**Evaluating Russian Forestry Sector: Market Orientation and Its
Characteristics**

by

James B. Wignall, B. Comm.

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Abstract

The purpose of this research was to identify characteristics associated with market orientation of a firm in a former communist country. The Russian forestry sector was studied using data provided by the International Institute for Applied Systems Analysis. Analysis was conducted using rough sets and discriminant analysis. This study has identified some firm's characteristics that contribute to specific market orientation.

In summary, market-economy oriented firms favor market-based mechanisms such as formal contract arrangements and cash-based transactions. They also export a large portion of their finished goods.

In contrast, planned-economy oriented firms often rely on barter and also experience problems marketing their products. Their primary market is domestic, with its easier access to informal network-based arrangements.

Encouraging firm's market behaviour along the lines described by these characteristics will encourage firm's transition towards operation according to market-economy principles.

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Introduction

This study compares the characteristics of firms considered to be market-economy oriented with characteristics of firms considered to be planned-economy oriented. This is a very general problem, appropriate for investigation using a case study approach with Russian forestry sector as a case. This selection was motivated by a visit to a research facility in Austria, and by the availability of the data to perform this analysis.

The motivation for this analysis is as follows; Knowing market orientation of firms is important to planners, legislators, and organizations supporting the transition from a central planned economy to one relying on market forces to guide actions by firms. In order to have a clear focus on the contrast between the two classes of firms, this research is restricted to one country, namely Russia, and one sector within that country, namely forestry. It is believed, however, that the results can to some degree be applied to a broader spectrum of sectors and countries. Of the firms in the Russian forestry sector, some are doing well and some less well, in their transition from planned-economy orientation to market-economy

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orientation. Researchers are trying a variety of approaches to determine what makes firms perform in a specific manner. This research is one such approach. Firms can be segregated into two classes, and therefore this research is the classical classification problem known in Statistics and in Artificial Intelligence (AI). That problem is being addressed here using statistics, in the form of discriminant analysis, and AI in the form of rough sets analysis. The scope of this research is to perform the analysis of data that attempts to identify those characteristics of the firms that are perceived to be important for market orientation. As mentioned, this study is focused on one sector of Russian economy – namely forestry sector. However, the paper will examine how this analysis of the forestry sector can be used with respect to other sectors of the Russian economy.

The analysis presented in this report utilized the data gathered from 245 interviews, with forestry managers in a variety of forestry-related businesses from across Russia. The interviews were conducted under the auspices of the Sustainable Boreal Forest Resources Project at the International Institute for Applied Systems Analysis (IIASA) in Vienna, Austria. The information from the interviews was encoded in the RUSCOMP database, which was used for the analysis described.

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Social scientists at IIASA utilized several of the attributes from the database to create a measure of the firm's operation in relation to market-economy or planned-economy orientation (Carlsson, Lundgren and Olsson, 2000). This measure, the GADICKE index (Gaddy and Ickes, 1998), allows assigning the firm into one of four classes based on the firm's *distance to market* and its level of *relational capital*. Distance to market is described as the combination of a firm's geographic distance to its potential markets, and the degree to which its practices are consistent with a market-economy operation. Relational capital is a measure of the goodwill the firm has created with suppliers, customers, employees, and government officials expressed as a relaxation of the usual business requirements such as cash payment for wages, taxes, and supplies. The combination of high and low values for each of these two measures defines the four classes. The two classes of interest for our research are described below.

A firm is considered to belong to the *market-economy class* if it has a low distance to market, meaning it is responsive to its market's needs, and is not reliant on non-market relationships with business associates or officials to be successful.

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A firm is considered to belong to the *planned-economy class* if it relies on non-market relationships rather than tending toward market-economy principles. The distance to market will be high for these firms, making it difficult for them to operate in a market-based economy.

Firms belonging to these two classes represent the extremes of the spectrum. In-between there is a whole spectrum of the firms that exhibit characteristics, to greater or lesser extend, of the firms belonging to these extreme classes. To increase the sensitivity of the analysis we decided to eliminate vague (not clear cut) firms in terms of their market orientation and therefore focus on the firms in only these two extreme classes.

For the purposes of this research the measure for these two categories, derived from the GADICKE index, will be called the ORIENTATION index. Identifying the differences in the characteristics of the two types of firms, as classified by the ORIENTATION index, will facilitate establishing principles of the institutional framework amenable for firm's adaptation into a business environment operating according to market-economy principles.

The thesis consists of seven sections organized in the following way. The first section contains a statement of the key assumptions underlying

the analysis and the research question to be answered.

The second section is a review of the current literature relevant to this study. The review is broken into two parts. The first deals with analytical methods used and topics studied by a variety of researchers. The second part deals with literature relevant to policy development and the framework for discussing results of this analysis.

The third section discusses the database used and the preparation of data for analysis.

The fourth section discusses the methodologies used in the analysis. The two methods, discriminant analysis and rough sets, have been contrasted in other studies by Krusinska, Slowinski, and Stefanowski (1992) and by Browne, Duntsch, and Gediga (1998).

The fifth section discusses the results of the analysis, including differences from the alternative methodologies that were used.

The sixth section discusses how the results can be generalized. Two dimensions are considered here. One is how the results can be applied to other sectors of the Russian economy. The other is how the results can be applied to the evaluation of other transition economies.

The final section summarizes the research.

Research Design

This research is based on two key assumptions. The first is that results of this research are applicable to the Russian forestry sector or a sector with similar characteristics.

The second assumption is that interviewed firms are representative of the sector. According to IIASA researchers these assumptions are valid, as the firms were selected in a representative way so that the results could be generalized to the whole Russian forestry sector.

The research question that the thesis will attempt to answer is:

Is it possible to identify the characteristics specific to forestry firms managed according to market-economy principles and specific to forestry firms managed according to planned-economy principles?

Literature Review

The literature review did not reveal any publications dealing specifically with the comparison of forestry enterprises in Russia. Therefore, the review was expanded to include studies of other industrial sectors as well. As a part of the literature review, a number of agencies were approached to gain an understanding of their expertise in motivating a change in a firm's market orientation. These included the European Union's European Commission, World Bank (WB), the International Monetary Fund (IMF), and a number of Canadian Government agencies; in particular Foreign Affairs Canada and International Trade Canada, and the Canadian International Development Agency (CIDA). These organizations have a vested interest in the changes taking place in Russia, either as institutional stakeholders or loan guarantors. Despite such involvement in a transformation of Russian economy and a resulting financial exposure, these organizations did not conduct specific studies on transition of Russian firms towards market economy.

One study dealing specifically with the restructuring in Russia is by Gaddy and Ickes (1998). The study examines why not all firms have

changed from operations more appropriate in a planned economy to operations consistent with a market economy. Their paper describes how some firms are restructuring to reduce distance to market, while others are exploiting relational capital to survive without restructuring. The researchers examine the implications of this behaviour with reference to monetary policy and intergovernmental relations and also propose an index to be used to measure market orientation of Russian firms. Gaddy and Ickes (2002) extend this discussion with their analysis of the virtual economy in Russia. This further examination follows the path of value from its creation by firms in resource based industries to its loss or destruction by firms in the manufacturing sectors. Such loss would be possible when firms rely on relational capital rather than on market forces. Carlsson, Lundgren, and Olsson (2000) published another paper dealing with the changes in Russia. This paper examines why, after ten years of transition, forestry production in Russia is at lower level than before the transition began. The conclusion is that the lack of a tradition of privately owned commodity producing firms and lack of a powerful middle class are significant contributors to such a situation.

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Economists from the WB also studied economic transitions of several countries around the world. Some of their research focused on shifting responsibilities for social services (Sewell, 1997). This provision of services is a factor in the behaviour of firms that utilize relational capital. In the past, this provision of social services was considered a domain of firms in a planned, centralized economy. In the current free market economy this feature of a firm may be a less reliable indicator. With inflation driving up prices in the face of frozen or declining wages, social benefits may become a reasonable incentive, for any firm, to attract and keep workers.

Several factors analyzed in the WB studies are also used as characteristics of the firms considered in this research. Brunetti, Kisunko, and Weder, (1997a) investigated one of these factors, the existence of obstacles to doing business. The perception of obstacles is considered to be a characteristic of the Russian forestry firms. Another factor is associated with the conditions necessary for reform to succeed (World Bank, 1998a). The WB study attempted to identify attributes that can indicate if a country's political conditions are favorable for reform to take place. The study was intended to help the WB tailor programs to individual countries,

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based on their readiness for reform, and it parallels the IIASA Sustainable Boreal Forest Resources Project in its attempt to identify characteristics of a market-economy oriented forestry firm.

Expanding on this theme, the WB surveyed 3600 firms in 69 countries worldwide to develop cross-country indicators of “institutional uncertainty” (World Bank, 1998b). The study highlighted the need for a reliable institutional framework for doing business and provided a way to measure the reliability of institutions on a cross-country basis.

The WB has also conducted a study of twenty economies in transition that looked at factors that indicate the stability of the institutional framework of the economy (Brunetti, Kisunko, and Weder, 1997b). These factors are the predictability of rules, political stability, the security of property rights, the reliability of the judiciary, and the lack of corruption. The study investigated whether these factors can explain differences in economic performance among the twenty economies in transition. All of these factors are present in Russia.

On the national level, the WB has conducted studies of reforms in countries that were under the former Soviet Union (FSU) sphere of influence. Among others, the reform of the Polish economy was analyzed

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(Montes-Negret and Papi, 1997). The Polish program involved the restructuring of enterprises at the same time that the banks were restructured. It highlighted the importance of reforming the banking sector to enable it to support reforms in the business and industrial sectors.

