various techniques for assessing resilience to extreme events” and “to determine the stability of a

¹²⁹ Canada’s national statistical agency Statistics Canada maintains five microanalytic simulation models, the Social Policy Simulation Database and Model (SPSD/M).

given system or entity” (p 4). Stress testing is practiced in a wide variety of disciplines including engineering, medicine (in particular, cardiology), and software programming. In describing its application to finance, Ong and Cihak (2014) write “stress testing is a “what if” exercise”, thus including it as a counterfactual method where “it measures the sensitivity of a portfolio, an institution, or a financial system to exceptional but plausible shocks” (p. 1).

Financial stress testing has its roots in the late 1980s as a novel tool for risk management by financial firms. Managers wanted to assess how their investment portfolios would be affected by abnormal but plausible exogenous shocks to various types of risk exposure; for example, a sudden rise in interest rates or a sudden drop in equity prices. Stress testing was developed in the American financial industry around the same time as other risk management tools, such as Value-at-Risk (VaR) models¹³⁰ (Schuermann, 2012, p. 5). Only later did it become recognized as a potential tool for external regulators and supervisors. In their 1995 amendment to the international accord on bank capital regulation, the Basel Committee on Banking Supervision recommended stress testing as an internal risk monitoring tool to be used by banks. After the 1997 Asian financial crisis, the International Monetary Fund (IMF) included stress testing as part of its Financial Sector Assessment Program (FSAP). FSAP was instituted by the IMF and World Bank as part of their efforts to identify “vulnerabilities in the financial systems of member countries that could have

¹³⁰ In one of the earliest academic articles on financial stress tests, Berkowitz (1999) gives an argument for integrating stress tests into a larger risk management framework centred on the VaR model, to ensure coherent risk analyses. The issue with this argument is that VaR models would later be found to be deficient during the 2008 financial crisis.

significant macroeconomic consequences” (IMF, 2001, p. 3). Yet, despite the increased use by firm managers and the encouragement of its use by national and international bank regulators, there was doubt on the eve of the 2008 financial crisis about whether any firm, at least in the United States, had “a fully-developed program of integrated stress testing that captured all major financial risks on a firm-wide basis” (Schuermann, 2012, p. 7).

Since the 2008 crisis, financial stress testing has risen in prominence not only through regulatory prescription that financial firms develop better stress testing frameworks for internal risk management but also through their use by public regulators to demonstrate to the public the soundness of financial firms. Regulatory authorities in the US in 2009 and in Europe in 2010¹³¹ conducted stress tests on several banks and publicly released the results. Banks which failed the stress test were obliged to raise the amount of regulatory capital held on their balance sheets. Since the crisis, the Bank of Canada has developed its own stress model, the MacroFinancial Risk Assessment Framework, to assess the various risks the Canadian banking sectors may face (Anand, Bédard-Pagé and Tracelet, 2014, p. 63). The Office of the Superintendent of Financial Institutions encourages banks to use stress models for internal risk management purposes. The use of stress tests as a tool has since expanded to other sectors of the economy.¹³² Given the public attention to financial stress testing, as well

¹³¹ The 2009 US bank stress tests were performed by the Federal Reserve and other regulators under the Supervisory Capital Assessment Program (SCAP) and involved 19 financial institutions. The Committee of European Bank Supervisors (CEBS) conducted stress tests on about 90 European banks in 2010 and 2011 (Schuermann, 2012, p. 2).

¹³² For example, the Canadian Department of Finance, which manages rules pertaining to eligibility of borrowers for government-backed mortgage insurance, announced in fall 2016 that highly leveraged

as the realization of the inadequacies of stress testing leading up to the financial crisis, the IMF (2014) has led in summarizing and further developing the design and application of various stress testing methods. There are three general approaches: 1) accounting-based, which draws upon the information featured in a bank's balance sheet and income statement, as well as off-balance sheet items; 2) market price-based, which exploits the information conferred in the market prices of instruments such as equity share prices, and 3) macro-financial, which examines the connections between the financial and nonfinancial sectors of the larger macroeconomy (IMF, 2014, p. 4).

Of the three, the accounting-based approach is seen as the "natural" method of stress testing banks, given that a bank's accounting information is often publicly available (or accessible to public regulators) and that it allows the "bottom-up" testing of individual banks (ibid.). In addition to being categorized among these three broad approaches, stress test methods can vary in their model complexity, their data requirements and their ability to be operationalized and be meaningful. As a rule of thumb, the IMF notes that "the more sophisticated the model, the greater the estimation uncertainty, an issue to be taken into account when drawing policy conclusions" (p.3).

homebuyers can not exceed certain personal balance-sheet thresholds to be eligible for government-backed mortgage insurance. Further, the borrower must be able to qualify for a conventional fixed rate five-year mortgage (using the Bank of Canada's posted rate) to assess whether the borrower would be able to continue to service its mortgage in the event of a rise in interest rates or reduction in household income. This provision serves as a quasi-stress test. (Source: Technical Backgrounder: Mortgage Insurance Rules and Income Tax Proposals (Revised October 14, 2016. http://www.fin.gc.ca/n16/data/16-117_2-eng.asp).

Cihak's 2007 IMF working paper (later included in IMF's 2014 compendium, introduces Stress Tester 2.0, a basic stress-test framework designed for practical application to a small and relatively non-complex banking system, yet capable of being modified with greater degrees of sophistication. As an example of the "accounting-based" approach, Stress Tester 2.0 is programmed in an Excel software spreadsheet, where different categories of financial risk (for example, credit, interest rate, and foreign exchange) are organized in Excel worksheet modules. Modules on other risks may be programmed and added. Together with worksheets featuring data and underlying assumptions, Stress Tester 2.0 provides a suite of typical risk exposures, which can be combined into scenarios. This framework provides a bank-by-bank, "bottom-up" treatment that allows ease of adding and dropping banks participating in the test.

Stress Tester 2.0 provides a one-period test where the shock is administered in a deterministic, non-stochastic fashion. The shock factor, say a sharp rise in average interest rates by 10 percentage points, is a numerical magnitude with no probabilistic properties. As the stress test is a one-period test, Cihak notes that this introduces two important issues related to this framework. The first is the treatment of time, where the "the impact of the shock is distributed over time," even though the test is organized as a single period. This single period could represent a relatively long duration in historical time, for example, one to three years. Cihak notes that "it takes time for asset quality to deteriorate and for the deterioration to have an impact" (2007, p.55). Closely related to this

is that during this snapshot representing a historical duration, banks participating in the test as well as regulatory authorities may plausibly undertake “a number of mitigating measures” (p. 55) (such as undertaking a stock issuance to raise capital or providing extraordinary financing facilities) that may offset the impact of the shock, especially if the duration is a longer time period, where feedback effects may begin having a role (*ibid.*). The author recommends two measures to manage these two sources of complicating factors: 1) maintain the transparency of the underlying assumptions and test for sensitivity of test results to the assumptions, 2) conduct stress test at several intervals in historic time to assess if the underlying pools of risk and structures of risk are shifting over time (p. 55). Computing a baseline scenario, which features bank behavior under normal conditions, can be used as a comparison with the stress test results in order to assess the quality of the latter.

1.6. Summary

A research design that is organized to test this essay’s counterfactual hypothesis about the consequence of bank mergers on crisis performance needs to identify the means to trace out the counterfactual period that unfolds from the antecedent condition to the consequent outcome. Here, the formal quantitative tools of financial data synthesis and stress testing may be employed to give such a representation. However, they need to be employed alongside references to historical accounts of what actually happened in the Canadian banking industry during this period, as well as any statements about how actor behavior is

expected to change under the imagined mergers. Together, these tools, low level theories and factual narratives (broadly described as set of general statements that describe something) can combine in a research framework that appears broadly consistent with the loose theory approach to counterfactuals described by Cowan and Foray (2002) above. The framework would not predict what would have happened in the counterfactual scenario, but instead restricts the analysis to a set of possibilities, reducing the number of “paths not taken” that we imagine in parallel with the actual historical path.

2. Research Design

Having summarized facets of the existing scholarship on counterfactual analysis, this section proceeds to outline the framework for testing this essay’s hypothesis. This counterfactual simulation is an application of the loose theory approach. This is evident not only in its choice of analytic tools but also in its use of theory. Outlining the counterfactual framework used here begins with a discussion of the basic terms of the framework. Among the terms laid out, I introduce conclusions of a related essay on bank mergers and risk when discussing expected changes in bank behavior induced by consolidation. This is followed by a discussion of the selected method of simulating the financial data of the two fictive banks over the counterfactual period. This is followed by the stress test to assess how these banks would have performed during the financial crisis had they faced similar market conditions as those observed during the crisis. Having obtained results from the stress test, the final step in the overall

research framework is to evaluate these stress test results within the larger context of what is believed to happen in the Canadian financial system in the counterfactual scenario. Reference to Canadian financial system history and theory about the Canadian bank regulatory relationship are employed here. This assessment will provide an answer to the question of whether the two merged banks would have failed during the crisis.

2.1. Basic terms of the counterfactual framework

2.1.1. The legitimacy of the counterfactual hypothesis.

As described above in the literature review, Elster (1979) argues that legitimate counterfactual must satisfy three conditions. The counterfactual hypothesis here does satisfy them. The antecedent clause *four Canadian banks were allowed to merge in 1998* is feasible, in that it does not create any logical internal inconsistencies. The possibility of bank consolidation, in Canada and abroad, is an empirical fact since at least the 19th century. The antecedent clause is also insertable, in that it is capable of being fit in at that moment in 1998. This is satisfied by virtue of the fact that this question was the subject of a policy debate leading up to the decision by the Canadian government in 1998. It was an option, and became the path not taken.¹³³ Elster's third condition, that

¹³³ The merger decision in December 1998 was in response to the intent to merge by the four banks that announced earlier in the year. This announcement by the banks and the response by the government took place amid the final year of the Task Force on the Future of the Canadian Financial Services Sector (Mackay Task Force), which had been struck in 1994, partly in response to the pressure placed by the chartered banking industry on the federal government to permit the banks greater freedom to sell insurance and automobile leasing (Harris, 2004, p. 161). With a mandate to make "recommendations to

the antecedent and consequent be linked by a dynamic theory, is satisfied through the use of data simulation and stress test tools, statistical generalizations about bank behavior and mergers, and historical generalizations explaining the resiliency of the Canadian banks during the financial crisis.

2.1.2. Stating dual hypotheses and assessing the evidence.

This essay tests the principal hypothesis, *if four Canadian banks were allowed to merge in 1998, would the resulting two merged banks have faced a greater risk of failure in 2008?* Following the setting of dual hypotheses as demonstrated by Harvey (2012) in his comparative counterfactual analysis approach, one can envision two hypotheses are set here: “the banks faced a greater risk of failure” and “the banks didn’t face a greater risk of failure”. Using the conventional model of hypothesis testing using the statistics, the former would play the role of the alternate hypothesis and latter would be the null hypothesis.

Evidence supporting either of these hypotheses is organized along these two categories. Evidence is gathered not only from the results of the stress test but also through the scrutiny of the test results. This scrutiny may be made through comparison with factual generalizations made about Canadian bank performance during the financial crisis. With this information, one can form a judgment about the balance of the evidence supporting one of the two hypotheses.

enhance competition, efficiency and innovation” (Department of Finance Canada, 1999, p. 5), this task force had not precluded the possibility of allowing mergers among banks, or cross-pillar mergers between banks and other financial institutions, such as life insurance companies.

2.1.3. Defining “greater risk of bank failure”.

The following defines what is meant by the phrase “greater risk of bank failure”, which figures in the consequent clause of the counterfactual hypothesis. It also describes how greater risk of failure is measured using capital adequacy ratios. Bank failure is commonly understood here as the exit of an insolvent bank, often closure by regulators. Operational bank insolvency is financial impairment to the extent that a bank is no longer being able to meet its present financial obligations to depositors, debt holders and counterparties. Operational insolvency differs from accounting insolvency, where the condition of insolvency arises when the value of bank capital (or shareholder equity) is wiped out, equating the value of assets with liabilities. Such a bank is on the razor-edge threshold of accounting insolvency as a downward movement in the value of assets could bring them less than the value of liabilities. In this case, an instantaneous liquidation of both assets and liabilities would result in insufficient cash to pay back all depositors and creditors. However, due to the varying liquidity and maturities of different assets and liabilities, the possibility of a bank not being able to meet its financial obligations to depositors and creditors may happen much before the reduction of shareholder equity to zero. Let us refer to this as operational insolvency.

Given the public costs of bank failure, bank regulators require banks to hold a minimum amount of regulatory capital (in proportion to its total assets weighted by risk) to act as a cushion against losses that thrust a bank toward

operational insolvency. The capital adequacy requirements regime in Canada that were in place ahead of the 2008 financial crisis (and aligned with the Basel II international accord on capital regulation standards)¹³⁴ defined regulatory capital mainly as financial instruments classified as shareholder equity, such as common and preferred shares, but also some debt instruments as well, such as subordinate debt¹³⁵. Under this definition, total regulatory capital is divided into Tier 1 and Tier 2 capital. Tier 1 capital, considered higher quality capital than Tier 2, is composed of common and preferred shares as well as retained earnings and contributed surplus. Furthermore, the amount of regulatory capital that a bank is required to hold on its balance sheet is not in proportion to the total amount of assets it manages on the other side of the its ledger, but in proportion to the amount of risk associated with those various assets. Using a schedule of risk weights by asset category issued by the regulator, bank managers must calculate the total risk-weighted assets they manage on their balance sheet. This forms the denominator when calculating capital adequacy ratios.

The capital adequacy ratio (CAR) is the instrument used in this essay to indicate whether a bank is facing a greater risk of bank failure. A bank faces a greater risk of failure when its capital ratio falls below a minimum level set by the prudential regulator.¹³⁶ In 2007, right before the financial crisis, OSFI set a

¹³⁴ Following the 2008 financial crisis, the Basel III accord was negotiated and came into effect in 2013. In its application in Canada, Basel III put emphasis on the Common Equity Tier One (CET1) capital ratio as the key capital regulation instrument rather than the Tier One ratio used under Basel II.

¹³⁵ Subordinate debt are bonds and notes issued by the bank that are lower than senior debt in the priority of claim settlement in the event the bank becomes insolvent.

¹³⁶ Some authors argue that the capital adequacy rules imposed by regulators should not be interpreted as strict rules that regulators will enforce if the bank falls below minimum levels (Lavoie, 2014, pp. 199-200), suggesting instead that regulators tend to accommodate undercapitalized banks even when they are technically insolvent in the hope that the bank will recover if given enough time. This accommodation

minimum Tier One capital ratio target of 7%. This was three percentage points higher than the minimum Tier One ratio of 4% agreed upon in the Basel II accord. For the purposes of the stress test here, the following assumptions are used:

- If a bank's Tier One capital ratio falls below 7% but is above 4%, this triggers (at a minimum) a Stage Two intervention by the bank regulator. In a Stage Two intervention described in its "Guide to Intervention for Federal Regulated Deposit-Taking Institutions", OSFI has identified problems in the bank "that could deteriorate into a serious situation if not addressed promptly, although the problems are not serious enough to present an immediate threat to financial viability or solvency" (OSFI, 2008, p. 7).¹³⁷ Among the remedial actions the troubled bank be asked to undertake, it may be required to increase its regulatory capital. In normal market circumstances, this would involve a public stock offering or an equity investment by a private investor. The fall in a bank's CAR below the

of technical insolvency is possible so long as the bank's depositors, creditors and other counterparties do not lose confidence in the bank's viability and pull their business. There is some evidence of regulatory forbearance in the Canadian financial history; see Kryzanowski and Roberts (1993) who demonstrate that the Bank of Montreal was insolvent on a market-value basis during the most of the 1930s Depression. However, in the contemporary context, where much bank information is publicly disclosed on a frequent basis (e.g. daily stock prices, quarterly financial reports), the regulatory capital ratio is a recognized gauge of a bank's solvency condition by private investors capable of scrutinizing a bank's health and punishing it by selling its shares. While arbitrary in nature, the regulatory capital requirement is a useful intersubjective metric of financial health.

¹³⁷ It should be noted that OSFI's "Guide to Intervention" makes no explicit reference to minimum capital adequacy ratios in determining stages of intervention. What is offered as one of the conditions for designating a bank at Stage Two is: "the combination of the institution's overall net risk, capital and earnings makes it vulnerable to adverse business and economic conditions which may pose a serious threat to its financial viability or solvency unless effective corrective action is implemented" (OSFI, 2008, p. 7).

minimum 7% not only signals to regulators but also to private investors that that the bank is undercapitalized.

- If a bank's Tier One capital ratio falls below 4%, a Stage Four intervention by OSFI is triggered, whereby the regulator deems the non-viability of the bank is imminent. In OSFI's judgment, "the institution has failed to meet regulatory capital requirements in conjunction with an inability to rectify the situation on an immediate basis" (p. 10). OSFI is then in a position to seize the bank and its assets, remove its directors and management and takes step to wind-up the bank. A Stage Four intervention signifies bank failure.¹³⁸

OSFI's Supervisory Framework, with its framework of staged intervention, assumes that an intervention process unfolds under normal market conditions, not in the extraordinary times such as the 2008 crisis. Therefore, given the acuteness of instability observed in other national banking systems and the fact that Canada's large banks dominate its financial system, it is assumed that OSFI and its regulatory partners may have pursued other options, such as public recapitalization, at Stage Four rather than close the distressed banks.

¹³⁸ Bank failure and closure is not the only condition that may follow a Stage Four intervention in extraordinary times like the 2008 crisis. Arjani and Paulin (2013, p. 10) classify banks who were "bailed out" during the crisis as having experienced bankruptcy (failure), private acquisition (including transactions brokered by the government and recapitalization using public funds (up to the point of full nationalization).

2.1.4. The banks in scope.

This exercise features the two fictive consolidated banks that would have resulted from the merging of Royal Bank and Bank of Montreal (hereafter RBC-BMO) and Toronto Dominion and Canadian Imperial Bank of Commerce (hereafter TD-CIBC). Bank of Nova Scotia and National Bank of Canada, the two large Canadian banks not involved in any publicized merger proposals in 1998 are not treated here, nor are any other Canadian financial institutions.

