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THE EFFICIENCY BASIS AND EMPLOYMENT IMPACTS OF
DIRECT JOB CREATION IN THE PRIVATE SECTOR

by

Surendra Kumar Gera, B.A., M.A., M.A.

A thesis submitted to
the Faculty of Graduate Studies and
Research in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy

Department of Economics

Carleton University

Ottawa, Ontario

October, 1983

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ABSTRACT

During the 1970s, federal direct job creation programs were used as a major instrument of Canadian manpower policy. Since the beginning of that decade, approximately \$2.5 billion has been spent on direct job creation programs. Concerns have been raised whether these programs pass the economic-efficiency criterion. Doubts have also been expressed about their employment impact. This study addresses questions concerning the efficiency basis of these programs and their net employment effects. The major objective of the study is twofold: (1) to examine whether there is an efficiency basis for subsidizing job creation in regions; and (2) to investigate the displacement effects and the net employment impact of such a policy. As a secondary objective, the study also examines the question whether direct job creation programs have any supply-side effect in the sense of improving the skills of the participants and, consequently, enhancing their future employability.

Our analysis is conducted in two stages. First we present a basic two sector model of a regional labour market and then examine theoretically the efficiency basis and the net

(iv)

employment effects of a job creation policy introduced in the temporary sector of the model. In the second stage of our analysis, these objectives are evaluated within the context of Canada's recent Employment Tax Credit Program (ETCP).

The empirical results indicate that in the presence of taxes and UI benefits in the system, and under the assumption of a diminishing marginal product of labour in the permanent sector, a case can be made on efficiency grounds for subsidizing job creation in the temporary sector in all the provinces. The long-run displacement effect of the ETCP is very small, assuming that all the jobs created by the program were incremental. When this assumption is dropped, the estimated net employment effect of the ETCP is reduced to only 33 per cent of the jobs asserted to have been created by the program. In other words, the displacement effect of the program is estimated to be 67 per cent. Finally, the program had no supply-side effect in the sense of improving the skills of participants.

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The views or opinions expressed in this study are my personal responsibility and, as such, have not been endorsed by either the Chairman or members of the Economic Council of Canada.

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(2) wage subsidy programs in the private sector not only ensure that the produced output meets the conventional tests of consumer demand but they also create jobs directly in regular employment, so that workers are not making a transition from special temporary programs; and (3) a targeted marginal wage subsidy may stimulate labour demand for less than the marginal supply price of labour. By contrast, public-sector employment programs, in effect, subsidize labour costs by an amount at least equal to the marginal supply price of labour.

Second, how big is the "displacement effect" of the direct job-creation programs? One of the problems associated with these programs is that of displacement effects -- the reduction of employment resulting somewhere else from the programs' job-creation impacts. Since the main objective of these programs is employment creation, they must be assessed in terms of the net job-creation impact, defined as the difference in employment levels in the economy with the programs and without them. Net job creation under these programs is likely to be less than gross job creation mainly because many of the program participants would have been working even in the absence of the programs (Haveman, 1980).

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CHAPTER 1

INTRODUCTION

In the 1970s, labour market policy in the industrialized world underwent a major shift away from programs that focused primarily on the supply side (training and mobility) towards measures aimed at the demand side (direct job creation). Since the beginning of that decade, direct job creation programs have been used as a major instrument of Canadian manpower policy, with approximately \$2.5 billion being spent on them during the fiscal years 1971-72 to 1980-81 (inclusive). Perhaps the most crucial factor contributing to a favourable climate for direct job creation programs was the rise in the national average unemployment rate from 4.4 per cent in 1969 to 6.2 per cent in 1971.¹ Another important factor was the limited effectiveness of federally run training programs² aimed at providing skills and jobs to the unemployed under the Adult Occupational Training Act (AOTA).³

Direct job creation is defined as measures that are undertaken to accomplish one or more of the following major objectives: 1) to create jobs directly for the unemployed in general during recessions; 2) to increase labour demand for specific groups in the economy, such as youths, minorities, the handicapped, or those with little education or skills⁴ - groups that constitute "the structurally

unemployed" and 3) to reduce poverty among the structurally unemployed, who generally tend to be found on the bottom range of the earnings scale.

Direct job creation policies can take many forms. The two predominant types are the direct public service employment programs and employment subsidy programs designed to create jobs in the private sector.

A. The Economic Rationale for Direct Job Creation

The economic rationale⁵ for direct job creation can be viewed from the following viewpoint. In a complex labour market such as Canada's, there may exist factors that constrain purely economic forces and lead to distorted resource allocation and economic efficiency. The presence in labour markets of minimum wages, strong labour unions, payroll taxes, and unemployment insurance benefits have often been suggested as factors driving a wedge between social opportunity cost of labour (SOCL) and the marginal product of labour. It is precisely the reduction of this gap that may be accomplished by direct job-creation programs. Such programs - whether public-service employment or employment subsidies - subsidize employment and thus reduce the cost of hiring labour to potential public or private employers and have the effect of narrowing the gap between

SOCL and the market wage. In this way they may improve the efficiency of the labour market.

One may argue, of course, that the best remedial action for policy-makers would be to remove labour market distortions at the source. That, however, oversimplifies the issue; in fact, such distortions as minimum wages and effective unions may not be within the practical realm of policy-makers' power to change.