Another study compared mid-sized firms in the Czech Republic, Hungary and Poland. According to the findings, private ownership dramatically improved corporate performance (Frydman, Gray, Hessel, and Rapaczynski, 1997). Outside ownership, by owners not previously involved in the business operation, was more successful, when measuring performance, than any form of inside ownership, whether by former managers or workers. With inside ownership, the firm's performance under management ownership was dramatically better than under worker ownership. Worker ownership offered no performance improvement over state ownership. Foreign ownership was not significantly better than domestic outside ownership. Increased revenue generation, rather than success at cost cutting, was found to be the reason the reformed firms were able to sustain or increase employment. This WB study indicated that, in Eastern European countries, the type of ownership might affect a firm's

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long-term success and viability. Ownership is one of the attributes in this study of the market orientation of forestry firms in Russia

Finally, the WB looked at aspects of the transition by Russia itself, in contrast to other European countries. One study directed attention to the fact that Russia is different from other Central and Eastern European countries because the other countries implemented political reform before economic reform (Denizer, 1997). These other countries also achieved a faster pace of economic reform, in part, because they had the goal of applying for membership to the European Union (EU). Most of the FSU republics stayed connected to Russia, and they remain enmeshed in socialist politics.

In summary, most studies deal with European economies in transition, and neglect microeconomic analysis at the firm level. This research helps to fill that void by looking at the characteristics of individual firms in the Russian forestry sector from a perspective of transition to market economy.

The literature review generated a broad range of information about policy development. Policy development is shown to be an important topic

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for countries in transition. These countries are attempting to improve their position by seeking membership in a variety of international organizations, such as EU, World Trade Organization (WTO), and North Atlantic Treaty Organization (NATO). In preparation for applying to these organizations, they have been compelled to make changes in a number of areas of their social structure and their institutions. They have much at stake. As stated by Kiggundu (2002) “...by participating in the global economy, these countries increase their chances of reducing poverty, raising wages and incomes, and accumulating wealth” (p. ix). While this statement is primarily focused on developing countries, it appears to also be valid for countries with economies in transition.

By watching the efforts of these countries to move toward market economy, researchers are able to gather data for study of both the processes being followed and the results these efforts achieve. Several papers, including Kolodko, (1999) and Pomfret, (2003), discuss the impact of *shock therapy* as a means to introduce market economy to post-socialist economies.

Attempts have been made to benchmark structural change in the transition economies (Raiser, and Schaffer, 2004) and to determine the

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expected extent of further changes in the economies studied. This work is particularly important for assessing when and if a country is ready to apply for membership in the desired international organization.

Other studies have looked at the size of government in transition economies (Gupta, Leruth, De Mello, Chakravarti, Kutan, Szokely, and Miller, 2003). As well as the sheer size of government, the activities in which it is involved can have an impact on the rate and success of transition to market economy. The literature indicated a recognition that government involvement will change over the course of the transition. Another study contrasts the strategies and outcomes of 12 years of transition in the former Soviet bloc countries (Svejnar, 2002) and outlines the principal challenges facing these economies. Key approaches to transition are described by Koveos (2003) as well as issues of importance for success in the transition process.

One paper is particularly relevant to this analysis of firm market behaviour. Peng (2003) bases his research on Scott's (1995) three pillars of institutional framework, namely regulations, normative behaviour, and cognitive beliefs and values. The three pillars will change over time, and at differing rates. Each firm's response to these changes will vary depending

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on the firm's characteristics, including the firm's market orientation and history.

As described by Peng, the cost of each network-based transaction increases as the complexity of the exchange network increases. Network-based transactions involve utilizing existing relationships for business contracts, often with non-monetary exchange as part of the settlement process. As a result of these increased costs, there is a reduction in benefits from these transactions. As well, the bureaucratic rules that form the institutional setting for this mode of transaction can often lead to massive market failure. Institutional transition involves replacing those bureaucratic rules with a set of rules and regulations that allow third party enforcement of arms-length transactions.

Peng acknowledges that there are high initial costs to develop and implement formal institutions, such as development of a court system. Ultimately though, these institutions reduce transaction costs as the number of market participants and the volume of transactions increase. Peng further suggests that in a transition economy there is an initial increase in network-based transactions as new opportunities emerge for the network-based

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firms to capture. This increase in opportunities also increases the complexity of the network.

Rule-based transactions become more attractive as new participants become active. Even so, since one of the Scott's pillars is normative behaviour, historical norms will continue to be a part of the institutional framework, even in a market-based economy.

Only when institutional frameworks stabilize are there increasing pressures to optimize a firm's activities and build competitive market-based capabilities. Until that time, as suggested by Peratti and Geifer (2001), there is an intensification of relationship networks. This intensification is thought to be due to a lack of formal market institutions during the transition.

In the initial phase of transition, incumbent firms experience little pressure, as measured by any of Scott's three pillars, to adopt market-driven behaviour. On the other hand, start-up firms need both the network of the incumbents as well as market-driven traits like quality to be able to prove their place in the market. Cognitive pressure, in the form of emerging beliefs and values, leads them to market-based rather than network-based transactions.

Entrepreneurs form new normative behaviour as they enter the market. The background of these entrepreneurs will determine whether they focus on market driven or relationship driven transactions.

As the transition process progresses, Peng has suggested a shift toward rule-based exchange is gradually required because returns from network-based strategy continue to diminish. At this stage formal rules may be of limited effectiveness because the benefits from impersonal exchange may not yet outweigh costs. New norms are introduced by start-up firms, but may not be the dominant behaviour until these firms become the predominant force in the market.

Regulatory pressure increases on incumbents but is still not enough to cause all firms to change to a market-driven approach. Some may respond by simply strengthening their networks, however limiting this strategy may ultimately be. Perotti and Geifer (2001) report the emergence of formal business groups in Russia in the 1990s. This confirms that some planned-economy firms employ this strategy.

Other incumbent firms will respond to those regulatory pressures by restructuring. This may be triggered externally by market demands or

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internally by efforts to model the firm's behaviour after successful new entrants to the market.

In summary, Peng suggests that a firm's strategic choices, including market orientation, change over time. This is especially true for firms operating in transition economies. New, formal, market-supporting institutions result in stronger pressures for firms to engage in market competition. These institutions, designed to support increasingly complex impersonal exchange, lead to decreasing marginal returns for the previous network-based strategy. This compels many planned-economy firms to convert to a new market-centered strategy.

Peng further suggests that a number of implications for public and business policies emerge. A critical insight for policy makers is that the fundamental, sweeping nature of transitions inevitably leads to institutional uncertainties. Simply enacting market-friendly rules is not enough. The challenge following their enactment is to enhance their enforcement, to reduce those uncertainties.

Firms operating during the transition process are essentially competing on the edge (Brown and Eisenhardt, 1998), between the past practices and the future market orientation. The best managers expect

strategy to shift over time and are constantly deciphering changes in the economic landscape and attempting to take advantage of new opportunities.

As transition economies evolve, the most prosperous firms seem to be those that convert their strengths, from the previous network-based phase, into market-centered resources and capabilities. Firms that fail to accept these changes in their environment are likely to fall behind or go out of business.

The Database of Forestry Firms

The Sustainable Boreal Forest Resources Project at IIASA is studying the sustainable use of the Russian forest resources. The researchers are interested in different aspects of evaluating sustainable development. To that end they are interested in the firms that are using the forest resources, since the market behaviour of these firms contributes to the successful sustainable use of the forest resources. IIASA in collaboration with the Russian Academy of Science financed a project aiming at developing a comprehensive database of Russian forestry firms (RUSCOMP). The IIASA researchers, through collaborators in Russia, gathered information from firms active in the forestry sector. All firms engaged in the Russian forestry sector were contacted. They were requested to allow their managers to take part in a survey to gather information about the operation of their respective firms. Of the firms approached 245 agreed to take part. The data was collected from open-ended questions posed during individual interviews. Information gathered during those interviews was subsequently coded into the survey instrument that had been developed for this purpose. The researchers used the index described by Gaddy and

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Ickes (1998) and some of the interview information, coded into the database, to categorize the firms. Those categories became the four values of the GADICKE index. The original RUSCOMP database was comprised of 245 records, each corresponding to an individual enterprise. The characteristics of each firm are described by 109 attributes, contained in each record. Appendix A lists those attributes names and their descriptions.

The researchers at IIASA provided the RUSCOMP database to be used for the research described here. The analysis was conducted for just two of the four original GADICKE classes. Firms in one of the excluded classes are considered doomed to fail because they have neither the closeness to market nor the high relational capital necessary to function with either orientation. Firms in the second excluded class have both closeness to market and high relational capital. Including these firms in the analysis would not aid in distinguishing the differences between the two groups under study. As a result of this reduction in classes, the index is renamed the ORIENTATION index to distinguish it from the original. To prepare the data for analysis a two-step process was followed to modify the database.

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In the first step, firms to be analyzed were selected. It was decided to focus on firms engaged in primary forest activities, such as production of sawn logs, lumber and pulp. Large numbers of the responding firms are involved in these activities. As mentioned, the analysis focused on only two of the original four GADICKE classes. The resulting database, used in the analysis reported here, contained information about 120 firms as the firms that were excluded either did not meet criterion of primary forest activities or could not be assigned to either of the classes forming the ORIENTATION index.

The second step involved developing criteria for selecting attributes for inclusion in the analysis. Based on those criteria the individual attributes were examined to determine suitability for inclusion in the analysis. The inclusion criteria for the attribute to be considered as firm's descriptor are as follows:

- The attribute must be related to the firm itself.
- The attribute must be reasonably objective [needs to be measurable].
- The attribute needs to have at least 67% of the values in a database.

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- The attribute must be independent from another one, namely the same information is not associated with another retained attribute. Moreover, the attributes of a hierarchical structure were decomposed to the simplest elements.
- The attribute must not have been used to calculate the values of the ORIENTATION index.

A more detailed description of the application of the above inclusion criteria is given below.