The organizational form of the two fictive banks mirror their actual constituent banks also being universal banks, including both commercial and investment banking wings and engaging in off-balance sheet activities.

2.1.5. Financial risk in focus.

As described above in the section on stress testing, a stress test may focus on a single type of financial risk or combine several types of risk in a scenario. The stress test developed here focuses on two sources of risk believed to have driven the crisis that began in summer 2007: market risk affecting bank assets and interest rate risk affecting short-term funding.

- *Market risk on the asset side.* The financial crisis featured the materialization of a form of market risk where the prices of mortgages, mortgage-backed securities and other financial instruments related to the US subprime mortgage market began to fall sharply in 2007. This resulted in the declaration of write-downs on portfolio value by numerous financial institutions worldwide in their quarterly reports. The variation in the

magnitude of these write-downs (especially in proportion to total assets) reveals much about the portfolio behavior of these banks leading up to the crisis and their performance during the crisis, with banks having larger write-downs tending to have greater distress (resulting in insolvency or bail-out). To approximate a shock in this aspect of market risk, the numerical variable representing the cumulative asset write-downs (as a percent of pre-crisis total assets) is used as an indicator.

- *Interest rate risk on the liability side.* Another major risk that materialized was the freezing of short-term inter-bank financing markets, leaving banks who were relying on these markets for their liability funding vulnerable. Signs of this impairment emerged in mid-August 2007 with the sudden rise in these short-term interest rates, continuing over the course of the next fifteen months when they would spike to unprecedented levels. This stress test uses this observed sharp rise in these interest rates as the shock to the liability funding of banks.^{139 140}

The stress test here exposes the fictive banks to shocks in asset values and in liability funding costs, both separately and combined, using a range of values drawn from historical observation.

¹³⁹ It is a matter of debate as to whether an upward shock in short-term interest rates is the best way to represent the functioning of interbank credit markets during the crisis. An alternative explanation is that of credit rationing where suppliers of short-term credit stop offering funds to borrowers at any price, especially borrowers already deemed financially fragile.

¹⁴⁰ A separate funding shock that is not considered in this test is the sudden withdrawal of deposits (the classic bank run). While there were instances of banks experiencing bank runs (Northern Rock, Washington Mutual), the freeze in short-term credit market was more commonly experienced.

2.1.6. Historical time period.

The historical period under this counterfactual analysis is divided into the pre-crisis period, marked from the 1998 merger decision (the antecedent event) to the eve of the financial crisis in 2007, and the crisis period (the consequent event), beginning in August 2007 and ending in late October 2008. The data simulation step in this framework attempts to develop synthetic estimates of financial indicators of the two fictive banks for the pre-crisis time series.

Quarterly estimates are obtained from first quarter 1999 (quarter ending January 1999) through to third quarter 2007 (quarter ending July 2007). For the stress test step, the crisis period¹⁴¹ is marked from August 2007, when short-term credit markets in the U.S. and other developed economies began to show distress in the form of a sharp widening of interest rate spreads. This “credit crunch” in the interbank lending market continued into the fall 2008, peaking in September and October 2008 when several large financial institutions in the US and Europe failed or were obliged to receive public support. This period covers five reporting

¹⁴¹ Dating the financial crisis is not a straightforward task as it contains several overlapping market and political processes that were distinct yet related both temporally and geographically. The bubble in the US housing market which began in 2001 showed signs of correction in the early 2006. However, the impact of declining housing sales and prices was not observed in financial markets until January 2007 when the ABX, a price index of subprime mortgage bonds, turned and began to fall (Lewis, 2011, p. 161). Following the announcement on August 9, 2007 by French bank BNP Paribas that it had suspended two of its hedge funds due to subprime-related losses, interest rate spreads in the short-term interbank credit markets widened sharply, initiating the credit crunch that would peak with the acute stress observed in the early fall 2008. Stress in these markets would only subside in the first half of 2009 when interest rate spreads narrowed to pre-credit crunch levels. Overlapping with the 2007-2009 credit crunch were macroeconomic downturns in several countries. In the US, the Great Recession was timed from December 2007 to June 2009 (National Bureau of Economic Research). US equity markets peaked in October 2007 and were led down by stocks in financial firms, bottoming out in March 2009 (Shufelt, Globe and Mail, October 7, 2017). While post-crisis recovery in North America appeared firmly in place in 2009, a sovereign debt crisis in parts of Europe would break out in 2010 as several sovereign nations found themselves teetering on insolvency.

quarters for the Canadian banks, from fourth quarter 2007 (ending October 31) to fourth quarter 2008 (ending October 31). In the stress test, this five-quarter historical period is treated as a single period “stress test horizon”. The shock factors for the two sources of financial risk discussed above are calculated this period.

This care in defining the counterfactual period under analysis reflects a conscious attempt to be sensitive to what actually transpired in terms of events and processes. One challenge of analysis is that this cognitive activity invariably involves assuming away or holding constant certain details of the larger historical tapestry to understand the workings of the part of the reality-picture under focus. This act of abstraction is very present in the methods of the strong theory approach to economic counterfactual analysis discussed above in the literature review.¹⁴² It comes up in at least two instances in this counterfactual exercise, both in the stress test itself, with its assumption of a single period horizon, and in the simulation of the counterfactual time series. In this latter case, this issue of the treatment of history arises in a discussion of the expected behavior of the main actors featured in the counterfactual scenario.

¹⁴² McIntosh (2002) and Barros, Bonfim, Kim and Martins (2014) both use time series data to estimate parameters of a structural model, which is then used to derive counterfactual estimates that are compared with actual historical observations. This use of the historical data to estimate structural parameters assumes that there is no underlying structural change featured in the data.

2.1.7. Expected behavioral changes of the actors

The two imagined bank mergers result in two banks that may behave differently from their predecessors over the historical period under consideration. The rationale for mergers is often premised on the promise of gains in cost efficiencies and shareholder value, gains which may only be enjoyed through a shift in business model and strategy. To presume that the business behavior of the resulting consolidated banks would be different is a safe assumption. To assert what that behavior would be is a bigger challenge, pushing us further into the realm of uncertainty. Further, while seeking to maintain a minimum re-write of history¹⁴³, one should not casually dismiss that bank consolidation would not precipitate change in the regulatory apparatus, given the close relationship between the Canadian banks and their regulators. The discussion of the expected behavior changes of these two principal actor groups in this exercise.

Post-merger behavior of banks.

Any prediction of the behavior of post-merger banks should contribute to how the simulated time series data of the fictive banks should be modeled. Yet we face a frontier of uncertainty about the character of this behavior. Thus, a reasonable first attempt at data simulation is to assume no change in the behavior of the merging banks. While this may appear as a naïve exercise, this approach does provide a baseline reference that may be used to compare with other data simulations.

¹⁴³ Minimum re-write supports historical consistency, one of the six best practices suggested by Tetlock and Belkin (1996).

With this reference simulation in hand, the next step in data simulation is to draw upon prior findings about how bank behavior may be affected by having experienced past mergers. Essay Two in this overall dissertation provides this information. Among their best practices for counterfactual analysis, Tetlock and Belkin (1996) give “statistical consistency”, that is consistency with well-established statistical generalizations (p 16-31). While not finding robust evidence supporting the hypothesis that a past merger of equals contributes to riskier behavior in the resulting bank, Essay Two did obtain two statistically significant findings with respect to asset and liability management. Banks that tend to be bailed out during the 2008 financial crisis tend to be more reliant on short-term funding for their overall funding needs than non-bailed out banks. Further, these banks also tend to have a higher proportion of risk-weighted assets among total assets on their balance sheets than non-bailed out banks. Bailed-out banks during the financial crisis also tended to be larger than non-bailed-out banks. As the proposed mergers would have obviously created two much larger banks than their predecessors, I argue here that we can expect that these larger banks would likely have been more reliant on short-term funding and hold a higher proportion of risk-weighted assets than their predecessors. These two behavioral tendencies of merged banks may be incorporated into this overall research design by making adjustments to the data in the time series simulation or adjusting parameters in the stress test.

Post-merger behavior of regulators.

Turning now to consider if the bank consolidation would have induced change in regulatory behavior, I argue it is not necessary to introduce any such changes. Essay One of this dissertation describes the developmental trajectory of the Canadian bank regulatory regime following the publication of the 1986 Estey Commission report and creation of OSFI in 1987. Continued development of the regulatory regime was evident during the 1996 Task Force on the Future of the Canadian Financial Services Sector. Within weeks of the Government of Canada's decision not to permit the proposed mergers in 1998, the Task Force would issue its final report, providing recommendations that would be included in the 2001 Bank Act. From 1986 through 1998 to the 2001 Bank Act and beyond, there has been a sustained movement to further develop and refine the regulatory apparatus. Given this particular historical institutional trajectory beginning in 1986 and being further supported by the recommendations of the Mackay Task Force, how would the regulatory apparatus, specifically involving the prudential supervision of banks, been altered? I consider three possible directions here: 1) a reversal of the regulatory trends towards deregulation, giving a looser supervisory regime, 2) a stronger, tighter regulation than what was actually being put in place, 3) no change.

- Lighter bank regulation is not likely to have been a response to the bank mergers. Any hint of a movement toward less prudential supervision of banks in Canada was quashed in the public response to failure of two regional banks in 1985. The idea of self-regulation, championed by

deregulators, was incorporated into the evolving responsive regulation relationship. Furthermore, the public debate over bank mergers in 1998 did raise some concerns of the effects of the mergers on stability, not just on competition (Lott, 2005, p. 12). A green light to the controversial bank mergers would not likely have been accompanied by an equally controversial move to deregulate, especially in the absence of a convincing narrative this side of the border for lighter touch regulation in the financial sector.

- As the potential risk posed by the mergers was on the minds of regulators, the government could have responded by imposing stronger capital regulations than already in place, as well as more stringent guidelines and disclosure requirements. This essentially builds on what was already in place in the regulatory regime.¹⁴⁴ There may have been a regulatory response to address possible reduced competition caused by mergers. This may have involved the required divestment of business assets such as bank branches or the reduced barriers to market entry. Altered productive capacity and the appearance of additional competitive pressures may then induce change in the behavior of the incumbent banks. Attempting to identify what behavioral changes these would be, and when they would appear are beyond the scope of this essay here.

¹⁴⁴ If the assumption of tighter regulations is pursued, one could assume the actual regulatory changes that were imposed by authorities on the Canadian banks following the 2008 crisis, were implemented earlier following the hypothetical mergers in 1998. These include new capital adequacy requirements aligned with the new 2013 international accord on capital regulation (Basel III), the new liquidity guidelines and the designation of the six large banks as Domestic Systemically Important Banks (D-SIBs).

For the purposes of this exercise, I assume that there would be no change in the behavior of the regulatory actors, in particular OSFI, following the bank mergers. It is sufficient to assume that the regulatory regime that was in the midst of developing during the 1998 merger debate would continue to develop as it did regardless of the outcome of the merger decisions. The actual overall regime, with the network of five state bodies, the role played by OSFI as prudential regulator and the use of capital rules and guidelines on bank conduct, is assumed to be in place leading up to and during the 2007 financial crisis.

To summarize how I will handle expected changes in the behavior of the principal actors in this stress test, I use Figure 1 below to display the two modes of behavior of the merged banks versus the assumed constancy of the regulator's behavior.

Figure 1: Assumptions about behavior change in principal actors

		Bank Behavior	
		Assume: no change	Assume: add elements of riskier behavior (from Essay 2)
Regulator Behavior	Assume: no change	Stress test outcome	Stress test outcome

2.2. Data simulation: tracing out the counterfactual financial data

Having described the basic terms of the counterfactual framework, I turn now to describe the method of obtaining simulated estimates of financial

variables of the two fictive banks on the eve of the crisis. This simulated data serves as inputs in the stress test, which evaluates the counterfactual hypothesis. The specific method adopted here is a “pro forma” simulation where the actual financial estimates of the unmerged banks are simply added together for each interval in the time series to give a baseline first approximation of the counterfactual time series. As will be shown below, this method is consistent within the family of determinist methods for the sequential estimation of financial processes.

From a theoretical perspective, the data simulation problem has the following characteristics. It shares the general form of being an asset-liability management (ALM) problem in that it features assets, liabilities, goals and constraints (Romanyuk, 2010, p. 2). The manager of the fictive bank may seek single or multiple goals (e.g. maximize profits or target a return-on-equity ratio) while facing constraints, either regulatory, industry and macroeconomic constraints. To meet this goal(s), the manager has to make a joint decision about both the asset side of the balance sheet (e.g. decisions about asset growth and allocation) and the liability side (e.g. funding decisions). One consideration in this decision-making is the relative liquidity of financial instruments, say loans and deposits, on both sides of the balance sheet. Added to this decision is the presence of risk (e.g. credit risk and liquidity risk) in the banker’s environment. ALM models that recognize the presence of risk feature stochastic elements.

With the intent of obtaining simulated financial data for the eve of the crisis (third quarter 2007), a counterfactual time series for each fictive bank is sought,

turning the theoretical problem from a single period to a multiple period ALM problem. The series is finite, featuring 35 quarterly intervals (first quarter 1999 to third quarter 2007). The advantage of estimating a time series, rather than a single period “snap shot” of the series end-point (third quarter 2007) corresponding with the consequent event, is that it explicitly shows a plausible evolution of the financial conditions of the hypothetical merged banks. Depending on the estimation technique used, values for the 35 periods may be estimated simultaneously or sequentially. Sequential estimation more closely replicates historical evolution of the balance sheet. Further, the literature suggests that there are at least two general methods that may be followed to address this problem, stochastic and determinist methods (Birge and Jódice, 2013, p. 4712), with stochastic methods being preferred among contemporary researchers in finance. See Appendix A for a deeper discussion comparing these two methods.

A determinist, non-stochastic method is adopted in this essay for computing the counterfactual financial estimates. The stochastic method applied through econometrics is more complex and computationally demanding than the determinist method. The choice to apply determinist methods to this problem is arguably an exercise in the “loose” theory approach to counterfactual simulation. In contrast to “strong” approach to estimation, which relies on formal modelling and econometric techniques, this non-stochastic approach relies on accounting relations, structural relations, behavioral assumptions, and other historical stylized facts, applied in both inductive and deductive reasoning, to estimate the

simulated time series. This is consistent with the theory-guided process tracing approach discussed above.

The specific type of determinist method for sequential simulation is the “pro forma” method.¹⁴⁵ This simulation method is used in earlier counterfactual bank merger studies where researchers simply add the balance sheet and income statement data of the two banks assumed to have merged (Boyd and Graham, 1988; Saunders and Walter, 1994). Such an approach assumes that while the two merging banks have combined under common ownership, they continue business operations as though they are separate business entities. This ignores “any potential product-revenue synergies and cost-based economies of scope and scale that result” from merging (Saunders and Walter, 1994, p. 186), not to mention the potential gains in market power the merged bank would enjoy. The authors defend their method by arguing that these estimates do avoid the biases that would be built in through assumptions about how the merged bank entity would adjust its business model. At best, these aggregated financial indicators may be viewed as a baseline first approximation of the potential effects of merging. With this method, the relevant financial data of the two fictive merged banks, RBC-BMO and TD-CIBC, are calculated and displayed in Table 1 below. Refer to Appendix B for variable definitions.

¹⁴⁵ A more sophisticated alternative would be a recursive procedure that begins with initial conditions based on actual historical observations and then derives financial values for each subsequent time interval using behavioral assumptions as well as accounting relations and structural relations estimated statistically.

Table 1: Simulated financial data for two fictive banks

Fictive banks: RBC-BMO and TD-CIBC

Period: Third quarter 2007

Data source: Bloomberg

	RBC	BMO	<i>RBC-BMO</i>	TD	CIBC	TD-CIBC
Total assets	\$ 604,582	\$ 359,154	\$ 963,736	\$ 403,890	\$ 338,881	\$ 742,771
Regulatory capital	\$ 23,268	\$ 16,600	\$ 39,865	\$ 14,882	\$ 12,128	\$ 26,958
Risk-weighted assets	\$ 250,197	\$ 178,687	\$ 428,884	\$ 145,900	\$ 125,030	\$ 270,930
Tier One capital ratio	9.30%	9.30%	9.30%	10.20%	9.70%	9.95%
Net interest income	\$ 9,209	\$ 6,096	\$ 15,305	\$ 8,453	\$ 5,569	\$ 14,022
Net non-interest income	\$ 15,419	\$ 6,084	\$ 21,503	\$ 8,752	\$ 9,257	\$ 18,009
Net revenue	\$ 24,628	\$ 12,180	\$ 36,808	\$ 17,205	\$ 14,826	\$ 32,031
Profit (net income)	\$ 6,607	\$ 3,085	\$ 9,692	\$ 4,461	\$ 3,893	\$ 8,354
Retained earnings	\$ 3,848	\$ 1,414	\$ 5,262	\$ 2,664	\$ 2,498	\$ 5,162

An immediate criticism of the pro forma simulation method is the limit it places on the meaning one can attach to the resulting simulated time series. As it stands, the resulting estimates represent the addition of two separate business histories uninterrupted by the counterfactual event, an event which if it actually happened would have likely precluded some of the actual historical events and processes from happening in the counterfactual scenario. As mentioned before, the rationale behind a non-hostile merger between two businesses is to exploit any synergies the merger may enable, such as realizing cost efficiencies and expanding into new product spaces. Mergers are often followed by a change in the existing business strategies of the two predecessor firms. However, in the

“pro forma” simulation, the financial data reflect the historical trajectories of two firms that continued in the absence of the hypothetical merger. Further, the two historical trajectories themselves are shaped by decisions and experiences of these two banks subsequent to the hypothetical merger event, decisions and experiences that may have been different had the two banks actually merged.¹⁴⁶

However, in its defense, the pro forma method provides a plausible quantitative referent. It is grounded on what was actually observed over the counterfactual horizon; these numbers were not picked out of thin air. Further, one can make adjustments to the resulting time series to reflect what the hypothetical merged banks may have pursued in terms of different business strategies, ones with more or less financial risk than their predecessors. These simulated historic trajectories can then be compared with the initial baseline series and also used in the stress test.

To illustrate this ability for comparison, consider the case of the liability management undertaken by a bank, where the bank managers must choose not only the amount of total overall funding, but also the relative proportions among different types of funding: deposits, short-term debt and long-term debt. An indicator of funding behavior, used in Essay Two and introduced here, is the ratio of short-term debt to total liability funds. This indicator of a bank’s funding model was found to be a statistically significant predictor of bank performance during

¹⁴⁶ A good example to reinforce this point is how the scuttled TD-CIBC merger likely enable the acquisition of Canada Trust by TD in 2000. Canada Trust CEO Ed Clark would succeed Charles Baillie as TD CEO in 2002. Under Clark’s leadership, TD would reduce its exposure to mortgage-backed securities, a decision that likely contributed to TD’s resilient performance within the 2007 financial crisis. One can not easily assume that a TD-CIBC merger in 1998 would have been followed by these historical events.

the crisis, where banks that failed or required a bail-out tended to have drawn 30% of its overall funding needs through short-term finance. Banks that did not fail or need a bail-out tended to have a funding model ratio of 20%.

Please refer to Chart 1 below, which compares measures of a fictive bank's reliance on short-term finance (as a percent of total overall funding) under the pro forma approach and under data adjustment. A greater reliance on short-term debt is one of the changes expected following bank mergers. One observes the actual observed funding ratio for TD and CIBC over the period of first quarter 1999 to third quarter 2007. Alongside these two series is a series of the pro forma ratio for the merged TD-CIBC fictive bank, which is the average of the two observed actual ratios. Further, there is an adjusted series for the TD-CIBC merged banks, where it is assumed that the management of TD-CIBC chooses to gradually increase the new entity's reliance on short-term funding, resulting in the funding ratio reaching 30% on the eve of the financial crisis. This chart displays two distinct counterfactual paths or trajectories for this fictive bank. The endpoint of each path, the estimates for third quarter 2007, potentially may be used in the stress test.

Chart 1.

2.3. The stress test.

2.3.1. The objective.

A stress test is used to test the principal hypothesis about the counterfactual consequent, that is the performance of the fictive merged Canadian banks during the 2008 financial crisis. The simulated data of the two fictive banks on the eve of the crisis is applied in the test model.

2.3.2. The means.

To assess if these fictive banks would have faced greater risk of insolvency, the stress test framework specified here is based on Stress Tester

2.0, an Excel-based numerical framework developed by Cihak (2007, 2014).

Stress Tester 2.0 is user-friendly in terms of computational complexity. It takes a balance sheet approach to stress-testing, as opposed to a market price-based or macro-financial approach. It is also a non-stochastic, determinist test as it does not involve elements of probability. The bottom-up character of the framework allows it to feature several individual banks.

Despite its apparent simplicity in both design and computational effort, Stress Tester 2.0 is part of a suite of tools the IMF has developed to assist regulatory authorities in member states meet the demand to provide more information about financial conditions in their respective countries. Such information is used in the IMF's Financial Sector Assessment Program (FSAP) and Article IV country assessments (Ong & Čihák, 2014). Further, Stress Tester 2.0 shares much in fundamental design and method with more sophisticated stress test models operated by regulatory authorities. Like Stress Tester 2.0, the Bank of Canada's MacroFinancial Risk Assessment Framework (MFRAF) is an accounting-based model, applying the balance sheet data of individual banks. It separates out different sources of risk into modules and has a primary focus on materialized risk on bank solvency¹⁴⁷ measured over a single period horizon (Anand, Bédard-Pagé, & Traclet, 2014, p. 64). While Stress Tester 2.0 may not be able to give the sophisticated results offered by models like the MFRAF, it nonetheless may be suitable for the information needs of this essay's question.

¹⁴⁷ That being said, the MFRAF is also capable of modeling liquidity risk and network spillover effects.

There are three crucial assumptions made in the design of the stress test framework used here: a) time dimension, b) financial risks being tested and c) choice of shock factors.

Time dimension

History is handled in two distinct ways in the test framework, both in identifying pre-crisis conditions and the shock horizon. Stress Tester 2.0 gives a static test in that it impose an exogenous shock to a system assumed to be unchanging during the time horizon specified in the test. The system's conditions, in this case the bank's financial characteristics, are measured at end of third quarter 2007. This pre-crisis snapshot of the bank is fed into the test framework as inputs. The exogenous shock factors is obtained by measuring the change in an exogenous variable over the span of the crisis, defined here as the five quarters from August 1, 2007 to October 31, 2008. While in fact a lengthy period of time, this shock horizon is treated as an instant during which there are no other changes (endogenous or through other exogenous shocks) to the banks' financial condition.

Financial risks tested and choice of shock factor

Stress Tester 2.0 is a flexible framework capable of modification to serve the needs of the tester. The example features test mechanisms for five risk types: credit, interest rate, foreign exchange, interbank contagion, and liquidity. The model here tests funding risk and asset value (market) risk.¹⁴⁸

¹⁴⁸ Financial risks not featured in this test framework include foreign exchange risk and market risk with respect to commodity prices.

- *Funding risk.* While the liquidity risk test in Stress Tester 2.0 assesses a bank's resilience against a drain on deposits (the classic bank run), this essay introduces a mechanism for testing a bank's reliance on the short-term funding market for its liability management needs. Instead of modeling a withdrawal of funds (a quantity shock), the test here involves a price shock, an unanticipated sharp rise in interest rates in the short-term funds market. The purpose is to evaluate the vulnerability of the bank to an interbank credit freeze.
- *Asset value risk.* Due to exposures to U.S. subprime mortgage-backed securities, most banks in North America and Europe experienced write-downs on the assets held both on and off their balance sheets during the financial crisis. All of the Big Six Canadian banks experienced asset write-downs, although not of a magnitude that threatened their solvency. The risk of write-downs in tradable assets may be understood as a form of market risk. However, Stress Tester does not feature a mechanism for market risk, where the portfolio behavior of bank managers is modelled. Further, data limitations and lack of previous studies in the literature hinder this development of this mechanism. To approximate this market risk, an autonomous shock in the form of a proportional value reduction in total assets is applied. The magnitude of the shock may be obtained from the ex post write-downs observed among a sample of banks during the crisis.

In addition to featuring the individual tests on these two categories of risk, the test framework is capable of combining these two shocks in a scenario which seeks to test a bank's resilience in a situation where it faces shocks to multiple sources of financial risk; in this case, a simultaneous sharp rise in short-term interest rates and a steep loss in portfolio value.

2.3.3. Outline of the stress test procedure

Please refer to Table 2 below, which depicts the Excel-based worksheet used as the stress test model.

Table 2: Stress Test Excel Worksheet

Fictive Bank (in millions Cdn dollars)	STEP	RBC-BMO	RBC-BMO	RBC-BMO
		Run 1 (combined shocks)	Run 2 (combined shocks)	Run 3 (combined shocks)
Pre-shock conditions				
Total assets	a	963,736	963,736	963,736
Regulatory capital	a	39,865	39,865	39,865
Risk-weighted assets	a	428,884	428,884	428,884
Tier One capital ratio (%)	a	9.30%	9.30%	9.30%
Net interest income (NII)	a	15,305	15,305	15,305
Net non-interest income	a	21,503	21,503	21,503
Net revenue	a	36,808	36,808	36,808
Profit (net income)	a	9,692	9,692	9,692
Retained earnings	a	5,262	5,262	5,262
Shock factors				
Short-term interest rate shock (basis points)	c	350	350	350
Elasticity coefficient: Δ i.r. to Δ NII	b	-9	-9	-9
Δ NII	d	-3150	-3150	-3150
Autonomous shock: write-downs as % of assets	e	-1.0%	-2.5%	-3.5%
Post-shock outcomes				
Total assets	f	954,099	939,643	930,005
Change in total assets	f	-9,637	-24,093	-33,731
Net interest income (NII)	d	12,155	12,155	12,155
Net non-interest income	f	11,866	-2,590	-12,228
Net revenue	g	24,021	9,565	-73
Profit (net income)	g	-3,095	-17,551	-27,189
Retained earnings	g			
Regulatory capital	g	36,769	22,313	12,676

Risk-weighted assets	g	419,247	404,791	395,153
Tier One capital ratio	h	8.77%	5.51%	3.21%

Step a: Data inputs.

Simulated values for the fictive banks for third quarter 2007 (refer to Table 1) are inserted in the Excel spread sheet in Table 2 above under “Pre-crisis conditions”.

Step b: Estimate a statistical relationship between short-term interest rates (STIR) and net interest income (NII).

Due to the limitations of bank data that is publicly available (Bloomberg does not offer a granular breakdown of a bank’s tradable assets), it is difficult to have a breakdown of asset and liability categories that are capable of being repriced through the impact of an exogenous shock such as a rise in interest rates. Cihak (2007) provides guidance on how to adapt to this situation using estimated statistical parameters that signify the relationships between variables for which one does have observations. For example, Cihak writes that such a stress test for interest rate risk:

“could be based on the net interest income on banks’ income statements. In particular, past data on net interest income of individual banks over time can be regressed on interest rates and other potential variables to estimate how banks’ net interest income responded to changes in interest rates, and the estimated slope coefficient(s) can be used to translate a change in interest rates into terms of profits (and potentially capital)” (2007, p. 23).

This is the approach taken here. A regression model is specified where change in net interest income is the endogenous variable and is a function of changes in market interest rates:

$$\Delta NII = \alpha + \beta_1 (\Delta SRSPD) + \beta_2 (\Delta LRSPD) + \beta_3 (\Delta DEPSPD) + \varepsilon$$

where:

ΔNII is the quarterly change in net interest income earned by a bank;

$\Delta SRSPD$ is the change in the quarterly average interest rate spread on short-term credit;

$\Delta LRSPD$ is the change in the quarterly average interest rate spread on long-term credit;

$\Delta DEPSPD$ is the change in the quarterly average spread between interest charged on bank deposits and interest charged on banks loans.

The estimator of β_1 , the coefficient for change in net interest income relative to change in short-term interest rate spreads ($\Delta SRSPD$) is used in this stress test model. The estimated coefficient from the preferred regression run is -8.97. It is weakly significant, having a p-value of 0.117. Please refer to Appendix C for details on this econometric exercise. With this estimated coefficient, rounded to -9, I infer that a one basis point increase in the short-term interest rate spread is associated with a \$9 million decrease in net interest income, *ceteris paribus*. The rounded estimator -9 is inserted in the stress test model. See step b in Table 2.

Step c. The shock in short-term interest rates.

The shock factor is measured as the change in short-term interest rates from the beginning of the crisis in August 2007 to the peak of stress in the short-term funding market in October 2008. It is measured for inter-bank lending markets in Canada, the US, the UK and the Eurozone, in term of basis points (bps), or one hundredth of one percentage point. They are displayed in the Table 3 below. These magnitudes serve as the range of shock values used in the stress test model.

Table 3: Cumulative rise in short-term interest rate spreads

Canada	United States	United Kingdom	Eurozone
3-month CDOR-OIS spread	3-month US dollar Libor-OIS spread	3-month British pound Libor-OIS spread	3-month Euribor-OIS spread
116 bps	350 bps	286 bps	200 bps

Source: Bloomberg

Step d: Applying the interest rate shock

With the estimated coefficient of -9, I apply this to the three shock values (+100 bps, +200 bps and +350 bps) and calculate the resulting drop in net interest income. For example, a 350 bps spike in short-term interest rates leads to a drop of \$3.15 billion in net interest income for RBC-BMO over the stress horizon. This reduction in net interest income is subtracted from net revenue, profit, retained earnings and if there is a loss, from regulatory capital. This

assumes no other change to other balance sheet variables. With diminished regulatory capital, the post-shock Tier One capital ratio is calculated.

Step e: The shock in asset values

The shock to asset values is proxied by the cumulative write-downs in assets that many banks declared between the August 2007 and September 2008, as a percentage of pre-crisis assets. A range of magnitudes is measured using a sample of the six large Canadian banks and six large peer banks from the United States¹⁴⁹. For the large Canadian banks, a range of 0.2% to 2.4% is obtained, with an average of 1.1%. For the six US banks, a range of 0.9% to 3.5% (average of 2.3%) is measured. Using these historic observations, I identify a set of write-down values (-1%, -2%, -2.5%, -3% and -3.5%) to be use in the test model.

Table 4: Cumulative asset write-downs as % of pre-crisis assets

(Expressed as minimum, average, maximum)

Canadian banks	US banks
(0.2%, 1.1%, 2.4%)	(0.9%, 2.3%, 3.5%)

Source: Bloomberg

Step f: Applying the asset value shock

Applying the asset value shock involves two simultaneous operations: a levels effect and a flows effect. In the levels effect, an x% write-down in total

¹⁴⁹ The six U.S. peer banks include JP Morgan Chase, Wells Fargo, Bank of America, Fifth Third, PNC and BB&T.

assets diminishes total assets by that percent and the absolute change in total assets is deducted from risk-weighted assets. Recall that risk-weighted assets is the denominator in the regulatory capital ratio. However, this reduction in total asset levels must be also reflected in revenue flows. So, this absolute change in total assets, represented as a trading loss, is deducted from net non-interest income. This leads to a reduction in profit. If this reduction causes an overall loss, regulatory capital is diminished by the amount of this loss.

Step g: Combining the two shocks

In addition to separate test runs for the interest rate shock and the asset value shock, the two shocks can be combined, giving a scenario that reflects these two financial risks observed in the financial crisis leading up to September 2008. For example, Table 2 above displays three scenarios, where the interest rate shock is held at 350 bps while the asset write-down factor varies between -1%, -2.5% and -3.5%. The effects of both shocks are additive, not multiplicative, in their effects on the banks' regulatory capital ratios.

Step h: Assessment of shock impact.

With post-shock capital ratios calculated in each test run, I can compare the performance of the fictive banks under each test scenario (interest rate shock, asset value shock, and combined shocks) by comparing these post-shock capital ratios with the decision-making rules described above. A fall below the minimum Tier One capital ratio of 7%, but above 4%, triggers a Stage Two

intervention by the bank regulator OSFI. A fall below 4% triggers a Stage Four intervention. This will indicate whether the fictive bank in question is below either of the regulatory capital thresholds, contributing information for evaluating the counterfactual hypothesis in this essay *“would the resulting merged banks have experienced a greater risk of failure in 2008?”*

2.4. History and theory of the Canadian regulatory apparatus

The results of the stress test suggest how the two hypothetical fictive banks would have performed during the crisis, under a given set of assumptions. The final step in the overall counterfactual framework is to assess these test results in light of the relevant historical processes and events assumed not to have been altered by the counterfactual antecedent “the four banks merge”. As discussed above under the basic terms of the framework, I assume no change in the evolution of the regulatory apparatus leading up to and during the 2007 crisis. This assumption of no change extends also to the nature of the regulatory relationship between banks and government. Detailing this history and theorizing about the regulatory relationship is the focus of Essay One. It will be summarized below.

First, the evolutionary trajectory of the regulatory apparatus that began with the recommendations of the 1986 Estey Commission would continue without reversal or diversion with the 1998 bank merger decision. The competition issues brought forth by the 1998 merger proposal were in many ways on a

separate policy track than the prudential issues raised by the 1986 commission. This separation allowed the autonomous development of the regulatory regime. By 1998, the Office of the Superintendent of Financial Institutions (OSFI) had already been created and was further strengthened through a legislated mandate in 1996 that incentivized early intervention in troubled banks. The Canadian Deposit Insurance Corporation (CDIC) had also been given enhanced power to intervene. These two agencies would join the Department of Finance and the Bank of Canada to form the regulatory coordination group, the Financial Institutions Supervisory Committee (FISC). Amid the public debate on bank mergers, OSFI had engaged the banks it regulates in a consultation and developed the Supervisory Framework, unveiling it in 1999, a year after the merger decision. The Framework defines how OSFI and the regulated banks interact with respect to regulatory disclosure, risk analysis and regular dialogue. This formal supervisory process, the culmination of the regulatory movement that begun in 1986, would be further enhanced through the publication of the Guide to Intervention and the introduction of the Composite Risk Rating system. By 2007, OSFI had required the banks under its supervisory umbrella to comply with its version of the Basel II capital accords, with banks having to maintain a minimum Tier 1 capital ratio of 7% and a maximum asset-to-capital ratio of 20%. By the time distress became evident in international financial markets in August 2007, Canada's contemporary regulatory regime was firmly in place.

Second, the effectiveness of this bank regulatory regime in promoting prudent risk management among Canadian banks is evident in regulatory

responses during the crisis. Leading up to the acute stress observed in September 2008, the only overt (publicized) policy response by any of the federal regulatory agencies were the actions of the Bank of Canada to progressively reduce its key policy rate and provide extraordinary short-term lending facilities. Assuming that bank-regulator interaction would have proceeded as described by the Supervisory Framework, it is likely that OSFI would have discussed privately with the Canadian banks about the extent of their exposures to the US subprime mortgage market and the risk management measures they were undertaking. It was only after the acute stress of September and October 2008 when regulatory agencies announced most of the support programs (including relaxed regulatory capital rules, a mortgage asset purchasing program and government guarantees of bank debt issuance), programs that probably helped more to support continued bank lending than boost bank solvency.

The main argument advanced in Essay One for why the Canadian banks performed relatively well during the crisis (by several metrics, including profitability, lending and capital maintenance) and did not require public recapitalization as did banks in the US and the UK is that the banks had been in, leading up to and during the crisis, an expectations-based relationship with their regulatory authority, where the regulator (and thus the public) has the expectation that the banks abide by the guidelines that the banks themselves helped formulate. Failure to abide by them may trigger intervention. This expectational relationship is backstopped by the threat of intervention by the

regulator should the banks fail at self-discipline. This relationship is argued to be at the core of the Canadian financial order leading up to the crisis.

With this historical explanation of the Canadian regulatory apparatus at hand, one is then able to compare the results from the stress test with our understanding of what would have been the likely response by regulators during the financial crisis if the fictive merged banks have faced pressure on their solvency.