- The attributes that are not related to the description of the firm were eliminated as well as the attributes that described geographical location. Examples include the attributes that represent the respondent's position and the region where the firm operates.
- Production was described by a variety of attributes. Collectively the attributes provided the needed information to calculate distance to market and relational capital indices. These attributes were eliminated from the analysis.
- Some attributes such as FIRM IN OPERATION (OPERATE), which indicates that the firm is still in operation had the same value for most

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cases. COUNTRY OF OPERATION (COUNTRY), which indicates the country in which the firm operates, had the same value for all cases.

Both attributes were eliminated for this reason.

- Attributes MAIN PRODUCT (MAINP), MAIN PRODUCT 1 YEAR AGO (MAINP1), MAIN PRODUCT 5 YEARS AGO (MAINP5), and MAIN PRODUCT 10 YEARS AGO (MAINP10) describe the main product of the firm at the time of the interview, as well as 1, 5, and 10 years prior. Less than 10% of the firms reported a change during this period, so only the attribute describing current firm's production was used.
- Some attributes such as OTHER OBSTACLES (OTHOBSTA) and FORMAL FORESTRY LEGISLATION (FORMLEG1) describe opinions of the interviewee that were unrelated to the firm's characteristics and they were omitted.
- INVESTMENTS MADE (INVESTM) is an attribute indicating whether or not a firm invests in its operation. INVESTMENT TYPE (INVTYPE) indicates the type of investment, with one choice being "No investment". INVESTM and other attributes with a similar pairing were eliminated.

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- Any attributes that were directly used in calculating the values of ORIENTATION index and those that were collinear with some other attributes were not considered.

The result of this examination was a modified RUSCOMP database that contained information about 120 firms described by 21 attributes. The breakdown of firms by class is given in Table 1 below.

Table 1
Frequency by ORIENTATION Index Class

Class	Market Orientation	Frequency
1	Market Economy	52
2	Planned Economy	68

Appendix B contains a table listing the retained attributes, a description of the information they contain and the possible values for the attribute.

Appendix C contains a table listing the data set used for this analysis. Firms are identified by the ID attribute from the original RUSCOMP database.

Methodology: Rough Set and Discriminant Analysis

As previously mentioned, the purpose of the study is to identify the characteristics (attributes) of a forestry firm that are associated with its market orientation, as measured by the ORIENTATION index. The firms of interest fall into two categories, market-economy oriented and planned-economy oriented, based on that index. The analytical techniques look for contrasts in the attribute values for the firms with each orientation. Those contrasting values become the characteristics that distinguish the two groups. As such, the analysis was approached as a classification problem. In this case the classes of interest are market-economy oriented and planned-economy oriented. This type of problem can be addressed through several possible analytical approaches. This study is focussed on two of these approaches, namely the Rough Sets (RS) and the Discriminant Analysis (DA). Both methods deal with the classification problems where homogenous classes are described by a set of the attributes. DA was selected because it is one of the traditional methods used for multi-variate analysis. RS was selected because it allows analysis where the data contains imperfectly balanced cases between the classes and does not

require rigorous assumptions regarding variables' distribution. This second trait allows evaluation, with some confidence, of data of low quality, such as data generated from open ended interviews. The use of two methods enabled the research to determine if one method produced better results than the other. The application of these two analytical methods has been compared by Krusinska et al. (1992) and by Browne et al. (1998).

Discriminant Analysis

Discriminant analysis, also known as discriminant function analysis, is used to classify cases into the values of a categorical dependent attribute. The independent attributes are used to make this classification. The result of the analysis is a classification table of correct and incorrect estimates of case classification. In this case the independent attributes are the characteristics of the forestry firms. The dependent attribute value is the class indicating the market orientation of the firm. That orientation is indicated through the ORIENTATION index value assigned to each firm.

There are several possible uses for DA. They include classifying new cases into groups using a discriminant prediction equation, and testing theory by observing whether cases are classified as predicted.

This analysis looks for those attributes of the firms that will predict whether or not a new firm has a specific market orientation. The purpose of this study is to assess the relative importance of attributes in classifying firms into the two categories of interest.

DA has a number of key assumptions.

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- As with multiple regression, DA assumes proper model specification, with all important attributes included and all extraneous attributes excluded from the analysis.
- DA also assumes the dependent attribute is a true dichotomy. This assumption is correct for this data set, since ORIENTATION index has only one of two values for each case.
- All cases must be independent. This assumption is also true, since each case represents a forestry firm, and each firm is represented only once in the data.
- Each case must belong to only one class and the classes must be mutually exclusive.
- There must be at least two cases for each class of the dependent attribute and class sizes must not be grossly different. There are 52 cases in one class and 68 in the other, creating a 43% to 57% split of cases.
- It is recommended that there be at least 4 to 5 times as many cases as independent attributes. In this study, there are 120 cases for 20 independent attributes, a ratio of 6:1.

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- Each attribute has a non-zero standard deviation in each class.
- There are outliers in this data set, which can sometimes affect the results. However, a comparison of results for this data with and without the outlier cases shows no significant difference in the results.

DA is performed in several steps. The first step is an F-test (Wilk's lambda) (Garson, 2004) to determine if the discriminant function as a whole is significant. Significance means the model is able to discriminate between the two classes. If that significance is present, the individual attributes are assessed. The assessment is conducted to determine which attributes differ significantly in mean by group. Those attributes that have significantly different means for the two groups are used to classify the dependent attribute, and these are the attributes of interest to this study.

Two sets of values are generated by these calculations for each attribute. The first is the Standard Canonical Discriminant Coefficients (CDCs). These are used to compare the relative importance of the independent attributes, much as beta weights are used in regression. These are partial coefficients. Therefore, only the unique explanation of each independent

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attribute is being compared, without consideration of any shared explanation.

The second set of values is the structure coefficients (SCs) for each independent attribute. Unlike the CDCs, these are whole coefficients, similar to correlation coefficients. They reflect the uncontrolled association of the independent attributes (firm characteristics) with the ORIENTATION attribute.

Thus, for the two-class DA such as this study, the SCs show the order of importance of the independent attributes by total correlation, whereas the CDCs show the order of importance by unique contribution.

There are two classes according to the ORIENTATION index, and therefore there is $(n-1)$ or one set of attributes used to create a discriminant function. For this analysis the following steps are taken. The SDCs and SCs are calculated for each attribute. These two sets of coefficients are multiplied together to produce Discriminant Ratio Coefficients (DRCs) (Thomas, 1992). The attributes and their associated DRCs are ranked from largest to smallest. A sub-set containing the largest positive DRCs is selected. These DRCs are a measure of the relative importance of each corresponding attribute. When added together, the DRCs indicate the

amount of correlation between this sub-set of attributes and the ORIENTATION index. That is a measure of their ability to distinguish between the firms in each of the classes. The discriminant function (DF) consists of this set of DRCs and their associated attributes. The DF was then tested to determine its ability to discriminate between classes.

Rough Set Analysis

The RS theory, its mathematical foundations, basic concepts, and the applications are described, among others, in (Lin, 1997; Pawlak, 1991; Slowinski, 1992). The RS methodology is a useful tool for analysis of data describing objects by means of disjoint subsets of condition and decision attributes. For example, if the objects are the forestry firms, the firm's characteristics are considered as condition attributes, and the class associated with an ORIENTATION index becomes a decision attribute.

The key idea of RS is related to an encapsulation of knowledge expressed by the decision attributes using knowledge that is expressed by condition attributes. RS theory allows describing several characteristics of the data related to such analysis, the first of which is described here.

That first characteristic is *consistency*. Consistency means there are no cases with different decision attribute values that share the same set of conditional attribute values. In data where there are no such cases, the data set is considered to be perfectly consistent.

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Objects, in this analysis firms, having the same values of condition attributes (firm's characteristics) are indiscernible with respect to the available information. This holds true even when they do not share the same value of decision attribute, their market orientation. The *indiscernibility relation* generated for such a situation constitutes a mathematical foundation of the rough set theory. It induces a partition of the data into blocks of indiscernible objects, called elementary sets. These sets can be used as “building blocks” to build a body of knowledge about a decision situation, such as market orientation.

Any subset of objects (firms) X , with the same value of decision attributes (i.e. firms with the same market orientation), may be characterized in terms of these building blocks either precisely, as a union of elementary sets, or approximately. In the latter case the subset X may be characterized by two ordinary sets, called *lower* and *upper approximations* that together define a rough set. The lower approximation of X is composed of all the elementary sets exclusively in X (i.e. whose elements certainly belong to X), while the upper approximation of X consists of all the elementary sets that share the same decision attribute value as X (whose

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elements may belong to X). The difference between the upper and lower approximations constitutes the *boundary region* of the rough set, whose elements cannot be characterized with certainty as belonging to X or not, using the available information. The information about objects from the boundary is, therefore, inconsistent or ambiguous.

The basic measure that characterizes the crispness of X , or *quality of approximation* is defined as ratio of number of objects in the lower approximation of X to the number of all objects in X . A similar measure is used to estimate the crispness of partition of data into subsets. Usually this partition is induced by decision attributes; then it divides objects into decision classes, and thus such partition is called *classification*. The *quality of approximation of classification*, or *quality of classification* for short, is defined as the ratio of the number of objects in the lower approximation of considered subsets (decision classes) to the number of all objects in the data set. This ability to generate approximations gives rise to more characteristics of the data set.

The second characteristic of the data is its *reducts*. Reducts are the non-redundant subsets of condition attributes, ensuring the same quality of classification as the whole set of condition attributes.

The third characteristic of the data set is its *core*. The core contains the condition attributes that cannot be eliminated from the approximation without decreasing the quality of the approximation.