2.5. Summary of the overall research design

To summarize, this overall framework to test the counterfactual hypothesis proposed in this essay is grounded on a set of basic terms, including the definition of bank failure, the types of financial risk faced by the two fictive banks and the historical period under analysis. These basic terms act as fundamental assumptions in both the data simulation step where financial indicators of the two fictive banks are traced out, and in the stress test phase, which subjects the fictive banks to financial risk shocks simulating the financial crisis. Information from Essay Two is employed to adjust the simulated bank data to reflect expected changes in bank behavior induced when two banks merge. Both sets of simulated data are used in the stress test. Finally, the results of the stress test are assessed against an explanation of the expected responses of regulators during the crisis. This explanation is drawn from Essay One.

3. Stress Test Results

The application of the simulated financial data of the two fictive banks in the stress test model described above gives three sets of results. Each set is organized by results from the interest rate shock scenario, the asset write-down shock scenario and combined scenario. The first set is obtained by applying the pro forma data in the test model. The second set of results are obtained by applying altered bank data and model parameters that reflect the expected changes in bank behavior following the mergers. A third set of results are gathered from a round of tests where the pro form data is modified so that each bank holds the bare minimum of regulatory capital according to the 7% Tier One threshold prior to the crisis. These banks are holding no additional capital cushion above 7%.

3.1.Pro forma simulated data

3.1.1. Interest rate shock.

Under this shock, I ran three test scenarios on the two fictive banks, the first being an increase in the interest rate spread of 100 basis points, which corresponds to the observed widening of spreads in the Canadian interbank market. As well, I used factors of 200 bps and 350 bps, corresponding to the widest spreads observed in the overseas interbank credit markets in the UK, Eurozone and US. Please refer to Table 5 below for the results.

For both fictive banks, the Tier One capital ratio rose under the three shocks. At first glance, this seems counterintuitive. However, this is not a surprising result if one considers the *ceteris paribus* assumptions implicit in the test model, which hold constant all other economic processes happening within the banking firm. In the absence of any other specified processes affecting the bank's costs and revenues, we must assume that any retained earnings gained, albeit diminished, are added to the cumulative stock of retained earnings, which form part of regulatory capital. Thus, in the absence of changes to the risk-weighted assets, the capital ratio will actually increase in scenarios involving shocks of this magnitude. This feature of the simulation model will reflect in other test results.

While the interest rate shock did reduce profit flows for the two fictive banks, the profit buffer was never eliminated, preserving the banks' regulatory capital cushion. I sought to identify the level of interest rate spread that would eliminate the fictive banks' profit buffer and push their capital ratios below 7%. The spreads were 2200 bps (22%) and 1850 bps (18.5%) for RBC-BMO and TD-CIBC respectively, far outside the spreads observed during the 2007 financial crisis or in all of credit market history. Assuming that the way in which funding risk is modelled here is accurate, one may conclude from these results that the solvency of the two fictive banks would not have been eroded by shocks to short-term interest rates in the interbank market.

Table 5. Short-term credit shock (basis points short-term interest rate spreads)

Expressed in terms of Tier One Capital Ratio

Rise in IR	+100 bps	+200 bps	+350 bps	“Breaking point” (below 7% CAR threshold)
RBC-BMO				
Pre-shock	9.30%	9.30%	9.30%	
Post-shock	10.31%	10.10%	9.79%	2200 bps
TD-CIBC				
Pre-shock	9.95%	9.95%	9.95%	
Post-shock	11.52%	11.19%	10.69%	1850 bps

3.1.2. Asset write-down shock

Running the stress test using different magnitudes of asset write-downs to bank assets did give more dramatic results, suggesting the solvency of the fictive banks would be much more sensitive to falls in asset values than rises in short-term interest rates. Refer to Table 6 below. A 2.5% write-down in total assets, which was the highest write-down observed among Canadian banks and the average cumulative write-down among in the American bank sample, induces the capital ratios of the fictive banks to fall below the 7% Tier One capital ratio by OSFI. This would, according to the assumptions about test thresholds, trigger at least a Stage Two intervention by OSFI, where they would require the banks to recapitalize their balance sheet (among other measures). A 3.5% write-down in total assets, the highest write-down among the US banks, would reduce the Tier One capital ratio of RBC-BMO to the 4% threshold while pushing TD-CIBC to 3.8%. A fall below the 4% threshold triggers a Stage 4 intervention by OSFI, where it deems the bank’s failure as imminent, seizing it. If the two fictive banks

experienced asset write-downs at magnitudes observed among US banks during the crisis, the two banks would have faced pressure on their solvency triggering at a minimum a Stage Two intervention by OSFI.

Again, one observes another instance where the banks' capital ratios actually rise. This occurs when the shock factor is 1%, which is the average write-down factor observed among the large Canadian banks. Its rise is explained by the relative changes between regulatory capital and risk-weighted assets. While risk-weighted assets (the denominator) is directly reduced by the shock factor in this simulation model, the numerator regulatory capital only decreases if the profit buffer is all but eliminated. A 1% drop in asset value does not eliminate the profit buffer for the two banks.

Table 6. Shock to assets values (percent of total assets)
Expressed in terms of Tier One Capital Ratio

Fall in asset value	-1%	-2%	-2.5%	-3%	-3.5%
RBC-BMO					
Pre-shock	9.30%	9.30%	9.30%	9.30%	9.30%
Post-shock	9.51%	7.39%	6.29%	5.16%	4.01%
TD-CIBC					
Pre-shock	9.95%	9.95%	9.95%	9.95%	9.95%
Post-shock	10.23%	7.99%	6.63%	5.24%	3.80%

3.1.3. Combined scenario: asset write-down and interest rate shocks

In this set of stress test runs, I combine the interest rate shock and the asset write-down shock, replicating the two sources of financial stress that the large Canadian banks faced in the crisis. As the two factors do not directly interact with one another, their effects are additive. While not eroding regulatory

capital when tested in isolation, the shock to interest rates works in combination with asset write-downs to further reduce profits and erode regulatory capital more sharply. A 2.5% write-down of total assets combined with a 100 bps widening of short-term credit spreads reduces the capital ratios of RBC-BMO and TD-CIBC to 6.07% and 6.28% respectively, triggering a Stage Two intervention in both banks. Recall that a 2.5% asset write-down and a 100 bps widening of credit spreads reflect maximum shock magnitudes observed in the Canadian banking system. When applying a 3.5% write-down, the largest percentage among US banks, in unison with widening credit spreads, the capital ratios of both banks are below 4%, suggesting imminent failure.

Table 7. Combined scenario: shocks to interest rate and asset values
Expressed in terms of Tier One Capital Ratio

Fall in asset value	-1%		-2.5%		-3.5%	
	+100 bps	+350 bps	+100 bps	+350 bps	+100 bps	+350 bps
RBC-BMO						
Pre-shock	9.30%	9.30%	9.30%	9.30%	9.30%	9.30%
Post-shock	9.31%	8.77%	6.07%	5.51%	3.78%	3.21%
TD-CIBC						
Pre-shock	9.95%	9.95%	9.95%	9.95%	9.95%	9.95%
Post-shock	10.23%	9.39%	6.28%	5.39%	3.44%	2.52%

3.2. Adjusted simulated data

The following stress test results take into consideration the expected behavioral change among banks who undergo bank mergers. Recall that with the pro formaform method of data simulation, the banks' accounting values are simply added together. These estimates provide a reference time series representing the effects of merging. It assumes no synergies found in either

revenue or cost streams. Research in Essay Two found statistical robust evidence of banks that were bailed out during the crisis tended to be more reliant on short-term funding markets than their non-bailed out peers, as measured by the ratio of short-term funding liabilities to total funding liabilities. Also, bailed-out banks had stronger risk appetites than non-bailed banks as measured by the ratio of risk-weighted assets to total assets. These structural differences in banking strategy can be introduced in the pro forma bank data, reflecting the assumption that the two fictive banks would have shifted their bank strategies after consolidation toward those strategies followed by the banks bailed out during the crisis.¹⁵⁰

- Higher reliance on short-term funding. As discussed above under the basic terms of the framework, bailed-out banks tended to have average short-term funding ratios of 30%, compared to about 20% among non-bailed banks. The unmerged four Canadian banks were in this latter category. Indeed, the pro forma funding ratios are 15% for that TD-CIBC and 20% for RBC-BMO. A challenge for incorporating this information into the stress test is that the model uses an econometrically estimated parameter to transmit the effect of rising interest rate spreads to net interest income flows. The econometric model estimates this elasticity of net interest income flow using only changes in market interest rates, not the relative levels of the interest-bearing funding liabilities held by the bank. In other words, the relative amount of a bank's short-term debt

¹⁵⁰ With these behavioral changes, I am not introducing the assumption that the profit flows and total assets of the two fictive banks grow larger. They remain the same as under the pro forma estimates.

among total funding liabilities is not featured as an explanatory variable.

As an ad hoc solution designed to provide a realistic simulation of increasing a bank's reliance of short-term funding, I increase the estimated parameter showing the sensitivity of change in net interest income to change in short-term interest rates from a factor of -9 to -13.5. This 50% increase in the parameter value represents a 50% increase in the average funding ratio from 20% for non-bailed out banks to 30% for bailed out banks. This parameter value of -13.5 is substituted into the stress test model.

- Higher risk appetite: With respect to expected change in risk appetite, which is measured as the ratio of risk-weighted assets (RWA) to total assets, bailed-out banks tended to have average risk appetite ratios of about 55%. Among non-bailed out banks, the ratio is 50%. The pro forma risk appetite ratios for RBC-BMO and TD-CIBC are lower at 44% and 36% respectively. To introduce the effect of a higher risk appetite that would follow from merging, I increase the level of risk-weighted assets held by each fictive bank to equal 55% of their total assets. Further, I make the assumption that each bank would maintain the same Tier One capital ratios as in the pro forma simulations: 9.30% for RBC-BMO and 9.95% for TD-CIBC. This forces a corresponding upward adjustment in the level of regulatory capital held by each fictive bank.

3.2.1. Interest rate shock

The upward adjustment to the interest spread elasticity parameter does not lead to depletion of the fictive banks' capital for it to fall below 7% in the stress tests (see Table 8 below). This is consistent with the results from the initial pro forma simulations, where we again observe the capital ratios rising under the three shock magnitudes. However, under this adjusted model, the breaking point shock magnitude where the banks' ratio falls below 7% is lower.

Table 8. Short-term credit shock (basis points short-term interest rate spreads)

Altered bank model

Expressed in terms of Tier One Capital Ratio

Rise in IR	+100 bps	+200 bps	+350 bps	"Breaking point" (below 7% CAR threshold)
RBC-BMO				
Pre-shock	9.30%	9.30%	9.30%	
Post-shock	10.04%	9.78%	9.40%	1625 bps
TD-CIBC				
Pre-shock	9.95%	9.95%	9.95%	
Post-shock	10.88%	10.55%	10.06%	1525 bps

3.2.2. Asset write-down shock

Referring to Table 9, we see that applying the write-down shock to the adjusted bank data gives post-shock capital ratios that are higher than under the initial pro forma test. For example, a 2.5% write-down to RBC-BMO leads to a 6.90% ratio versus 6.29%. For TD-CIBC, the post-shock ratio is 7.80% versus 6.63. Unlike the result of the corresponding pro forma test, these ratios are above the 7% threshold, meaning a Stage Two intervention would not be triggered.

Table 9. Shock to assets values (percent of total assets)

Altered bank model

Expressed in term of Tier One Capital Ratio

Fall in asset value	-1%	-2%	-2.5%	-3%	-3.5%
RBC-BMO					
Pre-shock	9.30%	9.30%	9.30%	9.30%	9.30%
Post-shock	9.47%	7.77%	6.90%	6.00%	5.09%
TD-CIBC					
Pre-shock	9.95%	9.95%	9.95%	9.95%	9.95%
Post-shock	10.13%	8.67%	7.80%	6.92%	6.01%

3.2.3. Combined scenario: asset write-down and interest rate shocks

Under the combined shock scenario, there is a similar pattern as in the asset write-down scenario. The application of the adjusted data results in capital ratios are higher than when using the pro forma data. A 2.5% write-down combined with a 100 bps widening of credit spreads (shock factor values associated with the more extreme financial conditions observed historically in the Canadian system during the crisis) results in a 6.63% ratio for RBC-BMO, versus 6.07%. For TD-CIBC, the post-shock ratio rises above the 7% threshold from 6.28% to 7.46%. Using the more extreme shock values observed in the American system (a 3.5% asset write-down and a credit spread widening by 350 bps), the resulting capital ratios are higher than those that result using the pro forma data. In fact, the resulting ratios are both above the 4% threshold that trigger a Stage Four intervention. RBC-BMO is at 4.14% (versus 3.21%) and TD-CIBC is at 4.78% (versus 2.52%). Under these test runs, both fictive banks appear better capitalized, giving weaker signals of imminent failure.

The decision to introduce changes in the simulated data reflecting riskier behavior in the fictive banks does affect the stress test results, but not in the way expected. For example, the rise in the proportion of risk-weighted assets held on a bank's balance sheet, an indicator of a higher risk appetite, is met with an equal proportionate rise in the amount of regulatory capital held by the bank, assuming the bank continues to maintain the same capital ratio as under the pro forma simulation. This creates a larger capital cushion in absolute value terms for each bank, reducing capital erosion under the various shock scenarios and leading to higher post-shock ratios.¹⁵¹

Table 10. Combined scenario: shocks to interest rate and asset values

Altered bank model

Expressed in term of Tier One Capital Ratio

Fall in asset value	-1%		-2.5%		-3.5%	
Rise in IR	+100 bps	+350 bps	+100 bps	+350 bps	+100 bps	+350 bps
RBC-BMO						
Pre-shock	9.30%	9.30%	9.30%	9.30%	9.30%	9.30%
Post-shock	9.22%	8.57%	6.63%	5.96%	4.82%	4.14%
TD-CIBC						
Pre-shock	9.95%	9.95%	9.95%	9.95%	9.95%	9.95%
Post-shock	10.13%	9.19%	7.46%	6.59%	5.66%	4.78%

3.3. Pro forma banks with minimum required capital

This round of stress tests applies data for the fictive banks where the banks hold the minimum amount of Tier One regulatory capital required by OSFI;

¹⁵¹ Underlying this mechanism is the assumption of a linear relationship between the rise in risk appetite (RWA/total assets) and asset write-downs. It is possible that in reality, there is an increasing non-linear relationship, where a small increase in the proportion of risk-weighted assets held on a balance sheet is associated with a larger increase in write-downs. A blunt proxy for this possibility is provided by including -3.5% as an extreme shock value for asset write-down, where a rise in risk appetite of the fictive Canadian banks is tested against a write-down size not observed in the Canadian system.

that is, 7% of risk-weighted assets. A comparison between these test results and those obtained using the initial pro forma bank data reveals the sensitivity of stress test results to actual capital levels held, which in turn is influenced by the regulatory capital ratios set by OSFI. Also, this round implicitly tests for the role of risk aversion in bank behavior in mitigating against insolvency risk. The difference between the minimum required Tier One capital and the level actually maintained by the banks, which in the case of the two fictive banks amounts to two percentage points above 7%, may be interpreted as a measure of relative risk aversion by the bank.

3.3.1. Interest rate shock

In the case of the interest spread shock, the results were consistent with those of the two previous rounds. Refer to Table 11 below. Each shock magnitude led to a higher post-shock capital ratio while the breaking point was at a lower interest rate spread. These results reinforce the previous conclusion that the interest rate spread shock plays a secondary role as driver of insolvency.

Table 11. Short-term credit shock (basis points short-term interest rate spreads)

With 7% pre-shock capital ratio

Expressed in term of Tier One Capital Ratio

Rise in IR	+100 bps	+200 bps	+350 bps		“Breaking point” (below 7% CAR threshold)
RBC-BMO					
Pre-shock	7.00%	7.00%	7.00%		
Post-shock	8.02%	7.81%	7.49%		1100 bps
TD-CIBC					
Pre-shock	7.00%	7.00%	7.00%		
Post-shock	8.57%	8.24%	7.74%		950 bps

3.3.2. Asset write-down shock

Post-shock results under the asset write-down shock give more severe results (Table 12). A 2% write-down, which is in the range of write-downs observed among Canadian banks, causes the fictive banks to fall below the 7% threshold, triggering a Stage Two intervention by OSFI. With a 2.5% write-down, the resulting capital ratio for RBC-BMO is 3.86% (versus 6.29% in the pro forma round) and is 3.47% for TD-CIBC (versus 6.63%). Being both below the 4% threshold, a Stage Four intervention would be triggered, signalling imminent bank failure.

Table 12. Shock to assets values (percent of total assets)

with 7% pre-shock capital ratio

Expressed in term of Tier One Capital Ratio

Fall in asset value	-1%	-2%	-2.5%	-3%	-3.5%
RBC-BMO					
Pre-shock	7.00%	7.00%	7.00%	7.00%	7.00%
Post-shock	7.16%	4.99%	3.86%	2.70%	1.51%
TD-CIBC					
Pre-shock	7.00%	7.00%	7.00%	7.00%	7.00%
Post-shock	7.20%	4.87%	3.47%	2.03%	0.54%

3.3.3. Combined scenario: asset write-down and interest rate shocks

Under the combined shock scenario, the same pattern is observed (see Table 12). The capital ratios are eroded much more sharply, even under more moderate shock values. A 2.5% write-down combined with a 100 bps widening of credit spreads, the scenario within the range of conditions observed in the Canadian system during the crisis, gives post-shock capital ratios below the 4% threshold, at 3.64% and 3.11% for RBC-BMO and TD-CIBC respectively.

Whereas the tests with pro forma data using these same shock magnitudes result in post-shock ratios just above 6% for both banks, triggering a Stage Two intervention where OSFI requires the banks to recapitalize, these test results signify a Stage Four intervention by OSFI in both banks. When applying the more extreme shock values observed in the American system (3.5% asset write-down and credit spreads widening by 350 bps), even more severe results are obtained. The post-shock capital ratio of RBC-BMO is reduced to 0.72% while the regulatory capital cushion for TD-CIBC is effectively wiped out.

Table 13. Combined scenario: shocks to interest rate and asset values
with 7% pre-shock capital ratio
Expressed in term of Tier One Capital Ratio

Fall in asset value	-1%		-2.5%		-3.5%	
Rise in IR	+100 bps	+350 bps	+100 bps	+350 bps	+100 bps	+350 bps
RBC-BMO						
Pre-shock	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Post-shock	6.96%	6.42%	3.64%	3.08%	1.29%	0.72%
TD-CIBC						
Pre-shock	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Post-shock	7.20%	6.35%	3.11%	2.22%	0.17%	-0.75%

3.4. Summary

Examining the results of these three rounds of stress tests using a consistent set of stress values gives the following conclusions. All three test rounds found that asset write-down shocks were the main driver that push the fictive banks toward insolvency, with shocks to interest rate spreads being minor. The second round of tests revealed that one can add elements of riskier bank behavior to the underlying bank data and test model and not put the fictive banks at a greater risk of insolvency, so long as the banks maintain a sufficient regulatory capital ratio. The third round of tests informed what a sufficient regulatory capital ratio means in the context of this test framework. It means holding regulatory capital in excess of the required minimum amount; in this case, about two percentage points above the required minimum ratio of 7%. This excess amount of capital appears to provide a cushion against not only the range of shock factors featured in the test but also against the effects of introducing elements of riskier behavior. Consider the application of a set of shock values considered the maximum values observed in the Canadian system during the crisis (a 2.5% write-down and a 100 bps spread widening). When the fictive banks maintain capital ratios similar in size as what the actual banks displayed on the eve of the crisis (in range of 9%), both banks are weakened, with one, RBC-BMO, triggering a Stage Two intervention. If these banks maintain capital ratios at the 7% minimum, both have post-shock ratios below 4% signifying failure. Maintaining the capital ratios above the regulatory minimum may be interpreted as an expression of risk aversion by banks.

With these general conclusions in mind, the two sets of specific findings may be made. If the two fictive banks RBC-BMO and TD-CIBC were exposed to shock magnitudes observed within the Canadian system, they would at most experience some pressure on solvency, possibly triggering a Stage Two intervention (which involves corrective actions to be undertaken by the banks). However, if the two fictive banks faced shocks in the range of observed in the US system, the stress test evidence suggests greater capital erosion, signifying bank failure. Both results assume that above-minimum regulatory capital ratios are maintained.

4. Discussion

The stress test simulation gives quantitative evidence supporting two counterfactual outcomes of the two fictitious merged banks: solvency or insolvency. If these banks experience asset write-downs in the range of what the actual Canadian banks experienced during the financial crisis (of less than 2.5%), they would at most fall just under the 7% Tier One capital ratio required by OSFI, triggering a Stage Two intervention involving corrective measures. These banks would not fail in these circumstances. However, if the banks faced asset write-downs in the range experienced by their US counterparts (equal to or greater than 2.5%), they tend to fall below the 4% ratio, sharply eroding their capital and signaling to regulators that imminent insolvency is likely. Both counterfactual outcomes are feasible. They are the results of a reasonably sound

simulation and it is plausible that either outcome could have happened. Neither is absurd or paradoxical.

To answer the principal question “if these four Canadian banks had merged in 1998, would the resulting two merged banks have faced a greater risk of failure in 2008?”, we need to judge these two mutually exclusive outcomes on the basis of which receives the strongest support by the contextual facts. In the case of comparative counterfactuals, Harvey (2012) suggests “the evidence for and against both counterfactuals must be discussed together, because the strengths of one are directly relevant to uncovering weakness of the other” (p. 5). Further, one should take the same approach with these two outcomes as when facing multiple equilibria in formal model analysis. By examining initial conditions and the structures which restrict and enable behavior, one may learn about the paths that would lead to these different outcomes. Both counterfactual outcomes are conditional. This decision cannot be made comparing quantifiable probabilities as one would along the lines of the Pearson-Neyman model of hypothesis testing using statistics. Instead, the counterfactual analyst must assess the information set for what may be held as fact. In counterfactual analysis, what is meant by “fact” are those relevant aspects of the historical reality under analysis that are judged not to change in the counterfactual scenario, that are not “rewritten”. These judgements are certainly subjective and should be held up to scrutiny. An example of a fact in the essay here is regulator behavior, assumed not to change if the four banks merged.

With the relevant information gathered in this exercise organized either in support of the principal (alternate) hypothesis “banks face a greater risk of failure” or in support of the null hypothesis “banks did not face a greater risk of failure”, a judgement on the balance of the overall weight of the evidence for each hypothesis is made, arriving at a conclusion about the principal hypothesis. To make this assessment, I first look at the limitations of the stress test framework before considering the behavior of the banks and the regulator during the counterfactual period.

4.1. Limitations of the stress test framework

It has been remarked at the outset that the stress test model is relatively simple in its assumptions and construction. One consequence of the model's simplicity is observed above in the results of some test runs where post-shock capital ratios rise rather than fall. These counterintuitive results are explained by both the specification of bank accounting mechanisms in the model and the *ceteris paribus* assumptions implicit in it, which hold constant all other economic processes happening within the banking firm. With this short-coming weakening the realism of the test model, further development is warranted.

Other features introduce various biases in the test results that favour either of the two hypotheses being considered. Features that produce biases against the principal hypothesis of facing greater risk of bank failure include the assumptions of linear, additive relations between financial variables in the model rather than non-linear relations. If in reality there is an increasing non-linear

relationship¹⁵² between portfolio write-down and solvency ratio, where a small change in the former leads to a large change in the latter, then a test model with this feature may give sharper declines in bank capital. This point on non-linear relations is linked to aspects of bank organization and market relationships not represented in the bank data and test model. Apart from being counted in the calculation of risk-weighted assets, a bank's involvement in off-balance sheet activities, such as holding financial derivatives or maintaining special purpose vehicles to facilitate securitization, is not represented in the simulated bank data. Exposure to these financial instruments and legal/accounting entities are a source of additional financial risk for banks. Further, the connections a bank has to other financial agents (including other banks), such as being a counterparty to derivative instruments such as credit default swaps, are not represented in the test model. These, and other examples of financial connectivity such as reliance on short-term money markets for funding, all contribute to a bank's exposure to systemic risk. Systemic risk is the probability of catastrophic breakdown in the wider financial system where numbers of financial actors become impaired and

¹⁵² A general non-linear mathematical relationship between two variables involves change in one variable that does not correspond with constant change in the other variable. The deficiencies and failures of established economic models that became apparent in the wake of the 2008 crisis has drawn attention to the role of non-linear relationships in finance and macroeconomics. Past confidence in linear economic relationships was undermined by the unexpected observations of non-linear behavior among variables. One explanation of this behavioral shift is change in the behavior and relations of the intervening variables that link two variables of interest. Constâncio (2014) offers three examples of non-linear economic relations now studied in the post-crisis era: 1) monetary policy and inflation expectations when the key policy rate is maintained at or near the zero bound limit (the intervening variables include unconventional monetary policy measures and the size of the fiscal multiplier), 2) macroprudential regulation of credit supply and macroeconomic stability (where Intervening variables include asset prices and financial innovation), and 3) monetary policy within a multinational monetary union and sovereign debt sustainability (where intervening variables include variation in financial frictions across member nations).

cannot honor their obligations to other actors, causing other actors to become impaired. Off-balance sheet activities and exposure to systemic risk can both add to the overall solvency risk faced by a bank. Their absence in the model may lead to an underestimation of post-shock capital ratios.

Another critical feature of the stress test model is that it assumes a single period horizon where the applied shock magnitudes cause an instantaneous change in the banks' financial variables. In this model, this single period represents five consecutive reporting quarters for the banks, from August 1, 2007 to October 31, 2008. Across these five quarters of this crisis period, there was a varied distribution of declared portfolio write-downs among the actual four Canadian banks. Also, several of these large Canadian banks were also able to raise capital privately to recapitalize after write-downs declared during these quarters. The absence of any opportunity to raise capital in the test's horizon biases the results against any corrective actions the banks actually took to rebuild their regulatory capital cushions during the crisis period. A more realistic test model would involve introducing several successive time intervals where the banks not only are subject to financial shocks but also have the option to attempt to recapitalize.

These arguments about the weaknesses of the stress test framework support both hypotheses. As it is difficult to judge towards which hypothesis the balance of the arguments tip, the information provided by exploring the limitations

of the framework is inconclusive.¹⁵³ The test findings supporting both hypotheses are taken as given.

4.2. Bank behavior

With the test model's exposed biases not favouring one hypothesis over another, we turn to the banks and ask what kind of bank behavior would support the outcome of bank insolvency. What kind of actions would place the fictive banks on a path resulting in asset write-down in the range of 2.5% to 3.5%? Four enabling conditions relating to bank behavior are identified.

- *One: banks take additional portfolio risk.* The fictive banks seek greater portfolio risk than the actual predecessor banks, risk that would not be adequately cushioned by their relatively high regulatory capital levels. This higher risk-seeking tendency exists despite the chastening effects of significant loss events experienced in the years leading up to the crisis. The actual large banks did experience such events (such as losses stemming from the internet bubble in 2000), argued to have led some banks (namely TD and CIBC) to have shifted their existing business models towards less risk.
- *Two: greater exposure to the US subprime market.* The second condition is that the fictive banks seek this additional risk through asset classes that underwent a similar scale of re-pricing during the crisis. This would likely involve greater exposure to the US subprime mortgage market either

¹⁵³ One direction for further research is to further develop the framework to address these shortcomings; for example, a multi-period test framework could be designed where the bank has an opportunity to raise capital after each period.

through direct mortgage loans or through mortgage-backed securities and related derivatives. This would entail greater activity by Canadian banks as originators of the subprime mortgage loans in the US (though commercial banking subsidiaries), as investment bank “middle men” involved either in the manufacture of subprime-related financial instruments or acting as market makers and counterparties, or as investors in these financial instruments. The fictive merged banks would have a larger footprint in these American markets than did their actual predecessor banks. While having made significant in-roads in the US, Canada’s actual Big 6 universal banks were relatively minor players south of the border, drawing most of their revenues from Canadian sources. Seeking similar risk in the Canadian mortgage market was not possible given the relatively little subprime mortgage loans originated in Canada and that the Canadian mortgage securitization market was dominated by a crown agency, the CMHC.

- *Three: banks hold minimum regulatory capital.* The third condition is that the fictive banks have less regulatory capital than the actual banks. Instead of holding more than 9%, they would have held closer to 7%, the regulatory minimum.
- *Four: banks do not recapitalize.* The fourth condition for these two fictive banks to book large write-downs in the 2.5% to 3.5% range that not only tempt insolvency but bring it to fruition is these banks either choose not to

raise capital from private investors in order to recapitalize after the write-downs or be simply prevented from doing so by lack of investor interest.¹⁵⁴

4.3. Regulator behavior

These four conditions about the behavior of the merged banks support the counterfactual outcome that the two fictive banks took on greater proportionate risk than the actual banks, experienced larger write-downs (in the range of 2.5 to 3.5 %), and faced insolvency. These conditions are all contrary to what was historically observed among Canadian banks leading up and during the crisis. Thus, this counterfactual path invites scrutiny. However, even if these conditions are accepted, we must consider that a set of institutions that combine to restrict the scope of bank behavior: the Canadian regulatory regime.

In addition to the actual actions taken by Canadian regulatory agencies to ease the stresses within the Canadian financial system, these agencies held several policy levers that were left unused during the crisis. An example is the Bank of Canada's Emergency Lending Assistance facility that could have been made available to qualified financial institutions who are solvent and "requiring more substantial and prolonged credit" (Longworth, 2010, p. 49).

¹⁵⁴ These conditions can be represented as a decision tree for the fictive banks displaying five levels of decisions (decision nodes) that would culminate in crisis performance: 1) add more risk, 2) market location of risk, 3) asset class, 4) regulatory capital levels, 5) raise capital during the crisis. While probabilities can not be assigned to each node and subsequent outcome, the decision tree would illustrate the number of contingencies involved if a bank pursues a particular path that ultimately results in insolvency.

Yet, rather than speculate on how unused policy levers could have been drawn upon in this counterfactual scenario to help avoid bank failures, let's focus on the set of regulatory institutions that was in force during the crisis, that of the prudential regulator OSFI. OSFI's Supervisory Framework, developed and initiated in ordinary times, was suddenly thrust into extraordinary times by August 2007. The framework in place included the four-stage graduated intervention system, risk rating assignment, frequent regulatory filings, periodic meetings between OSFI officials and bank directors and management as well as rules above minimum capital and maximum leverage and a host of guidelines. OSFI supervises banks on a consolidated basis, meaning it oversees both the domestic and overseas operations of Canadian banks. The regulatory relationship established before the crisis was characterized by a regular dialogue between bank and regulator, joint creation of principles of behavior and expectations of prudent conduct. Expectations set out prior to the crisis would support what would be deemed prudent responses during the crisis. This would have acted as a check on any tendencies within the banks to build up risk.

There are good reasons to believe this relationship functioned effectively once the crisis broke out. There is evidence of early dialogue between OSFI and the banks on how to be vigilant during the early turbulent times. The banks were requested by OSFI to focus on their internal stress-testing capabilities as part of their overall risk management efforts (OSFI, 2013). The graduated intervention system is predicated on early detection and course correction. In the quarters leading up to the peak stress of September and October 2008, most of

the large Big Six banks had publicly declared quarterly write-downs and in some cases, losses. CIBC, the Canadian bank that experienced the largest cumulative write-downs leading up to the peak crisis, booked most of them early in the crisis, between November 2007 and April 2008, along with quarterly losses and remedial capital raisings. CIBC returned to profit by the next quarter before the acute stress struck. These efforts to recapitalize are aligned with what we would expect OSFI to request of CIBC following these publicized financial updates. There is little doubt that these write-down declarations by CIBC and other fellow banks would have been a topic of discussion with the regulator, and that the regulator would encourage the banks to course correct. This is the sort of action described in Stage One and Stage Two of the intervention framework.

It is a reasonable assumption to expect the regulatory regime in the counterfactual scenario to respond as it is understood to have responded in history, guiding the fictive banks away from building up the amount of risk that would lead to asset write-downs that take the banks to the brink of insolvency. However even if the fictive banks did build up this amount of risk, the regulatory system would provide an opportunity for the banks to course correct, assuming the public disclosure of their write-downs and losses (in quarterly financial reports) were made early enough in the crisis. Stage Four interventions could have been averted.

4.4. Conditions leading to insolvency

The evidence supporting the argument that the regulatory regime would have blocked any bank actions that would lead to asset write-downs of 2.5% or greater also supports the hypothesis that the banks would not face a greater risk of insolvency. Given this argument, are there any conditions that would lead to a Stage Four intervention in the two banks by their prudential supervisor? There are three conditions underpinning this scenario.

- *Minimum asset write-downs of 2.5%.* The banks endure asset write-downs at a minimum of 2.5% of pre-crisis total assets (the average cumulative write-down among the sample of US banks).
- *Ineffective regulatory regime.* The second condition is that the regulatory relationship between the banks and OSFI is ineffective leading up and during the crisis, despite its design. The two banks would act outside the expectations inherent in their regulatory relationship. For example, they would have to ignore any guidelines on prudent portfolio management (contravening a principle of conduct they helped devise) and accumulate a higher exposure to US subprime mortgage-related instruments. They would hide this risk in their public and regulatory disclosures. OSFI and other regulators are ineffective in detecting this behavior, or they choose not to respond to it quickly. The two fictive banks maintain smaller Tier One capital cushions, in proportions closer to the 7% minimum ratio. As demonstrated in the stress tests above, this action would make the banks much more vulnerable to insolvency risk across the different write-down

shocks. Further, any efforts at course correction, as laid out by the Guide to Intervention, would be ineffective in arresting a descent toward insolvency.

- *All write-downs in a single quarter.* For course correction to be ineffective, the third condition is the timing of the write-down shock. To sharply reduce the chance that banks could turn their businesses around if impaired during the crisis period, most if not all of the cumulative write-downs would be declared in a single quarter (rather than distributed across five quarters) right before the months of peak stress in the crisis when several financial institutions in the US and Europe either failed or were bailed-out. This would be the banks' third quarter 2008 (the months of May 1st to July 31st, 2008), whose financial statement would have been reported thirty days hence in early September. September 2008 was a period of high uncertainty among US financial institutions. Recall that the US government seized the two quasi-public mortgage financiers Fannie Mae and Freddie on September 7, followed by Lehman Brothers declaring bankruptcy on September 15.

If the two fictive Canadian megabanks declared sharp write-downs and losses amid this escalating market unease abroad, displaying that they were seriously undercapitalized, it is probable that this would draw public questions about the banks' future viability, inducing sharp drops in stock prices, departure of clients, calls to post collateral by counterparties, withdrawal of deposits, et cetera, all

contributing to a rapid drain on the banks' cash resources without any option of a private sector resolution (either through investment, sale of assets or acquisition). This scenario ends in a Stage Four intervention by OSFI. However, the prospect of winding down and closing Canada's two largest banks would bring great dislocation in the aggregate supply of financial services. A more likely response by the Canadian government would have been to follow the lead of the British, American, French and German governments (who are at the same time forced to respond to faltering financial institutions) and publicly recapitalize the two fictive banks to avoid the collapse of the larger Canadian financial system.