The fourth characteristic is a data set's *decision rules*. These decision rules take the form of “*if...*, *then...*” statements. The statements are produced using the minimum number of condition attributes, and are induced from the approximations.

Several important aspects of rough set theory make it of particular interest to researchers evaluating real data sets describing various decision situations. With respect to the input information, rough sets allow analysis of both qualitative and quantitative data. Data inconsistencies need not be removed prior to the analysis, as they are dealt with by separating certain and doubtful knowledge extracted from the data set. With reference to the output information, rough sets allow acquisition of *a posterior* information regarding the relevance of a particular attribute, or set of attributes, for the

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quality of approximation. Moreover, the final result, presented in the form of “*if...,then...*” decision rules that are based on the most relevant attributes, is easy to interpret. The rules describe the classification represented by examples contained in the data set. They are logical statements where the antecedent (condition part) is a conjunction of the elementary conditions concerning particular condition attributes and the consequence (decision part) is a disjunction of possible assignments to particular decision classes (induced by decision attributes).

In practical applications the information about objects is often not complete because some data are missing. For example, in the case of firm’s orientation, income information was unavailable for some firms. To deal with the missing values, an extension of the rough set approach was used. The extended approach is based on a specific definition of the indiscernibility relation taking into account missing values. The decision rules induced from the rough approximations defined according to the new indiscernibility relation possess suitable properties. They are either exact or approximate, depending on whether they are consistent with respect to indiscernibility or not, and they are robust in the sense that each rule is

supported by at least one object with no missing value on the condition attributes represented in the rule.

Results

Applying the DA methodology to data, the correlation between the subset of attributes and the ORIENTATION index value was 86%. The subsets of attributes used to build the discriminant function in this study are given in Table 2.

Table 2
Reduced Set of Attributes from the Discriminant Function

Attribute name	Attribute DRC
EXPORT SHARE CATEGORY	0.259
PRIMARY BUSINESS OBSTACLE	0.147
BUYING TRANSACTION FORMALITIES	0.108
FIRM'S MAIN ACTIVITY	0.098
PRIMARY EXPORT MARKET	0.088
ERA FIRM ESTABLISHED	0.077
TERMS OF TIMBER ACQUISITION	0.050
BACKGROUND OF FIRM	0.042
Total = 0.869	

As a further examination, validation testing was performed to determine how well the function was able to classify the forestry firms (cases) into the two index classes. See Table #3 below. When classification testing was performed using the *leave-one-out*¹ method, only 64% of the original grouped cases were correctly classified using this subset of attributes. Further, when *10-fold cross-validation*² testing was performed, only 58% of the grouped cases were correctly classified. This result is not satisfactory, and will be discussed further following description of the results using RS methodology.

¹ In leave-one-out classification, each case is first removed from a training data and subsequently the classifier classifies that case. This is also known as the “U-method.”

² Cross validation involves randomly selecting part of the data set for hold out. The selected part of the data is not used to develop a classifier (either discriminant function or set of rules). The hold out data is then used to test predictive accuracy of a classifier. It is classified and the results are compared with actual class membership in order to derive a measurement of quality of classification. In 10-fold cross validation, the data is split into 10 approximately equal parts. For each fold, the algorithm is trained using 9 parts, leaving out a different part each time. The trained algorithm is then tested using the holdout data. The accuracy of the algorithm is estimated by measuring its ability to classify the holdout data, averaging the success rate for the 10 folds (Bouckaert, 2003).

Table 3

Discriminant Analysis: Accuracy of Classification

Subset of attributes	Classification accuracy (%)	
	10-fold cross-validation	Leave-one-out test
Discriminant Function	58.90 $\pm$ 10.30	64.17

During RS analysis it was determined that the core for this data set is an empty set. Therefore, no descriptive rules could be generated directly from the core. As a result, an alternative approach was used to find the most significant attributes.

The purpose of this approach was to produce a reduced set of attributes for which the descriptive rules could be generated. A number of such sets were produced and tested. The set that was best at classifying the holdout cases during validation testing was subsequently used to generate the set of descriptive rules.

In the first step of the alternative approach, all available attributes were used to generate the decision rules by LEM2 algorithm following Grzymala-Busse (1992). This approach resulted in generating a set

containing 30 rules.

In the next step, these rules were further evaluated and the *best rules* for each class were chosen. The rule was considered as the best if it was the strongest one for given class, where strength is measured by the number of cases in that class to which the rule applies divided by the total number of cases in that class. The best rules selected for each of the classes are presented in Table 4.

Table 4
The Best Decision Rules

Rule	Strength (%)
IF (PRIMARY CUSTOMER = COMPANIES) and (ERA ESTABLISHED = AFTER 1988) and (PRIMARY DOMESTIC MARKET = REGION) and (SALES TRANSACTION AGREEMENT = SIGNED CONTRACT) and (TIMBER SUPPLY SOURCE = STATE) THEN (ORIENTATION = MARKET ORIENTATION)	19.20
IF (PRIMARY CUSTOMER = COMPANIES) and (TERMS OF SALE = BARTER COMPONENT) THEN	27.27

(ORIENTATION = PLANNED ECONOMY)

The attributes from the condition part of the best rules were extracted to form a pseudo-reduct, called *best pseudo-reduct #1*. This provides a starting point for the search for the reduct containing the most significant attributes. The attributes in the pseudo-reduct generated from the best rules are presented in Table 5 below.

Table 5
Attributes in the Best Pseudo-Reduct

Attribute	Number of occurrences
PRIMARY CUSTOMER	2
ERA ESTABLISHED	1
PRIMARY DOMESTIC MARKET	1
TERMS OF SALE	1
FORM OF SALES AGREEMENT	1
TIMBER SUPPLY SOURCE	1

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All 2,581 reducts generated by the RS were evaluated in order to find those reducts that included all the attributes from best pseudo-reduct #1. In other words, those reducts that had the largest intersection with the best pseudo-reduct. There was one such reduct containing seven attributes. That reduct was labeled as *best reduct #1*.

A second pseudo reduct was created from the attributes from the best rules and was labeled *best pseudo-reduct #2*. It contains all the attributes from best pseudo-reduct #1 except PRIMARY CUSTOMER (CUSTOMER). This attribute has the same value in rules pointing towards both classes. As such, this attribute provides no discrimination between these classes. It can therefore be eliminated without reducing the quality of classification. The set of all reducts was then searched to find reducts that included all the attributes from this pseudo-reduct. There were three such reducts containing all five attributes from best pseudo-reduct #2. These reducts contained six, seven, and eight attributes each. Only the shortest reduct was retained. This reduct was labeled as *best reduct #2*.

The analysis of the RUSCOMP database was continued in order to distinguish shortlist of the attributes, considering their different properties. Thus, the set of all reducts was searched to find the reduct that minimized

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the number of attributes. There were two such reducts, denoted as *atom reduct #1* and *atom reduct #2*. Each reduct contained two attributes.

The analysis tried to identify which of the attributes appear most frequently among the 2,581 reducts. First, frequencies of attributes in all reducts were calculated. Then, the set of reducts was examined to find the reduct that contained the largest number of the most frequent attributes. There were six such reducts, each containing seven of the attributes of interest from the eight most frequent attributes. The shortest one, containing a total of eight attributes, was labeled *beta reduct*. The five longer reducts, which contained nine attributes each, were ignored because of their length.

The next step was to evaluate relationships between a set of the attributes identified with a help of DA and the information provided by the RS. Using the condition attributes in the discriminant function and forming a reduct denoted as *DA pseudo-reduct* started this. DA pseudo-reduct contains eight attributes. Then the set of all reducts was searched to find the reduct that included all the attributes from the DA pseudo-reduct. There was no such reduct. The set was searched again to find the reducts with the largest intersection with the DA pseudo-reduct. There were two such

reducts, each containing seven attributes of interest from the DA pseudo-reduct. The reduct, which contained seven attributes, was labeled *DA reduct*. The reduct that contained nine attributes was ignored, again because of its length.

The results of all the analysis described above are summarized in Table 6.

Table 6

Attributes Included in Reducts and Pseudo-Reducts

Attribute name	Subset name			
	Best reduct #1	Best pseudo-reduct #1	Best pseudo-reduct #2	Best reduct #2
PRIMARY ACTIVITY				
ALTERNATE TIMBER SUPPLY				
FIRM'S BACKGROUND		✓		
BROKEN BUYING AGREEMENTS				
BROKEN SELLING AGREEMENTS				
BUYING FORMALITIES				
PRIMARY CUSTOMER	✓	✓		
ERA ESTABLISHED	✓	✓	✓	✓
EXPORT CATEGORY				
EXPLANATION FOR TIMBER SHORTAGE				
PRIMARY EXPORT MARKET				
PRIMARY DOMESTIC MARKET	✓	✓	✓	✓
IMPORTANT BUSINESS OBSTACLE				✓
LEGAL STATUS				
TERMS OF SALE	✓	✓	✓	✓
PAYMENT TERMS FOR TIMBER				
FORM OF SALES TRANSACTIONS	✓	✓	✓	✓
TERMS OF TIMBER AQUISITION				
TIMBER SUPPLY SOURCE	✓	✓	✓	✓
TOTAL EMPLOYMENT IN 1998				

Table 6 cont'd

Attributes Included in Reducts and Pseudo-Reducts

Attribute name	Subset name				
	Atom reduct #1	Atom Reduct #2	Beta reduct	Da pseudo-reduct	Da reduct
PRIMARY ACTIVITY		✓			
ALTERNATE TIMBER SUPPLY			✓	✓	✓
FIRM'S BACKGROUND			✓	✓	✓
BROKEN BUYING AGREEMENTS					
BROKEN SELLING AGREEMENTS			✓		
BUYING FORMALITIES			✓	✓	✓
PRIMARY CUSTOMER					
ERA ESTABLISHED			✓	✓	✓
EXPORT CATEGORY				✓	
EXPLANATION FOR TIMBER SHORTAGE			✓		
PRIMARY EXPORT MARKET				✓	✓
PRIMARY DOMESTIC MARKET					
IMPORTANT BUSINESS OBSTACLE			✓	✓	✓
LEGAL STATUS	✓				
TERMS OF SALE					
PAYMENT TERMS FOR TIMBER					
FORM OF SALES TRANSACTIONS					
TERMS OF TIMBER AQUISITION			✓	✓	✓
TIMBER SUPPLY SOURCE					
TOTAL EMPLOYMENT IN 1998	✓	✓			

These reducts were then used to generate classification rules. Once the rules were generated, validation tests for their classification accuracy were conducted. The same two types validation tests were used for the RS analysis as the DA analysis, namely 10-fold cross-validation and leave-one-out. In both cases LEM2 algorithm was used to generate decision rules. The results of validation tests are presented in Table 7.

Table 7
Rough Sets: Accuracy of Classification

Subset of attributes	Classification accuracy (%)	
	10-fold cross-validation	Leave-one-out test
All condition attributes	67.65 $\pm$ 12.87	71.19
Best pseudo-reduct #1	69.62 $\pm$ 12.45	69.49
Best reduct #1	70.30 $\pm$ 10.79	77.12
Best pseudo-reduct #2	71.21 $\pm$ 12.93	72.03
Best reduct #2	72.88 $\pm$ 10.50	71.19
Atom reduct #1	44.85 $\pm$ 13.41	52.54
Atom reduct #2	51.82 $\pm$ 11.33	54.24
Beta reduct	60.61 $\pm$ 20.27	61.86
DA pseudo-reduct	62.73 $\pm$ 12.92	56.78
DA reduct	64.55 $\pm$ 8.50	57.63

For the 10-fold cross-validation test the highest classification accuracy was achieved for best reduct #2 (i.e. set of attributes containing all the attributes that appeared in best rules except PRIMARY CUSTOMER

(CUSTOMER)). For both tests the second highest classification accuracy was achieved for the reduct containing attributes from the best pseudo-reduct #2 (set of attributes containing all the attributes that appeared in best rules except CUSTOMER). This analysis suggests that the best reduced set of the attributes, to be used for evaluating market orientation of a forestry firm, should be derived from the best reduct #2. This set contains the attributes listed in Table 8.

Table 8
Attributes in Best Reduct #2

Attribute name
ERA ESTABLISHED
PRIMARY DOMESTIC MARKET
IMPORTANT BUSINESS OBSTACLE
TERMS OF SALE
FORM OF SALES TRANSACTION
TIMBER SUPPLY SOURCE

The DA function was only able to classify correctly in 58% of the cases during cross validation testing. Results of the RS cross-validation

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testing indicate that the set of attributes named best reduct #2 correctly classified 72% of the cases. This is somewhat better. However, interview data is very difficult to analyze, and the less stringent data requirements for RS analysis make it the preferred approach. The results from the RS analysis seem also more robust in light of the data used.

In addition to the difficulty with interview data, there is another possible cause for the poor classification results. It is possible that not all relevant attributes were included in the analysis. Some attributes may have been excluded from the original database when the survey instrument was created. Other attributes may have been eliminated from the modified database. For those attributes, too few cases contained values, so meaningful analysis was not possible. As a result, the available attributes provide only a partial description of the characteristics of each case.

In spite of the poor classification results, both methodologies generated similar results in terms of the relative importance of attributes. This is significant, since the purpose of this study is to determine the characteristics, represented by attributes, which are important for classifying firms.

Summary of the Analysis

As stated, the purpose of this analysis is to determine the characteristics that distinguish between firms based on their market orientation.

One of the strengths of RS methodology is its ability to generate decision rules and the ease of interpretation of those rules. In this study, the decision rules that are used to interpret features of firm's market orientation are based on the attributes in the best pseudo-reduct. These rules are being interpreted to derive the descriptive statement about the characteristics that describe market orientation. The descriptions given below are for the two classes under analysis, namely market-economy oriented class (ORIENTATION = 1) and planned-economy class (ORIENTATION = 2).

Market-Economy Oriented Firms

- In general, these are the firms that transact business in cash, instead of barter or other forms of credit. These firms do not have timber supply problems as they have either an adequate supply from their primary source or they have an alternate source that provides the

balance of raw material needs. The bulk of production is being exported with a small fraction sold domestically.

- They adhere to formal business practices characterized by written agreements signed by both parties.

Planned-Economy Oriented Firms

- These are older, state-owned firms that were typically established before 1947 and may be newly privatized. They focus primarily on local and domestic markets.
- They arrange payments either in cash or in barter. They experience problems finding markets for their goods and dealing with marketplace competition.

Application to Russia

The characteristics of forestry firms identified by this analysis as important in distinguishing the two classes are consistent with Peng's (2003) model discussed earlier. They also suggest that the Russian forestry sector is in the middle phases of transition. Support for this opinion follows.

Market-economy oriented firms are able to obtain adequate supplies of timber. This suggests the market forces are at work for these firms, and the institutional framework is supporting supply and demand interactions.

These firms also export the majority of their production. One explanation is that they are relying on production capabilities, such as quality, to sell their products. Another explanation is that the third party enforcement of transactions in foreign markets provides a more attractive environment than is provided by the Russian institutional framework. Both explanations are consistent with Peng's model.

In contrast, planned-economy oriented firms complain they experience problems finding markets for their goods and dealing with

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marketplace competition. The markets they do find for production are local or domestic and these firms use barter or cash for their transactions.

Their inability to find markets for their goods suggests their products are not as desirable as those of their competitors, or may indicate their failure to adjust to free market mechanisms that require competing for customers. The use of barter or cash indicates the institutional framework has not evolved sufficiently to enforce formal arms-length transactions. Their reliance on the local and domestic markets suggests production may not be suitable for export, or that network-based transactions are still possible when selling their production.

All these characteristics and explanations derived from this research are consistent with Peng's model.

Generalization of the Results

As stated, the results of this analysis are consistent with Peng's general economic model. Since the results for the forestry sector model are consistent with the general model, it can be asserted that the forestry sector model as described in the thesis can be applied to other sectors. Those sectors should be similar to the forestry sector, such as other resource-based sectors. Therefore, results in terms of firm characteristics are also applicable and could be used. As noted earlier, there are probably some significant attributes that were not captured in the data, as evidenced by the results of the classification testing.

Conclusions

This study asked the question “Is it possible to identify the characteristics specific to forestry firms managed according to market-economy principles and specific to the forestry firms managed according to planned-economy principles?”

The answer to that question is a qualified yes. The analysis identified the following six attributes as important to distinguishing firms in the two classes.

1. The era during which the firm was established, either before or after the break up of Soviet Union (ESTABLIS).
2. Location of primary market, either domestic or foreign (HOMEMARK).
3. Obstacles to business identified as important. Market-economy oriented firms identified tax and business legislation as important. Planned-economy firms mentioned difficulty in finding markets for their goods (IMPOBST).

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4. The form of payment for product sales. Market-economy oriented firms use some form of cash or equivalent. Planned-economy firms have a barter component to their payments (PAYSELL).
5. Nature of the sales agreement, whether oral or written and signed by both parties (SALEFORM).
6. Source of timber for the firm (TIMBSUP).

The answer is only a qualified yes. The reason for this opinion is that the accuracy of classification, as measured by the cross-validation tests using classifiers based on the above six attributes, is not very good. Given the success both methods have achieved in other studies, it suggests that not all significant characteristics have been identified. Two possible causes exist for these missing attributes. The first is that the data collected from the interviews failed to include all the salient attributes. The second cause might be that these attributes were included in the original database, but were removed prior to the analysis because too few cases contained values for these attributes.

If the first cause is at fault, this would require a review of current literature to determine if other attributes have been identified that are not included in the original data. Utilizing those attributes would require a

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repeat of the whole data gathering process. Ideally, the interview process in such case would include completion of the survey instrument at the time of the interview to ensure that no information was missing. With the knowledge gained from the first data gathering experience, the survey instrument could be reviewed to ensure that the answers for each question are exhaustive and mutually exclusive.

The second cause could be corrected by returning to the firms and getting the missing attribute information. The analysis could then be repeated, perhaps excluding attributes that have been shown to be less significant and including attributes for which more cases have values.

Given the possibility that some significant attributes are missing from the database, the objectives of this thesis have been partially met. Caution should be exercised in drawing conclusions based on the results of this analysis. However, the analysis has shown that a reduced set of attribute can, in a limited way, distinguish between firms with a planned-economy orientation and firms with a market-economy orientation.

The identification of the significant attributes is needed to aid in establishing an institutional framework that encourages the transition of firms toward market oriented operations. This study may not have

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identified all the significant attributes. It has, however, highlighted that an institutional framework must create an environment where formal business practices are encouraged. Firms must benefit from engaging in these practices if that framework is to foster market-oriented behaviour. This finding reinforces the IMF-WB Financial Sector Assessment (IMF-WB, 2003) that states “Banking sector reform is a matter of the highest priority...” Market-oriented firms transact business in cash, and they need a banking sector that supports those transactions and protects the cash reserves generated. A reformed banking sector will thus help encourage market-oriented behaviour.

Organizations such as WB or IMF may use information from studies like this one while tailoring their economic programs for specific sectors of the economies in transition. These programs include reforms to the tax system such as the Tax Administration Modernization Project (WB, 2003) that encourages tax compliance through document submission and improved voluntary tax submittal. This study identified the current tax structure as an important obstacle for market-oriented firms. Again, a reformed tax system, where all profitable firms face the same fair tax

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burden, will encourage market-oriented behaviour and discourage planned-economy behaviour.