4.5. Summary

Yet this path to a Stage Four intervention signifying imminent insolvency can at best be regarded as a special case with low probability within this larger counterfactual scenario. This outcome is contingent on several hypothetical conditions that would all need to exist and be enabled by the absence of several corresponding historical facts from this counterfactual scenario, historical facts about bank behavior and regulator behavior. See Table 14 below for a summary. The fictive banks could have attempted to act in ways contrary to historical fact and outside what we expect of behavior changes resulting from bank mergers, and have chosen to build up greater exposure to the US subprime mortgage market. However, this risk tendency by the banks would be braked or dampened through its relationship with its prudential regulator OSFI. Given the nature of the regulatory regime's evolution leading up to the 2008 financial crisis, that its

development was independent of the 1998 bank merger decision, and given the effectiveness of the regulatory regime actually observed during the crisis, I argue that this regulatory effectiveness would have existed in the counterfactual scenario, acting as a check on the fictive banks seeking additional portfolio risk that would have resulted in a greater risk of insolvency. This regulatory guidance, combined with the timing of write-down disclosures over the crisis period, would combine to assist the banks avoid greater insolvency risk. As the probability that the hypothetical conditions supporting the principal (alternate) hypothesis is low, the balance of the counterfactual arguments presented here favour the null hypothesis: the merged banks would not have faced a greater risk of failure in 2008.

Table 14: Summary of the counterfactual argument

NULL HYPOTHESIS	ALTERNATE HYPOTHESIS
<i>If the four banks had merged in 1998, the resulting banks would not have faced a greater risk of failure in 2008.</i>	<i>If the four banks had merged in 1998, the resulting banks would have faced a greater risk of failure in 2008.</i>
Risk: Rejecting the true hypothesis	Risk: Accepting the false hypothesis
ARGUMENTS/EVIDENCE	ARGUMENTS/EVIDENCE
Stress test model assumes single period horizon, does not allow for capital raising after quarterly losses. Model gives simplistic path to insolvency.	Stress test model is linear, does not include off-balance sheet risks and systemic risks. Model underestimates effect of write-down shocks.
Weaknesses of the stress test model affect both hypotheses, thus inconclusive.	
Stress tests find that if fictive banks have a cumulative portfolio write-down less than -2.5%, the banks would not face a greater risk of insolvency.	Stress tests find that if fictive banks experience a cumulative portfolio write-down greater than or equal to 2.5%, they would face a greater risk of insolvency.
HISTORICAL FACTS NEGATING HYPOTHETICAL CONDITIONS	HYPOTHETICAL CONDITIONS FOR EXPERIENCING A ≥ 2.5 WRITE-DOWN:
Supervisory Framework in place at beginning of crisis; evidence of it	Regulatory relationship is ineffective (e.g. supervisors do not detect issues or

functioning as designed (e.g. active bank-regulator dialogue)	hesitate to act; rules are challenged and guidelines ignored)
Loss events in the ten years leading up to 2008 crisis discourage risk taking.	Banks seek greater portfolio risk.
OSFI's "Large Exposure" guideline limits exposure to US subprime MBS.	Banks seek additional portfolio risk through US subprime MBS and related derivatives.
Banks held Tier One capital ratios over 9% on eve of crisis.	Banks hold no regulatory capital in excess of OSFI's 7% minimum for Tier One capital.
Banks recapitalized throughout the crisis, even during quarter of peak stress.	Banks choose not to recapitalize by tapping equity markets, or do not have option.
Banks distribute disclosed write-downs across the five quarters leading up to peak stress.	All cumulative write-downs are booked in one quarter (May-July 2008) and disclosed during peak stress of September 2008.
The (subjective) probability that all the conditions supporting ≥ 2.5 write-downs would have existed and have been enabled by the absence of these historical facts (about both bank and regulator behavior) is small.	
CONCLUSION. The balance of the counterfactual arguments as presented here favours the null hypothesis: the merged banks would not have faced a greater risk of failure in 2008.	

5. Conclusion

Early in 1998, the final year of a federal task force on the future of financial services in Canada, two large Canadian banks, Royal Bank and Bank of Montreal, announced their intention to combine in merger of equals, surprising both government officials and the Canadian public. Several weeks later, two other large banks, Toronto Dominion and CIBC, conveyed similar intentions. After months of public debate, then federal Minister of Finance Paul Martin announced that the two proposed mergers would not be permitted for reasons of competition. As such, the four banks continued along their historic paths as unmerged banks. Ten years later, these banks would display relative strength and stability while many of their counterparts in the US and in Europe would endure insolvency or public rescue during the 2007 financial crisis. Among the explanations offered to explain this Canadian puzzle was the past policy decision to block the bank mergers. This decision helped Canada dampen the “too-big-to-fail” problem with its banks, thereby avoiding having to intervene and publicly recapitalize the banks.¹⁵⁵

This essay sought to test this proposition that the blocked bank mergers helped contribute to their relative stability during the crisis by posing its

¹⁵⁵ Given the dominating size and complex linkages of the Big Six banks within the Canadian financial system, they are without a doubt “too big to fail” (TBTF) as the failure of any one of them would have significant consequences for stable continued supply of financial services within the Canadian system. This status is in fact now official with the 2013 designation by OSFI of the Big Six banks as domestic systemically important banks (D-SIBs). However, the decision to block mergers and not allow further industry concentration served to inhibit the problem of having TBTF banks; that is, the moral hazard problem of banks being able to wield their power to exploit any implicit government policy to rescue such TBTF banks if they succumb to the downside of risk. Such exploitation could take the form of pursuing high risk business strategies in the knowledge they will be publicly rescued should they fail. By blocking the mergers, the government prevented a more concentrated banking oligopoly and the enhanced economic and political power of the banks that enables such behavior.

counterfactual and attempting to answer it: *if these four Canadian banks had merged in 1998, would the resulting two merged banks have faced a greater risk of failure in 2008?* It tested this proposition that history may have been different using a counterfactual framework. The challenge of counterfactual analysis is that it does not enjoy the benefits of using evidence of what actually happened. Instead the analysis relies on a simulation of what may have happened and uses these simulation results to answer the counterfactual question. In the counterfactual exercise here, the evidence gathered and organized finds that the probability of hypothetical conditions supporting the hypothesis as low, tilting the balance of the argument toward the following conclusion: the merged banks would not have faced a greater risk of failure in 2008. Here is how I arrived at this conclusion.

The counterfactual framework designed to test this hypothesis is an example of the “loose theory” approach to counterfactual analysis. Eschewing the formal modeling- and-econometrics direction of the “strong theory” approach that tends to be followed in economics research, this framework combines data simulation, stress testing and prior theorizing in an overall methodology akin to appreciative theorizing and theory-guided process tracing. The financial time series of the two fictive banks from the 1998 merger decision to the eve of the 2008 crisis were obtained using a pro forma method, which is simply the summation of the actual time series of the two predecessor banks involved in each hypothetical merger. A second set of simulated data is obtained by modifying the pro forma data reflecting changes in bank behavior expected to

follow consolidation. Both sets of data are applied in a simple financial stress test model where the two fictive banks are subject to two financial shocks, a funding shock and a portfolio shock, over a single period horizon representing the crisis period of August 2007 to October 2008. Using varying magnitudes of these two shocks in both separate and combined scenarios, we can measure how the two fictive banks would perform under similar distressed conditions observed during the crisis. By focusing on the effects these shocks have on the banks' regulatory capital, we can assess the pressure placed on their solvency.

Several iterations of the stress test result in two general outcomes. If the two fictive banks had suffered cumulative portfolio write-downs less than 2.5% of pre-crisis total assets (the range of write-downs observed among Canadian banks), the two banks would have at most experienced some capital erosion, possibly triggering requests by the prudential regulator to course correct, including seeking recapitalization from private investors. Yet this would not have threatened their continued viability. If, however, the banks experienced write-downs equal to or greater than 2.5% (levels observed among American banks that failed), they would suffer capital depletion to levels assumed in this framework to indicate imminent failure.

This latter outcome, which confirms the principal hypothesis, does not stand up under broader consideration. For the experience of portfolio write-downs of this magnitude to be highly probable in this counterfactual simulation, several conditions would have to exist. These conditions include seeking greater exposure to US subprime mortgage-related instruments, holding no excess

regulatory capital, avoiding opportunities to raise capital, publicly disclosing all portfolio write-downs in a single quarter amid the acute financial distress of September 2008 and generally cease complying with the regulatory regime. For these conditions to exist and enable this outcome, several historical facts that would negate these conditions would have to be absent in the counterfactual scenario. However, there are strong reasons to not make this judgement. Among them is the effectiveness of the Canadian regulatory regime, both leading up to and during the financial crisis. The relationship between the fictive banks and their prudential regulator would dampen or brake any tendencies within these two banks to build up additional risk that would unknowingly threaten their solvency during the crisis. Therefore, the combined series of events that would lead the two banks to experience portfolio write-downs of this magnitude is a deemed of low probability in this counterfactual scenario. The balance of the argument supports the proposition that the merged banks would have not faced a greater risk of failure in 2008.

This is a provisional conclusion in an exercise designed to assess the historical significance of a past policy action in explaining the performance of Canada's banking system during the recent global financial malfunction. What I present here is a first contribution in a potential wider research initiative. Further refinement of the overall counterfactual framework could involve employing different methods of data simulation and further refining the stress test model.

Conclusion to Dissertation

Summary of three essays

The dissertation posed three questions about the Canadian banking system and answered them in three essays. All three relate to the puzzle of Canadian bank stability during the 2008 financial crisis, the puzzle that Canadian banks displayed relative resiliency while their counterparts in the United States and in several European nations faced the threat of insolvency. No exploration of the Canadian puzzle can avoid the role of public policy and other state actions. Not only is the government a key actor in explaining this episode, it is present throughout Canadian banking history, transforming the financial system over time through the creation of institutional structures. Given the role of public policy in financial stability, it is not surprising the observed stability of the Canadian banks has attracted the interest of governments seeking policies to address banks deemed “too big to fail”.

One policy action that has been included among causal explanations of the Canadian puzzle is a federal government decision in 1998, when proposed mergers of four large banks into two consolidated megabanks was rejected by the government. The historic interlude marked by this 1998 decision and the 2008 crisis figure in all three questions explored in this dissertation.

In Essay One, the 1998 merger decision is argued to be a key event in the formation of a stable national financial order that would condition the behavior of the large banks up to and during the 2008 crisis. This essay asked: *among the factors responsible for the observed stability of the large Canadian banks in*

2008, was it the behavior of the banks themselves, above and beyond that required by public regulation, which played an important role in avoiding instability? To answer this question, a historic narrative of the evolution of the Canadian financial system is organized using a political economy framework adapted from Cox's (1981) method of historical structures. The framework, dubbed the neoMHS, organizes the swath of Canadian financial history, from its early European colonial origins to the recent crisis, into five conjunctural periods defined by the emergence and existence of distinct national financial orders (NFO). An NFO is defined here as a configuration of structural forces (institutions, ideas and material capabilities) that defines the problematic of national finance; that is, how state actors and private economic actors combine to supply financial services.

The application of the neoMHS describes the NFO that begins to emerge in 1986 following the failure of two regional banks in 1985, and later solidifies in form between the 1998 merger decision and the 2002 Bank Act (which in part clarified the merger review process going forward). This NFO would be place leading up to and during the 2008 crisis. This emergent NFO is distinguished by a new regulatory relationship at the centre of it. The 1999 Supervisory Framework implemented by the Office of the Superintendent of Financial Institutions (OSFI) is argued to be the keystone policy event among several incremental developments that re-define the bank-regulator relationship. It is described as an expectation-based relationship along the lines of responsive regulation theory articulated by Ayers and Braithwaite (1992). Two core tenets of

the relationship are the principle of escalating intervention – the willingness of the regulator to escalate or de-escalate intervention in response to bank performance – and enforced self-regulation - where banks collaborate with the regulator to create rule and guidelines, with which they are then expected to comply. These core tenets, among other features, provide incentives for the banks to cooperate in this relationship. This relationship may be represented in game theoretic terms as a variation of the prisoner’s dilemma. In the Game of Responsive Regulation where banks face the choice of cooperation or defection, bank cooperation is reinforced by these incentive structures, giving an equilibrium outcome that is consistent with observations of the Canadian banking order leading up to and during the crisis.

This interpretation of the historical context in which the Canadian banks acted during the crisis implies that this essay’s principal question is unanswerable. Given this regulatory relationship, it is difficult to disentangle autonomous bank behavior from the relationship banks have with the regulatory state. The behavior of the large Canadian banks, above and beyond that required by public regulation, cannot be isolated to allow judgement of whether it played an important role in avoiding instability during the crisis.

Essay Two extends the factual investigation of the Canadian puzzle but from a positivist methodological angle. The essay tests the hypothesis that *“mergers of equals” contribute to riskier behavior by the consolidated banks*. Statistical analysis, including the estimation of an econometric model, provides evidence that serves in this hypothesis test. The test framework explicitly

measures the impact of a merger of equals event, a rare form of corporate consolidation, on consequent bank behavior. It uses information about bank behavior from the period leading up to the 2008 financial crisis, drawn from a cross-national sample of large banks from several developed economies. The Canadian Big Six banks are in the sample. The sampled banks are organized in two groups depending on performance status of each bank during the crisis: was the bank publicly bailed out or not (where the “bail-out” outcome includes bankruptcy and government-brokered acquisition under distress)? The explanatory variables are mostly accounting-based indicators believed to proxy behavioral variables about bank risk. The general aim of the statistical analysis is to identify statistically significant relations between crisis outcome and the explanatory variables, especially with respect to the status of having a past merger of equals.

Does having a merger of equals (in the past twenty-five years) contribute to the likelihood of being bailed out in the financial crisis? The answer to this question helps figure out the Canadian stability puzzle. Statistically significant relationships linking these outcomes with accounting-based indicators can be interpreted as robust behavioral tendencies that can be generalized across the behavior of banks (or at least among large banks from developed economies on the eve of the crisis). Confidence in the evidence supporting an asserted causal relationship would allow one to make the following inference: if the four large Canadian banks had been permitted to merge in 1998, this would contribute to

the likelihood of the two resulting consolidated banks being bailed out in the 2008 crisis (all other things being equal).

As it turns out, the test evidence in Essay Two is ambiguous in showing whether to reject the hypothesis that a past merger of equals has any statistical significance in explaining performance during the 2008 financial crisis.

Therefore, we can not make the direct inference that had the four large Canadian banks merged in 1998, they would have been at higher risk of being bailed out during the crisis. Despite not being able to make this confident inference, this essay did reproduce the earlier finding by Arjani and Paulin (2013) that a bank's liability funding model is a statistically significant explanatory variable of bank performance. A relatively higher reliance on short-term funding markets is associated with being bailed out. Also, a measure of a bank's risk appetite (the ratio of risk-weighted assets to total assets) is found to be a significant predictor of crisis performance, where banks with a relatively higher risk appetite ratio tended to be bailed out. These two analytic results are used in the third essay.

Essay Three departs from the factual investigations of the Canadian bank puzzle pursued in the first two essays, featuring a counterfactual simulation that tests the consequences of a policy decision: *if these four Canadian banks had been permitted by the government to merge in 1998, would the resulting merged banks have faced a greater risk of failure in 2008?* Like Essay Two, it employs quantitative tools. In this case, a stress test model is specified to simulate financial conditions observed in the 2008 financial crisis. Further, when developing the synthetic data and specifying the parameters of the stress test

model, Essay Three draws on statistical inferences made in Essay Two about the associations of liability funding and risk appetite with banks that were bailed out in the crisis. Essay Three also enlists the qualitative insights of Essay One about national financial order and bank behavior leading up and during the crisis, using these factual insights as a check against the results of the counterfactual simulation.

A battery of test runs using this framework find that asset write-down shocks are the main driver of greater insolvency risk for the two fictive banks and that the introduction of elements of higher risk behavior into the stress test model (e.g. higher shorter-term funding use and higher risk appetite, both inferences from Essay Two) did not put the two fictive banks at greater risk of insolvency. What the test runs did reveal is that the choice of banks to hold regulatory capital in excess of that required by the prudential regulator OSFI cushioned the effects of the asset write-down shocks. This behavior was observed historically among the large Canadian banks leading up to the crisis, where they held regulatory capital about two percentage points higher than the 7% minimum for Tier One capital ratio.

These findings help identify the conditions where the imagined merged banks would face greater risk of insolvency, assumed here to occur when the post-shock Tier One capital ratios of the two banks fall below 4%. These conditions include experiencing asset value write-downs at levels observed among U.S. banks during the crisis (actual Canadian banks had lower write-downs), the regulatory relationship becoming ineffective (the banks cease

cooperating with regulatory authorities), having all write-downs declared in one quarter (rather than having them spread out across five quarters) and that this one quarter precedes the moment of peak stress in September 2008. However, when considering the explanation of national financial order and bank behavior that is developed in Essay One, it is argued that these conditions would have been precluded by the expectation-based regulatory relationship between the large Canadian banks and OSFI. Such conditions, many of them reflective of intentional bank decisions, would be indicative of defection from the regulatory relationship, triggering intervention by the regulator to course correct the behavior of the banks. The balance of the argument supports the conclusion that the merged banks would have not faced a greater risk of failure in 2008.

Synthesis of the three essays

While the three essays are intended to stand on their own, a synthesis of their findings may offer some unity that transcends any apparent disciplinary and methodological boundaries within this dissertation's overall design. The essays ask three different questions, answered by three different methods, yet are all related to the puzzle of Canadian bank resiliency. Using these three answers, can a general conclusion be drawn about the Canadian puzzle? At first glance, the effort of combining these three answers may risk incoherency, especially given the diverse methods, both quantitative and qualitative, employed among the essays. However, the practice of triangulation in the social sciences, defined

as the “mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic” (Olsen, 2004) invites this effort.

One strategy to help avoid incoherency is to return to Cox’s methodological principles introduced in Essay One and embrace them for the larger dissertation. Cox describes his general methodological orientation as historicist, with its emphasis on describing continuity and change in historical structures believed to underpin social reality. However, Cox maintains that positivist research methods are compatible within this general historicist approach if they are nested within this research strategy. This complementary relationship between historicism and positivism is supported by Cox’s ontological and epistemological position on social reality, which includes a commitment to the assumption of an impermanence of certain aspects of social reality, aspects that are capable of change through time. These aspects have the form of social structures. The task of the historicist critical thinker is to identify and understand these moments of structural change. However, the pace of structural change is often sufficiently gradual to allow treating constituent structures of social reality as fixed for some bounded period of historical time, allowing the positivist methods to be applied successfully.