These WB programs also include reforms to the judicial system such as the Judicial Reform Support Project (WB, 2004). This project improves the quality of judgements as well as improving access to timely court proceedings. High quality and consistent judgements, and their accompanying enforcement, encourage arms-length transactions, which are critical for market-oriented operations. They also encourage the use of formal contract documentation that provides supporting evidence should judicial intervention be required. Timely access to court proceedings makes the use of these formal business practices, preferred by market-oriented firms, a realistic method to conduct business.

In conclusion, this study has identified some firm's characteristics that contribute to specific market orientation. Encouraging firm's market behavior along the lines described by these characteristics will lead to establishment of solid foundation for firm's transition towards operation according to market-economy principles.

Appendix A

Attributes' Labels and Descriptions

Attribute name	Description
ID	Identification number
LEGSTAT	Legal status , or legal structure, of the firm
LOCATION	Location of the firm
REGION	Region code for the firms location
RESPON	Respondents position in the firm
ESTYEAR	Year company established
BACKGR	Background of enterprise; ownership history
JOINTVEN	Is the firm in joint venture with foreign firm?
TYPEIND	Activity of the firm
MAINP	Main product at a time of a survey
MAINP1	Main product 1 year ago
MAINP5	Main product 5 years ago
MAINP10	Main product 10 years ago
OWNER	Ownership of the company
NUMBWO	Number of workers at a time of a survey
NUMBWO5	Number of workers 5 years ago
NUMBWO10	Number of workers 10 years ago
NUMBWH	Number of white collar workers at a time of the survey
NUMBWH5	Number of white collar workers 5 years ago
SOCRESP	Social (community) responsibilities
INVESTM	Are investments made in the company?
INVTYPE	Type of investments made in the company
INVFINAN	Source of financing for the investments.
BAKREL	Is there a relationship (accounts, loans) with a bank?
BANKREL1	Why no relations in the banking system?
TIMBSUP	Source of timber supply
TIMBSUPP1	Percentage of timber from largest source
TIMBSUPP2	Percentage of timber from second largest source
TETIMAQU	Terms of timber acquisition

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ALTSUPP	Is there an alternate supply of timber?
AMTIMSUP	Is there an adequate timber supply?
EXPLSHOR	Explanation for timber shortage?
PAYTIMB	Payment terms for timber or raw materials
ARRPAYBU	Arrangements for buying payment
BROKBUY	Broken buying arrangements (degree of problem)
ENFOBUY	Enforcement methods for buying arrangement
BUYFORM	Buying formalities (form of transaction agreement)
CUSTOMER	Primary customer
EXPORT	Are products exported?
EXPMARK	Primary export market
EXPSHARE	Percentage of production exported
HOMEMARK	Primary domestic market
MOIMPMA	Percentage of production to most important domestic market
SALEFORM	Form of sales agreement
ENFOSELL	Enforcement methods for selling arrangement
BROKSELL	Broken selling arrangements (degree of problem)
PAYSELL	Terms of sale
ARRPAYSE	Arrangement of selling payments
MEMBRAN	Member of a branch organization (association)?
WHYMEM	Reason for membership in branch organization
OBSTRULE	Rules that are business obstacles for the firm.
IMPOBST	Important business obstacle
OTHOBSTA	Other obstacles of importance
BINDREST	Most important binding restriction for operation of the firm
FORMLEG1	Is formal legislation adequate for forest business?
FORMLEG2	General problem with formal legislation
IMPCHANG	Important change required in Russian forest sector
CONSCUST	Which firms utilize services of consultants
CONSMARK	Region where consultants operate
OPERATE	Is the company in operation?
COUNTRY	Country of operation (Russia / Sweden)
TOTEMP98	Total employment in 1998 (and 1999)

TOTEMP5	Total employment 5 years ago
TOTEMP0	Total employment 10 years ago
REG1	Firm's region re-categorized
EMPSIZE	Size of company
ACTIVITY	Primary activity of the firm
SOCRESPO	Social responsibility
SOCIREL	Social relations (relational capital)
MARKD	Dummy variable
MARKDIST	Dummy variable
MARKDI2M	Distance to market
PROD5CAT	Production change in 5 years
REGIONS	Regions
OWNER1	Ownership re-categorized
EXPCAT	Export categories (percentage)
ESTABLIS	Era established
OBSTFIRM	Firm obstacle categories
ICHANGE	Important change categories
OTHEROBS	Other obstacle categories
BINREST	Binding restriction categories
ENFOS	Selling enforcement categories
ARRPAY	Cash or barter
PAY	Payment timing
ENFOS2	Enforcement categories
IRKUTSK	Location variable
GADICK1	Dummy variable
GADICK2	Dummy variable
GADICK3	Dummy variable
GADICK4	Dummy variable
GADICKE	Decision attribute
BACK1	Firm's background

Appendix B

Attributes Used in Analysis

Attribute code	Description	Values for the attribute
ACTIVITY	Primary activity of firm.	Forest management, Harvesting, Sawmill/process, Pulp/paper, Trading/consult, Sawmill/harvesting etc.
ALTSUPP	Alternative supply of timber. Is there a backup supply of timber not currently utilized?	yes, no.
BACK1	Firm's background.	State, old private, new private, joint venture.
BROKBUY	Violation of buying agreement. A measure of the magnitude of the problem of broken buying agreements.	large, small, none.
BROKSELL	Violation of selling agreements. Magnitude of the problem of broken selling agreements.	large, small, none.
BUYFORM	Buying formalities. Form of transaction agreement.	written, oral.
CUSTOMER	Primary customers for products.	private, company, state.

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ESTABLIS	Era company established	before 1947, between 1947 and 1989, after 1989.
EXPCAT	Export category.	none, less than 40%, more than 40%.
EXPLSHOR	Explanation of shortage. What is the reason for any shortage in supply?	financial, legislation, technology, disorder.
EXPMARK	Primary export market.	Europe, Asia, North America, no export.
HOMEMARK	Primary domestic market.	region, rest of Russia, both.
IMPOBST	Important obstacle to doing business.	taxes, legislation, enforcement of business legislation, finding market/ dealing with competition, no obstacles.
LEGSTAT	Legal status. The form of incorporation or type of organization.	There are 14 values of this attribute describing types of firms and forms of incorporation.
PAYSELL	Terms of sale. What is the method of payment for sales of product?	cash on/ before/ after delivery, barter.
PAYTIMB	Payment terms for timber or raw materials. What is the method of payment for supply of timber?	cash on/ before/ after delivery, barter.
SALEFORM	Form of sales agreement.	contract, oral.
TETIMAQU	Terms of timber acquisition.	stumpage, long term contract, short term contract.
TIMBSUP	Major timber supply source.	state, private, company, mixed [a combination of state and private sources].

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TOTEMP98	Total employment 1998 or 1999 (current employment at the time of the survey.)	integer
GADICKE	Gaddy-Ickes Space [Decision Variable]. 2 x 2 matrix based on "Distance to Market" and "Relational Capital".	Values are: 1. Low / Low (market oriented) 2. Low / High (either market environment) 3. High / High (planned economy) 4. High / Low (unlikely to succeed)
ORIENTATION	Analysis Index [Decision Variable]	Values are: 1. Low / Low (market oriented) 2. High / High (planned economy)

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Appendix C

Data Set Used in Analysis

ID	ORIENTATION	ACTIVITY	ALTSUPP	BACKI	BROKBUY	BROKSELL	BUYFORM	CUSTOMER	ESTABLIS	EXPCAT	EXPLSHOR	EXPMARK	HOMEMARK	IMPOBST	LEGSTAT
1	2	5	1	3	1	1	1	2	2	3	2	6	4	8	2
3	2	7	1	3	1	1	1	2	2	2	19	2	2	1	3
4	2	2	1	3	2	2	2	2	3	1	19	19	3	20	4
5	2	3	1	3	3	3	1	4	3	2	19	1	3	1	1
10	1	7	1	3	1	1	20	20	3	3	19	9	3	6	2
11	2	3	2	1	3	2	20	20	2	1	19	19	3	20	6
12	2	3	1	3	1	2	1	2	2	1	19	19	1	8	1
15	2	7	1	3	1	1	1	4	3	1	19	19	1	7	10
16	2	3	1	1	1	1	20	2	2	2	6	12	1	7	10
17	2	7	1	3	2	2	20	20	3	1	19	19	3	6	1
18	2	7	1	3	3	20	20	1	3	1	19	19	1	10	2
21	2	7	1	1	2	2	20	20	3	1	19	3	3	6	10
25	1	3	1	2	1	1	1	2	1	3	6	4	20	11	10
30	2	3	1	2	1	3	1	4	3	1	2	19	1	20	2
35	1	7	2	2	1	1	3	20	2	1	19	19	1	8	10
36	2	3	1	3	2	1	3	4	3	1	19	19	1	4	10
37	2	2	2	2	1	1	20	2	3	2	19	3	3	11	10
39	2	7	1	2	4	1	4	2	3	3	2	20	4	6	2
41	2	7	2	2	2	2	3	2	1	1	20	19	3	1	10
42	2	7	2	3	20	1	20	2	3	1	19	20	3	6	10
44	2	2	20	1	1	1	20	2	1	3	2	20	3	4	10
45	1	2	2	1	1	1	1	2	1	3	19	3	3	11	9
46	1	3	1	2	2	1	1	1	2	1	19	19	1	1	3
50	2	7	1	3	2	1	20	20	2	1	19	19	1	20	8
51	2	7	1	3	20	20	20	7	2	2	19	20	3	1	2
52	2	7	20	2	3	3	20	4	2	1	19	19	1	2	2
53	1	3	1	2	2	3	1	2	2	3	2	12	2	1	10
56	2	7	1	2	1	1	1	2	1	1	7	19	1	1	10

MARKET ORIENTATION AND ITS CHARACTERISTICS

ID	ORIENTATION	ACTIVITY	ALTSUPP	BACK1	BROKBUY	BROKSELL	BUYFORM	CUSTOMER	ESTABLIS	EXPCAT	EXPLSHOR	EXPMARK	HOMEMARK	IMPOBST	LEGSTAT
57	1	3	1	2	2	2	1	2	1	3	2	4	4	1	10
58	2	3	1	3	3	2	1	4	2	1	19	19	2	20	2
59	1	3	1	1	3	3	1	4	1	3	2	4	3	1	10
61	1	4	1	2	3	3	1	2	1	3	19	4	4	1	10
62	1	2	2	3	2	1	3	2	2	1	5	19	1	2	10
63	2	2	2	2	1	1	3	2	2	1	19	19	1	6	10
64	2	7	20	1	20	1	1	2	2	1	5	19	1	20	7
68	2	1	20	1	1	2	20	3	2	1	20	19	1	5	9
69	1	7	20	1	20	1	20	4	1	1	20	19	1	7	9
70	1	2	2	1	3	1	1	2	3	1	19	19	1	2	10
71	1	2	2	1	1	1	3	4	3	1	2	19	1	1	14
72	1	1	20	1	20	1	20	20	3	1	20	19	20	7	9
73	2	3	1	1	1	1	1	4	1	1	19	19	1	1	14
74	2	3	1	2	2	1	1	4	1	1	19	20	1	1	10
75	1	3	1	3	2	1	1	2	3	1	19	19	1	4	3
78	1	3	1	2	1	1	1	6	2	1	19	19	1	11	3
79	1	3	1	2	1	1	1	2	2	1	19	19	20	4	10
81	2	3	1	2	2	1	1	2	2	1	7	4	2	5	10
82	1	4	1	2	2	1	1	5	1	1	19	19	3	4	10
83	2	3	1	1	2	1	1	2	3	1	19	19	1	11	10
86	2	3	1	3	2	1	1	2	3	1	19	19	1	1	3
87	2	4	2	2	2	1	1	2	2	2	19	3	3	1	10
89	2	7	20	1	1	1	20	2	2	2	19	3	1	20	14
90	1	7	2	3	1	1	1	2	3	1	2	19	1	1	10
92	2	7	20	1	20	3	20	4	2	1	4	19	1	1	9
95	1	3	1	2	1	2	1	1	1	1	19	19	1	1	5
96	2	3	2	3	2	2	1	1	3	1	2	19	1	10	4
97	1	5	2	3	1	1	1	2	3	3	4	20	4	4	1
100	2	3	1	3	2	2	20	4	3	3	19	20	4	11	3
102	2	7	20	2	1	1	20	2	2	1	19	19	1	1	10
104	2	2	2	2	1	1	20	2	2	1	2	19	1	20	10
105	1	7	2	2	2	20	1	2	2	2	19	20	1	11	10
108	2	3	2	3	1	1	2	2	3	1	2	19	2	11	3
109	1	2	1	3	2	3	1	2	3	3	19	3	4	1	3
110	1	2	2	3	3	3	1	2	3	3	19	3	1	1	3

MARKET ORIENTATION AND ITS CHARACTERISTICS

ID	ORIENTATION	ACTIVITY	ALTSUPP	BACKI	BROKBUY	BROKSELL	BUYFORM	CUSTOMER	ESTABLIS	EXPCAT	EXPLSHOR	EXPMARK	HOMEMARK	IMPOBST	LEGSTAT
111	1	2	1	3	3	3	1	2	3	1	19	20	1	1	3
112	2	3	1	2	2	2	1	2	2	1	2	19	1	1	10
116	1	2	1	3	1	1	20	2	3	3	19	3	4	11	1
117	1	5	1	3	3	2	1	2	3	3	19	3	4	11	1
118	1	5	1	3	1	1	1	2	3	3	20	3	4	11	10
120	2	3	1	3	1	1	1	1	3	1	2	19	1	11	2
121	2	5	2	1	1	1	1	2	3	1	19	3	1	11	10
123	1	5	1	3	1	1	1	2	1	3	19	3	4	1	3
124	1	2	2	3	1	1	20	2	3	3	19	3	4	11	1
126	1	5	20	3	2	1	20	2	3	1	20	19	2	1	1
127	2	5	1	3	1	2	20	1	3	1	20	20	1	20	1
128	1	3	2	2	1	3	1	2	3	1	2	19	1	4	1
130	1	3	2	1	20	3	1	4	3	1	19	19	1	5	2
132	1	2	1	3	1	1	20	2	3	1	20	3	1	1	1
133	1	2	2	2	1	1	1	20	2	3	19	20	1	11	10
158	2	7	2	1	20	1	20	6	2	2	4	1	3	11	9
160	2	2	2	2	3	20	3	2	3	1	20	19	1	1	1
163	1	7	1	2	1	1	1	2	2	1	19	19	1	2	10
164	2	3	1	2	2	1	1	2	1	3	19	20	1	4	-9
170	1	2	2	2	1	1	1	2	2	1	5	19	3	8	3
171	2	2	2	1	1	1	1	2	2	1	2	19	3	5	7
172	2	2	2	2	1	1	1	2	2	1	2	19	1	6	10
173	2	7	20	1	20	1	20	6	2	1	20	19	1	11	9
174	2	7	20	1	20	3	20	6	2	1	20	19	1	11	9
177	1	4	20	2	20	20	20	2	1	3	20	4	3	10	10
181	2	2	1	2	1	1	1	2	2	2	2	20	1	1	10
182	2	2	2	1	1	1	1	4	2	1	2	19	1	1	6
183	2	7	1	2	1	1	1	4	1	1	19	19	1	1	1
185	2	2	2	2	1	1	1	4	2	1	19	19	1	1	10
189	1	1	20	1	20	1	20	2	1	1	20	4	1	2	9
192	2	4	2	2	1	1	1	4	1	1	19	19	3	6	10
195	2	4	1	2	2	1	1	2	1	1	19	20	20	1	10
196	2	2	2	1	1	1	1	4	1	2	19	19	1	1	6
197	1	2	2	2	3	2	20	2	2	2	19	4	3	1	10
198	2	5	20	2	20	1	20	20	1	1	20	4	3	19	-9

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ID	ORIENTATION	ACTIVITY	ALTSUPP	BACK1	BROKBUY	BROKSELL	BUYFORM	CUSTOMER	ESTABLIS	EXPCAT	EXPLSHOR	EXPMARK	HOMEMARK	IMPOBST	LEGSTAT
201	2	3	2	2	2	2	1	2	2	3	2	4	3	11	1
202	2	3	2	2	2	2	1	2	3	1	2	19	3	19	1
202	2	3	2	2	2	2	1	2	1	1	19	19	3	1	3
206	2	2	2	2	2	1	3	2	1	1	19	19	1	2	10
208	2	3	2	2	3	1	3	2	1	1	19	19	1	1	5
209	2	3	2	3	3	3	2	1	3	1	2	19	3	1	3
211	2	5	1	3	2	2	20	2	3	1	19	19	1	10	1
212	2	3	2	2	2	2	1	2	1	3	2	10	4	1	3
213	1	3	2	3	2	2	1	2	3	3	19	4	4	1	1
214	2	7	1	2	2	3	1	2	1	3	7	4	1	1	10
217	2	2	2	2	3	3	1	2	2	2	7	4	1	11	3
219	1	7	2	3	3	3	1	2	3	3	4	14	1	4	1
222	1	1	2	1	20	3	20	4	1	1	1	19	1	2	9
225	1	7	2	1	2	2	1	2	1	1	2	19	3	10	14
226	1	2	2	1	3	1	3	2	3	1	2	4	1	19	6
228	1	3	2	3	1	3	1	5	3	1	19	19	1	1	1
230	1	1	20	1	2	3	4	4	1	1	19	19	1	1	9
235	1	7	1	3	3	1	1	2	3	3	2	4	1	1	3
237	1	7	1	3	1	1	1	2	3	3	19	4	1	1	1
240	1	7	1	3	20	20	1	4	3	1	19	4	3	4	3
241	1	3	1	3	1	1	1	2	3	1	20	19	1	19	4
243	1	2	1	3	2	1	1	2	3	1	5	19	1	1	1

MARKET ORIENTATION AND ITS CHARACTERISTICS

ID	ORIENTATION	PAYSELL	PAYTIMB	SALEFORM	TETIMAQU	TIMBSUP	TOTEMP98
1	2	5	6	1	3	5	3
3	2	5	6	1	5	2	57
4	2	1	6	1	5	2	17
5	2	2	4	20	3	6	2
10	1	4	2	3	1	1	72
11	2	5	20	20	1	1	?
12	2	6	6	20	3	20	123
15	2	4	4	1	4	1	18
16	2	5	20	20	20	4	807
17	2	8	6	1	1	6	19
18	2	1	1	20	1	1	15
21	2	3	3	3	1	1	400
25	1	4	5	1	3	1	1009
30	2	1	1	3	3	1	8
35	1	8	6	3	3	6	998
36	2	3	6	1	3	1	120
37	2	5	7	1	1	1	625
39	2	4	7	1	5	7	142
41	2	1	2	1	1	1	555
42	2	5	2	1	1	7	347
44	2	5	4	1	1	7	503
45	1	1	1	20	20	1	116
46	1	1	1	20	3	4	2439
50	2	8	6	20	1	1	20
51	2	4	6	20	4	6	18
52	2	8	8	1	5	1	73
53	1	1	5	1	2	1	156
56	2	1	5	1	2	1	603
57	1	4	5	1	3	1	2478
58	2	7	1	1	2	6	67
59	1	6	5	1	2	6	240
61	1	6	1	1	5	4	1908
62	1	4	8	1	1	1	350
63	2	4	1	1	1	1	362
64	2	3	20	1	20	1	564