This argument that positivist research strategies may be nested within a broader historicist framework offers a means of relating the three essays. In tracing out the evolution of the Canadian banking system in terms of successive national financial orders leading right up to the 2008 crisis, Essay One is an historicist exercise that describes the structural context for bank behavior during

the period between 1998 and 2008. Essay One argues that the regulatory regime that emerges at the centre of this national financial order makes it difficult to disentangle autonomous bank behavior from the regulatory expectations inherent in the regime. This relationship is a key explanator of the Canadian puzzle. As we have seen, this conclusion serves as context in Essay Three when discussing the outcomes of the stress test.

But before we shift to that essay, let us look at how Essay Two, a positivist exercise through its statistical analysis, relates to Essay One. In a way, both essays demonstrate the synchronic mode of thought, where it is assumed that the underlying structural configuration of the object under analysis is fixed. Through the described national financial order of the conjunctural period leading up to the crisis, Essay One provides historical context for Essay Two's tests for relationships between behavioral variables measured on the eve of 2008 crisis and performance variables during the crisis. In turn, some of Essay Two's robust statistical findings reinforce factors described in Essay One as contributing to bank stability. For example, Essay Two finds evidence that banks with a lower reliance on short-term finance for their liability funding needs tend not to have been bailed out during in the crisis. This reinforces the assertion in Essay One that a legacy financial capability originating in 19th century branch banking gave contemporary Canadian banks the advantage of having a stable deposit base, insuring against the sudden freeze in short-term inter-bank lending markets early in the crisis.

Turning to Essay Three, the counterfactual simulation which draws much from positivist methods¹⁵⁶, we have already alluded to how the other two essays relate to it. Essay Two lends some its revealed statistical relationships for the specification of the data simulation and stress test model in the counterfactual framework. Furthermore, Essay One's main conclusions were invoked when judging the outcomes of the counterfactual simulations. It was argued that the conditions that would lead the merged banks to insolvency would be precluded by the expectation-based relationship between the banks and the regulator, a relationship described as the equilibrium outcome of a Game of Responsive Regulation. The act of altering one causal component of the larger explanation of the Canadian puzzle, that component being the blocking of the 1998 mergers, serves to simulate and analyse its consequences on bank performance in 2008. This counterfactual exercise forces the consideration of whether such stress test outcomes such as insolvency are possible within the structural context described in this national financial order, anchored by this regulatory relationship. The conclusion was "No", given the description of the NFO in Essay One.¹⁵⁷ This exercise of attempting to integrate the conclusions of the three essays draws to the fore the role of the national financial order in explaining the Canadian bank puzzle.

¹⁵⁶ One example would be the artificial closures ("assumptions") introduced in the data simulation and stress test model, such as a single period horizon, to operationalize this framework and give test results. Such tactics are commonplace in formal economic modelling.

¹⁵⁷ This exercise of synthesis does raise a new question: would the counterfactual merged banks, with enhanced economic power, have broken the regulatory regime described in Essay One through defection or capture and corruption, or is this institutional structure secure against an increasingly concentrated oligopoly? Answering this question is beyond the scope of this dissertation, and will be left for another day.

Figure 1. Triangulating relations between the three essays

Extending the research

The research conducted for these three essays has revealed several directions for extending these research projects beyond this dissertation.

- Essay Three. Given the recognized issue of maintaining a single shock horizon in the stress test model, the model may be modified to feature five shock intervals, paralleling the five financial reporting quarters that compose the historical crisis period. These intervals would feature an option for banks to raise capital if need be, again mimicking what was observed historically. A variation of this type of stress model has been developed by Anand, Bédard-Pagé and Tracet (2014). Another area for

further development is to explore an alternative to the pro forma method of data simulation used in this essay. One approach is a recursive procedure that begins with initial conditions based on actual historical observations and then derives financial values for each subsequent time interval using behavioral assumptions as well as accounting relations and structural relations estimated statistically.

- Essay Two. The search for robust, statistically grounded relationships between bank behavior and performance may be extended along several dimensions. One could experiment with different indicators of the dependent and explanatory variables. Instead of measuring crisis outcome in binary terms (bail-out, no bail-out), performance outcome could be measured in relative terms such as the change in bank share price. Additional variables describing industry level factors (e.g. degree of concentration), regulatory institutions and nation-level features may be introduced. Bank risk behavior may also be proxied through a risk index constructed using qualitative information featured in the public communications of banks. In terms of estimation techniques, the instrumental variables method may be attempted in addition to the ordinary least squares and logit methods used here. Finally, building time series data for each bank in the sample will afford more dynamic econometric analysis (such as survival analysis).
- Essay One. The historical narrative presented here could be further refined with more detail and nuance, with elaboration on subject matter

not explored. Examples include the role of provincial governments in shaping the evolving Canadian financial order, the linkages of Canadian banks and regulators to the international sphere, the presence of other large financial institutions such as life insurance companies and pension funds, and the emergence of a state bureau supporting consumers, the Financial Consumer Agency of Canada created in 2002. Additional methods of data gathering, such as interviews and content analysis, could also be employed. Bank profitability (and associated franchise value) as a factor contributing to bank stability is under-developed in both Essay One and Two. Its exploration as a likely incentive mechanism reinforcing certain modes of behavior would complement further elaborations of the game theoretic representation of the responsive regulatory regime argued to describe the Canadian banking order.

The overall conclusion of this dissertation that the puzzle of Canadian bank stability during the 2008 crisis is largely explained by national financial order (and its associated regulatory regime) should be tested against the history that has unfolded since 2008. These three essays serve as a foundation for an ongoing mixed methods research program into the evolving Canadian financial order.

Epilogue: the post-2008 Canadian financial order

Ten years have passed since this crisis erupted in 2007. Among the events and processes to mark the international financial system in this post-crisis era, there has been the European sovereign debt crisis in 2010, the Libor-rigging

scandal and the general movement of re-regulation at both national levels (e.g. the Dodd-Frank Act in the US) and at the international levels (e.g. the creation of the Financial Stability Board and the Basel III agreement on bank capital standards). Throughout, Canadian banks have taken advantage of their positions of relative strength and have continued to carry out their strategy of investing abroad while cultivating their domestic bases.

The current Canadian financial order, with its origins in the recommendations of the 1986 Estey Commission, has remained stable. This is not to discount new pressures that have emerged in recent years, not least the disruptions to financial capabilities caused by further innovations in information and communication technology (“fintech”) and the recent decision by the United State to renegotiate NAFTA, which may alter existing trade rules with respect to financial services. With the federal Department of Finance having just announced its second round of public consultations ahead of the 2018 renewal of the Bank Act, we should watch to see if yet another transformation of the Canadian financial order is imminent.

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Appendix

Appendix A

Mandate and governance of four federal financial regulatory arm's length agencies

	Mandate	Governance	Obligations to Parliament
Bank of Canada (BoC)	monetary policy, bank notes, oversight of the financial system and supervisor of the payments system, funds management	Board of directors, appointed by government, appoints Governor and Senior Deputy Governor. Deputy Minister of Finance is ex-officio director.	Submits annual report (with audited financial statements)
Office of the Superintendent of Financial Institutions (OSFI)	regulator and supervisor of federally regulated deposit-taking institutions, insurance companies, and federally regulated private pension plans.	Government appoints the Superintendent of Financial Institutions to be the deputy head of the Office.	Submits annual report (with audited financial statements)
Canadian Deposit Insurance Agency (CDIC)	insurer against the loss of part or all of deposits at member institutions	Board of directors featuring 5 government-appointed private members and 5 ex-officio directors from Finance, BoC, OSFI and FCAC, plus a government-appointed chair. The board appoints the CEO.	Submits annual report and a five-year corporate plan
Financial Consumer Agency of Canada (FCAC)	oversight of consumer protection measures in the federally regulated financial sector, and to expand consumer education	Government appoints the Commissioner of FCAC.	Submits annual report

Appendix B

Financial crisis timeline

This time line of the 2007-2009 financial crisis is subdivided into periods corresponding with the financial reporting calendar of the Canadian banks, who mark October 31 as the end of their fiscal year.

- *August 1- October 31, 2007 (Fourth quarter 2007)*

Many observers mark the beginning of the credit freeze with the sharp rise in short-term interest rates following the announcement by French bank BNP Paribas on September 9 that it was suspending three of its investment funds due to an inability to value some of its investments linked to U.S. subprime mortgages.¹⁵⁸¹⁵⁹ This stress in credit markets was reflected in sharp widening of the three-month U.S. Libor-OIS spread (define?). On September 14, British lender Northern Rock would receive liquidity support from the Bank of England financial institutions after it was unable to borrow adequate short-term funding through private credit markets.

¹⁵⁸ <http://www.reuters.com/article/us-bnpparibas-subprime-funds-idUSWEB612920070809> .
<http://www.reuters.com/article/us-bnpparibas-subprime-funds-idUSWEB612920070809> .
<http://www.nytimes.com/2007/08/09/business/worldbusiness/09iht-bnp.1.7055473.html> .

¹⁵⁹ Alternatively, some writers associated the difficulties experienced by German lender IKB in July as the beginning of the credit freeze (Germain, 2010, p. 81). I choose August 9 as the beginning date as it corresponds with the sharp widening of inter-bank credit spreads, as measured by such indicators as the 3-month US dollar Libor-OIS spread.

- *November 1, 2007 - January 31, 2008 (First quarter 2008)*

While a quieter quarter compared to the previous one, it did feature a report by the U.S. National Association of Realtors on January 24, 2008 announcing the largest single-year drop in US home sales in the past twenty-five years, adding to the accumulating evidence of the depth of the correction in the U.S. housing market.¹⁶⁰

- *February 1, 2008 - April 30, 2008 (Second quarter 2008)*

On February 17, Northern Rock would be nationalized by the British government after not being able to find a private buyer (Guardian). On March 14, US investment bank Bear Stearns is purchased by JP Morgan Chase in a government-brokered acquisition to prevent the troubled Wall Street firm from failure. The acquisition features a \$29 billion loan from the Federal Reserve Bank of New York to provide new funding for Bear Stearns.¹⁶¹

- *May 1, 2008 - July 31, 2008 (Third quarter 2008)*

Again, signs of lessening financial stress suggest to some the credit freeze is thawing. In a Wall Street Journal interview on May 6, U.S. Treasury Secretary Hank Paulson says he believed the worst is likely behind us.¹⁶² After disclosing on May 12 that is not very well capitalized, US mortgage lender Indymac is

¹⁶⁰ http://money.cnn.com/2008/01/24/news/economy/housing_prices/index.htm

¹⁶¹ <http://www.cbsnews.com/news/bernanke-defends-bear-stearns-bailout/>

¹⁶² <https://www.wsj.com/articles/SB121011652297872261> .

seized by the Federal Deposit Insurance Corporation (FDIC) on July 11, becoming the in the third-largest bank failure in US history up to that moment.¹⁶³

- *August 1, 2008 - October 31, 2008 (Fourth quarter 2008)*

This is the quarter of peak distress during the credit crisis, with the failure and/or public rescue of several financial firms in September 2008. After a summer of questioning of financial viability of quasi-public mortgage financiers Fannie Mae and Freddie, the U.S. Federal Housing Finance Agency seizes the two government sponsored enterprises on September 7. Eight days later on September 15, Wall Street investment bank Lehman Brothers files for bankruptcy after failing to find a private buyer. This event is quickly followed by several financial firms in the US either failing, merging under distress (often through government guidance/insistence) or being publicly rescued¹⁶⁴. Following this flurry of firefighting at several financial firms, the US government passed the Emergency Economic Stabilization Act on October 3, which created the Troubled Asset Relief Program (TARP). With a budget of \$700 billion to purchase toxic assets, the intent of TARP was to clean up the balance sheet of private financial firms to staunch the rapid loss of confidence in them and place firms on a more

¹⁶³ <https://www.wsj.com/articles/SB121581435073947103>

¹⁶⁴ Merrill Lynch agrees to be acquired by Bank of America on September 14, the day before Lehman Brothers files for bankruptcy. Two days later on the 16th, insurance giant American Insurance Group (AIG) is granted a \$85 billion secured credit facility by the US Federal Reserve in order to continue meeting its financial obligations. The UK government broker the acquisition of British lender HBOS by Lloyds TBS on September 17. After securing large capital investments by Warren Buffett and Japanese bank Mitsubishi UFJ respectively, Goldman Sachs and Morgan Stanley convert to bank holding companies on September 21. Washington Mutual, the largest saving and loan in the US, is seized by FDIC and other regulators on the 25th. Eight days later on October 3, the FDIC approves the acquisition of Wachovia by Wells Fargo.

stable footing. This initial program did not have the desired effect in the US, nor abroad, as reflected in falling stock markets. On October 8, the British government unveil a £500 billion bank rescue package¹⁶⁵, which includes £50 billion earmarked for public investment in bank equity.¹⁶⁶ Capital injections with public funds is a new development as a policy response, as governments are effectively becoming major bank shareholders (and in some cases, the single shareholder).¹⁶⁷ Other European governments follow suit, with Germany and France announcing on October 13 large stabilization packages in amounts of €500 billion and €360 billion respectively, with funds earmarked for bank recapitalization.¹⁶⁸ Given the policy direction taken by Europe and with little sign of the downward spiral abating, the US government decides to use TARP funds for bank recapitalization, informing nine of the country's largest firms on October 13th that the government would be investing in their equity structure¹⁶⁹ as a bulwark against further erosion of public confidence.

¹⁶⁵ It should be noted that the UK government was not the first European government to make public commitments to intervene more directly in their banking industries. On September 29, the Government of Iceland nationalized failing lender Glitnir and later took control of its two other large banks Kaupthing and Landsbanki on October 6. The Irish government pledged on September 30 that it would guarantee €440 billion of liabilities at six domestic-owned and one foreign-owned banks operating in Ireland.

¹⁶⁶ Under the British recapitalization program, banks were invited, not forced, to participate. The Royal Bank of Scotland and Lloyds TBS (with its recent acquisition of HBOS) agreed to the capital support, while other large lenders Barclays, HSBC and Standard Chartered declined the offer.

¹⁶⁷ October 8, 2008 also featured a coordinated cut of 0.5% in the key policy rates administered by the central banks of the US, UK, Japan, Switzerland, Canada, and Sweden, as well as the European Central Bank.

¹⁶⁸ Among other European governments to announce bank "bail out" programs, Switzerland recapitalizes UBS on October 16 and the Netherlands injects funds into ING Group on the 19th.

¹⁶⁹ The nine participating banks were Citigroup, JP Morgan Chase, Wells Fargo, Bank of America, Merrill Lynch (recently acquired by Bank of America), Goldman Sachs, Morgan Stanley, State Street and Bank of New York Mellon.

- *November 1, 2009 – January 31, 2009 (First quarter 2009)*

With bank recapitalization programs in place in the US and several European nations, stress in the interbank credit markets begins to recede following the record highs in the previous quarter. In addition to meting out capital support to financial firms (insurer AIG, smaller regional banks, Citigroup and Bank of America for additional investment), the US government is approached by the Big Three automakers for assistance under TARP. At the inaugural Group of Twenty (G20) Summit in Washington, D.C. on November 14-15 (ten days after Democrat Barack Obama is elected President of the United States), there is agreement among the assembled heads of state to seek solutions to the unfolding financial and economic crisis.

- *February 1, 2009 - onward*

On February 17, 2009, early in the Obama Presidency, the US government passes the American Recovery and Reinvestment Act, a \$787 billion stimulus package. The following week on the 25th, US regulators announce plans to stress test American banks by April to assess the adequacy of their capital. On March 6, the Dow Jones Industrial Average US stock market index bottoms out at 6,469 points, marking the beginning of recovery in broader equity markets in the US and abroad, and more generally in the international financial system, until the outbreak of the European sovereign debt crisis in 2010.