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ID	ORIENTATION	PAYSELL	PAYTIMB	SALEFORM	TETIMAQU	TIMBSUP	TOTEMP98
68	2	5	6	20	20	20	57
69	1	1	20	1	20	20	284
70	1	1	2	1	1	1	15
71	1	1	9	1	1	1	104
72	1	20	20	1	20	20	213
73	2	8	4	1	2	6	628
74	2	8	4	1	3	20	410
75	1	4	1	1	3	4	202
78	1	1	1	1	2	4	458
79	1	1	1	1	2	4	1044
81	2	8	1	1	2	4	3050
82	1	4	1	1	4	6	698
83	2	5	1	1	3	4	71
86	2	8	4	1	2	6	484
87	2	2	4	1	2	6	3019
89	2	5	4	1	1	7	274
90	1	1	1	1	2	7	760
92	2	3	9	1	5	20	?
95	1	8	6	20	4	6	552
96	2	1	1	1	3	1	8
97	1	1	1	1	3	4	55
100	2	8	4	20	3	6	78
102	2	5	6	1	2	7	280
104	2	3	1	1	2	7	401
105	1	20	2	3	2	7	220
108	2	5	4	2	3	5	4
109	1	1	5	1	1	1	41
110	1	1	1	1	1	1	53
111	1	1	5	1	1	1	42
112	2	5	3	1	20	1	345
116	1	10	9	20	20	20	18
117	1	4	5	1	20	1	17
118	1	4	5	1	2	20	10
120	2	4	2	1	3	1	48
121	2	3	1	1	20	4	39

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ID	ORIENTATION	PAYSELL	PAYTIMB	SALEFORM	TETIMAQU	TIMBSUP	TOTEMP98
123	1	1	1	1	20	6	27
124	1	6	1	20	20	1	13
126	1	20	2	1	20	20	14
127	2	7	5	20	1	8	2
128	1	4	5	2	3	6	15
130	1	2	1	1	20	6	11
132	1	4	2	1	2	1	37
133	1	2	2	1	2	1	220
158	2	1	20	1	5	1	38
160	2	10	4	20	2	1	374
163	1	1	1	1	2	1	950
164	2	5	1	1	2	1	1295
170	1	4	5	1	5	1	275
171	2	3	5	1	1	1	240
172	2	5	3	1	3	1	94
173	2	1	20	1	20	20	80
174	2	8	20	1	20	20	104
177	1	20	20	1	20	1	7996
181	2	3	3	1	2	1	241
182	2	3	3	1	1	1	277
183	2	1	3	1	3	1	136
185	2	5	5	1	2	1	723
189	1	4	20	1	20	20	62
192	2	3	3	20	3	8	360
195	2	5	4	1	20	6	504
196	2	1	4	1	1	1	27
197	1	1	9	1	2	1	205
198	2	8	20	1	20	20	60
201	2	1	20	1	3	5	200
202	2	5	1	1	3	5	350
202	2	5	6	1	2	4	478
206	2	3	1	2	1	1	385
208	2	8	1	1	3	4	85
209	2	5	4	2	3	3	54
211	2	8	6	1	3	6	22

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ID	ORIENTATION	PAYSELL	PAYTIMB	SALEFORM	TETMAQU	TIMBSUP	TOTEMP98
212	2	5	4	1	3	6	447
213	1	8	1	20	3	4	473
214	2	5	4	1	1	4	1221
217	2	8	2	1	20	1	498
219	1	1	1	1	3	1	5
222	1	1	9	2	5	1	53
225	1	4	2	1	1	1	100
226	1	8	2	1	2	1	84
228	1	1	1	1	3	6	13
230	1	2	1	1	20	1	22
235	1	1	20	1	2	1	22
237	1	4	2	1	1	1	45
240	1	5	20	1	1	1	319
241	1	1	1	1	3	1	12
243	1	4	8	1	1	1	98

References

- Brown, S., Eisenhardt, K. (1998). *Competing on the Edge*. Harvard Business School Press, Boston.
- Browne, C., Duntsch, I., Gediga, G. (1998). IRIS Revisited: A Comparison of Discriminant and Enhanced Rough Set Data Analysis, Rough Sets. In L. Polkowski and A. Skowron (eds) *Knowledge Discovery*, Vol. 2, Physica Verlag, 345 – 368.
- Brunetti, A., Kisunko, G., Weder, B. (1997a). Institutional Obstacles for Doing Business: Data Description and Methodology of a Worldwide Private Sector Survey. World Bank Discussion Paper No. 1759, World Bank, Washington, DC.
- Brunetti, A., Kisunko, G., Weder, B. (1997b). Institutions in Transition: Reliability of Rules and Economic Performance in Former Socialist Countries. World Bank Discussion Paper No. 1809, World Bank, Washington, DC.
- Bouckaert, R.R. (2003). Choosing between two learning algorithms based on calibrated tests, Proceedings of the Twentieth International Conference on Machine Learning (ICML-2003), Washington, DC.
- Carlsson, L., Lundgren, N.G., Olsson, M.O. (2000). Why is the Russian Bear Still Asleep After Ten Years of Transition. IIASA Interim Report, IR-00_019.
- Denizer, C. (1997). Stabilization, Adjustment, and Growth Prospects in Transition Economies. World Bank Discussion Paper No. 1855, World Bank, Washington, DC.
- Frydman, R., Gray, C.W., Hessel, M., Rapaczynski, A. (1997). Private Ownership and Corporate Performance: Some Lessons from

MARKET ORIENTATION AND ITS CHARACTERISTICS

Transition Economies. World Bank Discussion Paper No. 1830, World Bank, Washington, DC.

Gaddy, C., Ickes, B.W. (1998). To Restructure or Not to Restructure: Informal Activities and Enterprise Behavior in Transition. Unpublished Manuscript.

Gaddy, C., Ickes, B.W. (2002). *Russia's Virtual Economy*. Brookings Institute Press, Washington, DC.

Garson, D.G. (2004), PA 765 Multivariate Analysis in Public Administration,
<http://www2.chass.ncsu.edu/garson/pa765/discrim.htm>

Grzymala-Busse J.W. (1992). LERS – A System for Learning from Examples Based on Rough Sets. In R. Slowinski, (ed.) *Intelligent Decision Support*, Kluwer Academic Publishers, 3—18.

Gupta, S., Leruth, L., De Mello, L., Chakravarti, S., Kutan, A., Szokely, I., Miller, J. (2003). Transition Economies: How Appropriate is the Size and Scope of Government?. *Comparative Economic Studies*, 45, 554-576.

International Monetary Fund – World Bank (2003). Financial Sector Assessment – Russian Federation – October 2003, World Bank, Washington, DC.

Kiggundu, M.N. (2002). *Managing Globalization in Developing Countries and Transition Economies*. Praeger Publishers.

Kolodko, G. (1999). Ten Years of Post-Socialist Transition Lessons for Policy Reform. World Bank Discussion Paper , World Bank, Washington, DC.

Koveos, P. (2003). Economies in Transition: Recent Performance. *Syracuse Journal of International Law & Commerce*, 30, 287-305.

- Krusinska, E., Slowinski, R., Stefanowski, J. (1992). Discriminant versus Rough Sets Approach to Vague Data Analysis. *Applied Stochastic Models and Data Analysis* 8. 43 – 56.
- Lin, T. (1997). Fuzzy Controllers: An Integrated Approach Based on Fuzzy Logic, Rough Sets, and Evolutionary Computing. In T. Lin and N. Cercone (eds) *Rough Sets and Data Mining*, Kluwer Academic Publishers, 123-139.
- Montes-Negret, F., Papi, L. (1997). The Polish Experience with Bank and Enterprise Restructuring. World Bank Discussion Paper No. 1705, World Bank, Washington, DC.
- Pawlak, Z. (1991). *Rough Sets: Theoretical Aspects of Reasoning about Data*. Kluwer Academic Publishers.
- Peng, M. (2003). Institutional Transitions and Strategic Choices. *Academy of Management Review*, 28, 275-296.
- Perotti, E., Geifer, S. (2001). Red Barons or Robber Barons? Governance and Investment in Russian Financial-Industrial Groups. *European Economic Review*, 45, 1601-1617.
- Pomfret, R. (2003). Lessons from Economies in Transition from Central Planning. *Australian Economic Review*, 36, 245-252.
- Raiser, M., Schaffer, M. (2004). Benchmarking Structural Change in Transition. *Structural Change & Economic Dynamics*, 15, 47-81.
- Sewell, D. (1997). Shifting Responsibility for Social Services as Enterprises Privatize in Belarus. World Bank Discussion Paper No. 1719, World Bank, Washington, DC.
- Scott, W.R. (1995). *Institutions and Organizations*. Sage, Thousand Oaks, CA.

- Slowinski R. (ed.). (1992). *Intelligent Decision Support. Handbook of Applications and Advances of the Rough Set Theory*. Kluwer Academic Publishers.
- Svejnar, J. (2002). Transition Economies: Performance and Challenges. *Journal of Economic Perspectives*, 16, 3-28.
- Thomas, D. (1992). Interpreting Discriminant Functions: A Data Analytic Approach. *Multivariate Behavioral Research*, 27, 335-362.
- World Bank (1998a). Political Credibility and Economic Reform. World Bank Discussion Paper No. 681-85, World Bank, Washington, DC.
- World Bank (1998b). Cross-Country Indicators of Institutional Uncertainty. World Bank Discussion Paper No. 680-51C, World Bank, Washington, DC.
- World Bank (2003). Project Performance Assessment Report – Russia - Tax Administration Modernization Project – (Loan 3853). World Bank, Washington, DC.
- World Bank (2004). Russian Federation - Judicial Reform Support Project, Initial Project Information Document, Report No: AB139. World Bank, Washington, DC.