Appendix C

Sample of 78 bank holding countries organized by bailout and merger of equals status

Bank Holding Company	Country	BAILOUT	MERGER	MERGER2	CTYCAP
Royal Bank of Canada	CAN	NO	NO	NO	4
Toronto Dominion	CAN	NO	NO	NO	4
Bank of Nova Scotia	CAN	NO	NO	NO	4
Bank of Montreal	CAN	NO	NO	NO	4
Canadian Imperial Bank of Commerce	CAN	NO	NO	NO	4
National Bank	CAN	NO	NO	NO	4
Citigroup	USA	YES	YES	YES	4
Bank of America	USA	YES	YES	YES	4
JP Morgan and Chase	USA	YES	NO	YES	4
Wells Fargo	USA	YES	YES	YES	4
Wachovia Corporation	USA	YES	YES	YES	4
Goldman Sachs Group	USA	YES	NO	NO	4
Morgan Stanley	USA	YES	YES	NO	4
Merrill Lynch & Co.	USA	YES	NO	NO	4
Lehman Brothers Holdings	USA	YES	NO	NO	4
Bear Stearns Companies LLC	USA	YES	NO	NO	4
WMI Holdings (WaMu)	USA	YES	NO	YES	4
Fifth Third Bancorp	USA	YES	NO	NO	4
US Bancorp	USA	YES	NO	NO	4
PNC Financial Services Group	USA	YES	NO	NO	4
National City Corp	USA	YES	NO	YES	4
SunTrust Banks	USA	YES	NO	YES	4
BB&T Corporation	USA	YES	YES	NO	4
Barclays PLC	GBR	NO	NO	NO	3
HSBC Holdings PLC	GBR	NO	NO	NO	3
Standard Chartered PLC	GBR	NO	NO	NO	3
Royal Bank of Scotland Group	GBR	YES	NO	YES	3
HBOS PLC	GBR	YES	YES	YES	3
Lloyds Banking Group PLC	GBR	YES	NO	YES	3
Alliance and Leicester	GBR	YES	NO	YES	3
Credit Suisse Group AG	SUI	NO	NO	NO	3
USB AG	SUI	YES	YES	YES	3
Rabobank Nederland-Rabobank Group	NED	NO	NO	NO	3
Dexia	BEL	YES	NO	YES	3

KBC Groep NV	BEL	YES	NO	YES	3
Erste Group Bank AG	AUT	YES	NO	NO	5
Allied Irish Banks PLC	IRL	YES	NO	NO	1
Bank of Ireland	IRL	YES	NO	NO	1
Deutsche Bank AG	GER	NO	NO	YES	1
Deutsche Postbank AG	GER	NO	NO	NO	1
DZ Bank AG-Deutsche Zentral-Genossenschaftsbank	GER	NO	NO	NO	1
Commerzbank AG	GER	YES	NO	NO	1
Hypo Real Estate Holding AG	GER	YES	NO	NO	1
Landesbank Baden-Wuerttemberg	GER	YES	NO	YES	1
Bayerische Landesbank	GER	YES	NO	NO	1
Portigon AG (formerly WestLB)	GER	YES	NO	NO	1
HSH Nordbank AG	GER	YES	NO	YES	1
BNP Paribas	FRA	YES	NO	YES	2
Credit Agricole S.A.	FRA	YES	NO	YES	2
Societe Generale	FRA	YES	NO	YES	2
Natixis	FRA	YES	NO	NO	2
Groupe Caisse d'Epargne	FRA	YES	NO	NO	2
Banque Federative du Credit Mutuel	FRA	YES	NO	NO	2
Banco Santander SA	ESP	NO	NO	YES	4
Banco Bilbao Vizcaya Argentaria SA	ESP	NO	NO	YES	4
Banco Popular Espanol SA	ESP	NO	NO	NO	4
UniCredit SpA	ITA	NO	NO	YES	4
Intesa Sanpaolo	ITA	NO	NO	NO	4
Banca Monte dei Paschi di Siena SpA	ITA	NO	NO	NO	4
Danske Bank A/S	DEN	YES	NO	YES	2
Nordea Bank AB	SWE	NO	NO	YES	3
Skandinaviska Enskilda Banken AB	SWE	NO	YES	YES	3
Svenska Handelsbanken	SWE	NO	NO	YES	3
Swedbank AB	SWE	NO	NO	YES	3
DnB ASA	NOR	NO	YES	YES	3
National Australia Bank Limited	AUS	NO	NO	NO	3
Commonwealth Bank of Australia (CBA)	AUS	NO	NO	YES	3
Westpac Banking Corporation	AUS	NO	NO	NO	3
Australia and New Zealand Banking Group (ANZ)	AUS	NO	NO	YES	3
Mitsubishi UFJ Financial Group	JPN	NO	YES	YES	4
Mizuho Financial Group	JPN	NO	NO	YES	4

Sumitomo Mitsui Financial Group, Inc.	JPN	NO	NO	YES	4
Industrial and Commercial Bank of China	CHN	NO	NO	NO	3
China Construction Bank Corporation	CHN	NO	NO	NO	3
Bank of China Limited	CHN	NO	NO	NO	3
Bank of Communications Co. Ltd	CHN	NO	NO	NO	3
United Overseas Bank Limited	SIN	NO	NO	YES	1
Kookmin Bank	KOR	NO	NO	YES	3

Appendix D

Sensitivity tests

Table D1. Correlation matrix of independent variables

	MERGER	LOG SIZE	BUS MODEL	FUND MODEL	LIQUID- ITY	LEVERAGE	COST EFFIC	REGCAP ADEQ	RISK APPETITE
MERGER	1.00								
LOGSIZE	0.18	1.00							
BUSMODEL	0.04	0.29	1.00						
FUNDMODEL	-0.02	0.53	0.48	1.00					
LIQUIDITY	-0.03	-0.09	-0.54	-0.44	1.00				
LEVERAGE	-0.08	0.34	0.45	0.54	-0.32	1.00			
COST EFFIC	-0.01	0.28	0.64	0.38	-0.40	0.50	1.00		
REGCAP ADEQ	0.00	0.01	0.01	-0.08	0.23	-0.13	0.01	1.00	
RISK APPETITE	0.14	-0.54	-0.43	-0.64	0.29	-0.77	-0.49	-0.23	1.00

Table D2. Regression run: dropped LEVERAGE variable

Explanatory Variable	Model 1: Ordinary Least Squares (standard error)	Model 2: Logit Regression (standard error)
Constant	-0.927 (1.294)	-7.249 (7.877)
MERGER	0.262* (0.155)	1.740* (0.941)
LOGSIZE	-0.067 (0.079)	-0.594 (0.503)
BUSMODEL	0.001 (0.005)	0.021 (0.031)
FUNDMODEL	0.027*** (0.006)	0.195*** (0.056)
LIQUIDITY	0.002 (0.002)	0.009 (0.022)
COSTEFFIC	0.009 (0.008)	0.055 (0.048)
RISKAPPETITE	0.015*** (0.004)	0.103*** (0.034)
REGCAPADEQ	0.012 (0.036)	-0.044 (0.246)
Observations	65	65
Adjusted R Square	0.296	--
Log likelihood	--	-28.392
Pseudo R2	--	0.361
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level		

Table D3. Regression run: imputed values for observations with missing values

Explanatory Variable	Model 1: Ordinary Least Squares (standard error)	Model 2: Logit Regression (standard error)
Constant	-2.713 (1.456)	-18.321* (9.862)
MERGER	0.210 (0.150)	1.516 (0.942)
LOGSIZE	0.005 (0.076)	-0.234 (0.512)
BUSMODEL	0.001 (0.004)	0.023 (0.032)
FUNDMODEL	0.024*** (0.004)	0.188*** (0.052)
LIQUIDITY	0.001 (0.002)	0.008 (0.022)
LEVERAGE	0.018** (0.008)	0.118* (0.065)
COSTEFFIC	0.007 (0.007)	0.043 (0.047)
RISKAPPETITE	0.023*** (0.006)	0.155*** (0.046)
REGCAPADEQ	0.047 (0.040)	0.183 (0.287)
Observations	72	72
Adjusted R Square	0.341	--
Log likelihood	--	-29.420
Pseudo R2	--	0.4092
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level		

Table D4. Regression run: alternative measurement of MERGER

Explanatory Variable	Model: Ordinary Least Squares (standard error)	Model: Logit Regression (standard error)
Constant	-2.774 * (1.503)	-18.178 (10.195)
MERGER2	0.168 (0.120)	1.452 * (0.845)
LOGSIZE	-0.026 (0.081)	-0.480 (0.561)
BUSMODEL	-0.002 (0.005)	0.006 (0.032)
FUNDMODEL	0.027*** (0.006)	0.188 *** (0.053)
LIQUIDITY	0.001 (0.002)	0.004 (0.027)
LEVERAGE	0.017 (0.011)	0.118 (0.075)
COSTEFFIC	0.012 (0.008)	0.086 (0.054)
RISKAPPETITE	0.024 *** (0.006)	0.164 *** (0.052)
REGCAPADEQ	0.063 (0.043)	0.228 (0.302)
Observations	65	65
Adjusted R Square	0.299	--
Log likelihood	--	-27.553
Pseudo R2	--	0.380
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level		

Table D5. Regression run: Inclusion of control variable for differences in national institutions (capital regulation, CTYCAP)

Explanatory Variable	Model: Ordinary Least Squares (standard error)	Model: Logit Regression (standard error)
Constant	-1.883 (1.628)	-13.283 (10.327)
MERGER	0.248 (0.158)	1.690* (0.953)
LOGSIZE	-0.028 (0.083)	-0.368 (0.547)
BUSMODEL	0.001 (0.005)	0.021 (0.033)
FUNDMODEL	0.026 *** (0.006)	0.191 *** (0.056)
LIQUIDITY	0.001 (0.002)	0.009 (0.022)
LEVERAGE	0.009 (0.013)	0.061 (0.088)
COSTEFFIC	0.008 (0.008)	0.051 (0.049)
RISKAPPETITE	0.021 *** (0.007)	0.137 *** (0.048)
REGCAPADEQ	0.036 (0.044)	0.081 (0.305)
CTYCAP	-0.047 (0.070)	-0.267 (0.452)
Observations	65	65
Adjusted R Square	0.300	--
Log likelihood	--	-27.419
Pseudo R2	--	0.383
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level		

Appendix E

Stochastic and determinist methods in data simulation

The literature suggests that there are at least two general methods that may be used to address the asset-liability management (ALM) problem: stochastic and determinist methods (Birge and Júdice, 2013, p. 4712). A review of current literature suggest stochastic methods are preferred among contemporary researchers in finance. This reflects in choice of formal modelling strategy, which often includes explicit inclusion of probabilistic elements, and in choice of empirical analysis technique, which often is a variation of econometrics. Brodt (1977) gives an early attempt at modelling multiple-period ALM decisions under uncertainty, a variation of the general problem of optimal decision-making under a constraint. In a more recent version of the ALM problem, Birges and Júdice (2013) derive a one-period model that describes the optimization decision of the banker who faces various sources of financial risk (e.g. credit risk, liquidity risk). The estimation of a counterfactual time series using the stochastic approach to ALM problems involves deriving a model along the lines of an optimal decision-making model where a given variable of interest, for example, a bank manager's demand for short-term funds, is designated as the dependent variable. The explanatory variables may feature other balance sheet variables (e.g. assets, deposits), prices (e.g. interest rates) and other variables that may be probabilistic in nature (e.g. default rates on loans). Using this formal model, an econometric model can be specified for the purpose of estimating values for the time intervals

of interest, using either cross-section methods (where a sufficient amount of data from a sample of banks, assumed to be sufficiently homogenous, is used to estimate the model's parameters) or time series methods (which require a sufficient back period of historical data to fit the model and compute point estimates for time intervals of interest). In both regression approaches, an outstanding question is whether the model relies on explanatory variables that are themselves simulated estimates. If yes, where do these simulated estimates come from?

An alternative to stochastic methods is non-stochastic or determinist methods, such as linear programming and input-output analysis. Whereas the stochastic method involves first estimating parameters of the model's variables using empirical data, the determinist approach relies on specifying a mathematical model with variable parameters that are already known or are self-evident. The model may be solved algebraically or have numerical data applied to the model to solve it. Linear programming has a history of application to modeling bank asset-liability management. Chambers and Charnes (1961) apply linear programming to construct a ALM model of a bank's decision-making tool for managing its portfolio of assets over several time periods. Illustrated with a numerical example, it assumes the decision-maker seeks a goal (e.g. maximizes profits) while facing certain constraints (e.g. a reserve requirement with the central bank and the expectation by supervisors of maintaining a balanced portfolio) (p. 393).

While stochastic methods tend to be favored in the contemporary economics toolbox, determinist methods contain several advantages. The stochastic method applied through econometrics, as outlined above, is more complex and computationally demanding than the determinist method. The input data needs are likely greater and the assumptions introduced into the estimation process (e.g. structural homogeneity among banks, stationarity in the time series) may denature the perceived realisticness of the estimates. While simpler, the determinist method may produce counterfactual estimates that are perceived with a similar level of plausibility, if not more, than estimates obtained through stochastic methods. Further, the computational nature of the specific ALM problem, say one where unknown values over a multiple interval finite horizon need to be estimated, may lend well to determinist methods. Also, the limits on the available detail of the financial data may pose challenges in developing a stochastic model. While lacking the same degree of technical sophistication of contemporary econometrics, there are well-developed methods in economic research that fall under the determinist category, such as linear programming, input-output analysis and stock-flow consistent modelling (Godley and Lavoie, 2007), and can not be ruled a priori as inappropriate for this problem-type described here.

Appendix F

Financial variable definitions

Balance sheet variables (levels)

- Total assets: total claims of ownership by instrument. Total assets include cash and cash-like instruments, claims on other banks, financial securities, loans and other assets.
- Total liabilities: total claims on the bank by instrument. Total liabilities include short-term debt, long-term debt, deposits and other liabilities.
- Short-term debt: interest-bearing financial instruments with a maturity of less than one year, issued by banks to raise funds. It is recorded on the bank's balance sheet under liabilities.
- Shareholder equity: financial instruments that signify the ownership of the bank. This includes common and preferred shares held by bank owners as well as retained earnings (accumulated undistributed profits).
- Tier One regulatory capital: the sum of regulatory capital instruments classified as Tier One. A bank may be required by its regulator to hold a minimum amount of Tier One capital on the liability side of its balance sheet as a stability measure, acting as a cushion against large losses. The Basel II international accord defines Tier One capital as including common

equity, retained earnings and preferred shares. Tier Two capital supplements Tier One capital. It includes revaluation reserves, undisclosed reserves, hybrid instruments and subordinated term debt. In Canada, Tier One and Tier Two capital combine as total regulatory capital. Regulatory capital overlaps with the accounting definition of shareholder equity, although the inclusion of certain liability instruments such as subordinate debt prevent a strict correspondence.

- Risk-weighted assets (RWA): the sum of balance sheet assets and some off-balance sheet exposures (including letters of credit and derivative instruments), where the value of assets by category are adjusted by a corresponding risk weight. The regulatory authority defines the schedule of risk weights by category, with values ranging between 0 and 1 inclusive.
- Tier One capital ratio: the ratio of Tier One regulatory capital to risk-weighted assets. Expressed as a percent.

Income statement variables (flows)

- Net interest income: the sum of interest revenues less the sum of interest expenses.
- Net non-interest income: the sum of all non-interest inflow of revenue, including trading account profits/losses, fees and commissions earned and other operating income (loss).
- Net revenue: the sum of net interest income and net non-interest income.
- Profit (net income): in general, the difference between revenue and expenses. Using a more exact accounting definition, it is the residual difference between net revenue and the sum of total non-interest expenses, non-operating income, income tax expense, net extraordinary losses (gains) and dividend payments minority interest.
- Retained earnings: the portion of profit that is not distributed as dividends to shareholders but held on the books of the bank. Retained earnings are considered a component of shareholder equity and qualifies as regulatory capital.

Appendix G

Estimating the statistical relationship between short-term interest rates and net interest income

The stress test model includes a parameter obtained from an estimator of a variable coefficient featured in an econometric model. The independent variable of focus is change in short-term interest rates and the dependent variable is change in net interest income. The estimator of the coefficient of change in short-term interest rates signifies the sensitivity of change in net interest income to change in short-term interest rates.

The model and variables

$$\Delta NII = \alpha + \beta_1 (\Delta SRSPD) + \beta_2 (\Delta LRSPD) + \beta_3 (\Delta DEPSPD) + \varepsilon$$

where:

- ΔNII is quarterly change in a bank's net interest income.
- $\Delta SRSPD$ is the change in the quarterly average interest rate spread on short-term credit. The selected interest rate indicator is the 3-month CDOR-OIS spread.
- $\Delta LRSPD$ is the change in the quarterly average interest rate spread on long-term credit. The selected interest rate indicator is the Merrill Lynch Canadian financial bond index, which offers a spread to Government of Canada bonds as well as a yield.

- ΔDEPSPD is the change in the quarterly average spread between interest charged on bank deposits and interest charged on banks loans. The proxy for deposit rates is the average five-year GIC rate and the proxy for the loan rate is the five-year mortgage rate..

These three explanatory variables mirror the three sources of liability for a bank: short-term credit, long-term credit and deposits. They are sources of cost that contribute to net interest income, the net difference between total interest revenue and total interest expenses.

Data

Quarterly observations of net interest income are gathered for the six large Canadian banks (RRC, BMO, Bank of Nova Scotia, Toronto Dominion, CIBC and National Bank) from fourth quarter 2003 to third quarter 2007, using the Bloomberg data service. The quarterly observations of the interest rate variables are measured as quarterly averages of daily interest rate spreads. Interest rate data is gathered from Bloomberg or in the case of " ΔDEPSPD ", the Bank of Canada.

Regression methods.

As the observations have the form of a balanced panel data set, the model was estimated both as a fixed effect model and as a random effects model.

Conducting the Hausman test to assess if the model is best estimated as a fixed

effect or a random effect model finds evidence in favour of a random effect model.

Further, the model was initially estimated with a longer time series, for the period fourth quarter 2003 to first quarter 2009. As I suspected that there was a structural break between third quarter 2007 and fourth quarter 2007 (mainly because the freezing of credit markets in August 2007 lead to a sharp widening of interest rate spreads), a Chow test was conducted, showing evidence of a break. For this reason, the shorter time series is used.

Lastly, several regressions were run where in each iteration, a different bank was dropped from the sample to assess the impact of this bank on the statistical significance of the individual variables and the overall fitness for the estimated model. Including the National Bank of Canada, the smaller of the Big Six banks, does appear to weaken the estimates. It was subsequently dropped from the sample.

Results

A sample of the results of different regression runs are displayed below in Table G1. For the reasons explained above, the preferred estimated model is Run 4, where the shorter time series is used and National Bank has been dropped from the sample. The estimated coefficient for change in short-term interest rate spreads (Δ SRSPD) is -8.97. It is weakly significant, having a p-value of 0.117.

With this estimator, I state the following statistical relationship: a one basis point increase in the interest rate spread is associated with a \$9 million decrease in net

interest income, ceteris paribus. The rounded estimator -9 is inserted in the stress test model.

Table G1. Regression run results
Model/estimation technique: random effect panel model

Explanatory Variable	Run 1. Full time series.	Run 2. Full time series, National Bank omitted.	Run 3. Shortened time series.	Run 4. Shortened time series, National Bank omitted. PREFERRED
Constant	17.179 (12.106)	19.740 (14.106)	8.848 (8.654)	10.760 (8.888)
STSPD	-1.634* (0.993)	-2.457** (1.054)	-7.388 (5.568)	-8.969* (5.718)
LTSPD	0.859*** (0.309)	1.084*** (0.328)	2.775* (1.735)	2.370 (1.782)
DEPSPD	0.496 (0.628)	0.675 (0.666)	-0.875 (0.709)	-0.839 (0.728)
Units	6	5	6	5
Time	Q4 2003 – Q1 2009	Q4 2003 – Q3 2007	Q4 2003 – Q1 2009	Q4 2003 – Q3 2007
Observations	132	110	96	80
Wald chi2(3)		12.92		
Prob > chi2	0.0376	0.0048	0.0517	0.0566
Note: *** significant at 1% level; ** significant at 5% level; *significant at 10% level				

Note: The p-value for the estimator of STSPD in Run 4 is 0.117.