According to Baily and Tobin (1977), direct job creation through public-service employment programs and wage subsidy programs may be designed so as to alter the mix of employment in favour of individuals who experience exceptionally high rates of unemployment and/or of regions that are hit by above average structural unemployment. By targeting such programs at workers who have less bargaining power on wages than more advantaged workers or at sectors with low upward wage responsiveness, increased employment can be achieved with lower inflationary pressures. The basic strategy, as Baily and Tobin describe it, is simple: shift labour demand to types of workers who are - because of high unemployment, less bargaining power, rigid wages, or other characteristics - on a relatively flat Phillips Curve. If the government hires these individuals or induces other employers to hire

them, no upward pressure is generated on wage costs in the aggregate. Thus, it is possible to "cheat the Phillips Curve". For the short run, this means shifting the Phillips Curve to the left and achieving high rates of employment, with diminished inflationary consequences. For the long run, it means diminishing the non-accelerating inflation rate of unemployment (NAIRU).

B. Direct Job Creation in Canada

Public service employment (PSE) programs in Canada have generally been designed to accomplish one or more of the following objectives: (1) to increase total employment in general and to provide jobs for particular groups of individuals such as youths, natives, the handicapped, and those with little education or few skills, who face the greatest difficulties in obtaining regular jobs; (2) to improve the earnings or "future employability" of individuals who participate by developing their marketable skills; and (3) to produce a more equitable income distribution. Based on these principles, a series of PSE programs have been initiated since the 1970s (see Table 1-1). However, their scale and design have changed from year to year in response to varying economic conditions.

In the winter of 1971-72, the Local Initiatives Program (LIP) was introduced. A labour-intensive, winter-season, community involvement program, LIP paid the local going wage rate and served an average of over 50,000 clients per year. Its average annual expenditures were approximately \$140 million until it was phased out in 1977. It was superseded by a year-round program called "Canada Works" (considered a "permanent" program until at least 1981-82), which funds incremental local employment or nonprofit community services that enhance the skills of the participants. The Canada Works (CW) program has provided 208,000 jobs so far, at a cost of \$680 million. Lately, its focus has slowly been shifting away from providing aid to disadvantaged individuals on a short-term basis, and more emphasis has been placed on creating longer-term, self-sustaining employment opportunities. In 1978-79 and 1979-80, an "Economic Growth Component" (EGC) was added to the CW program, with a view to creating permanent employment in the private sector, preferably in high-unemployment areas. The Local Employment Assistance Program (LEAP), a "permanent" program, was designed to create long-term employment for the chronically unemployed. Its target groups include youths, women, native people, the handicapped, welfare recipients, and ex-convicts; its clients number close to 9,000 annually. In 1980, the Local Economic Development Assistance (LEDA)

program stressing developmental aspects was introduced on an experimental basis.⁶

In Canada's private sector, the Job Experience Training Program operated from 1977 to 1979 and was designed to offer summer jobs to potential high-school drop-outs. The Employment Tax Credit Program (ETCP), which will be discussed in detail in Chapter 7, was initiated in 1978 as a temporary wage-subsidy scheme offering tax credits of up to \$2.00 per hour to firms for "incremental" employees working full-time for at least three months. Initially designed to create 50,000 jobs annually with an expenditure of \$100 million, the scheme was discontinued in April 1981. During the fiscal year 1979-80, the program created a gross total of 50,786 jobs, at a cost of about \$90 million. A new wage-subsidy program for the disadvantaged was introduced in May 1981. It provides a decreasing scale of subsidy (85 per cent, 50 per cent, and 25 per cent) for three phases of 13, 26 and 26 weeks respectively -- 65 weeks in all. This program was expected to create 2,300 jobs for handicapped persons and 6,900 jobs for other employment-disadvantaged persons during the year 1981-82.⁷

C. Evaluation of Direct Job Creation Programs

Despite the recent expansion in the use of, and interest in, federal programs to create jobs, their efficacy is a matter of considerable dispute, primarily because little has been undertaken in the way of quantitative evaluations of these programs. In discussions concerning the merits of these programs a number of questions have been raised.

First, do the direct job-creation programs pass the economic efficiency test? This requires the evaluation of their efficiency in terms of their social benefits and social costs. Such programs lead to an increase in economic welfare of the community if the social benefits exceed the social costs. The major item on the benefit side is the value of output produced by the workers directly employed through the program. On the cost side, the key element is the social opportunity cost of program participants, i.e., the value of what the workers employed would have been doing if the program had not existed.

Little is known about the economic efficiency of narrowly targeted public-employment and wage-subsidy programs. What is known suggests that they have potential but that they may have difficulty in passing a strict economic efficiency test.

because of the relatively low value of the output, the low level of skills among participants (especially if the program is targeted on low-productivity workers), and the input biasing nature of the program.⁸ Haveman (1980) argues that in case of PSE programs, the key issue is the value of the output produced. Since the output of these programs is not marketed, its value is hard to measure.⁹ Haveman (1978) performed a cost-benefit analysis of the Dutch Social Employment Program in the Netherlands. He pointed out that on the benefit side, there are two key elements: the value of the output produced by the workers directly employed through the program and the additional future output that program participants will be able to provide because of any increase in their productivity due to the contribution of the work experience or on-the-job training. This factor may also increase the value of the participant in the labour market in terms of enhancement of future employability and his or her earnings in the future.¹⁰

The major elements of social cost are the following: First, the 'opportunity cost' or foregone output of the program participants, i.e., the value of what the workers employed would have been doing if the program had not existed. This foregone output might involve the participant's alternative market activities, e.g., regular or part

time employment opportunities they vacate are not filled by other workers who otherwise would have been unemployed, or the home production (e.g., child care) or simply, the value of the foregone leisure. Second, the output of such programs may displace some regular public or private output, and if the resources that would have produced the latter are not re-employed, this foregone output is also a social cost. Finally, the program operating costs other than salaries of the program participants --the expense of supervisors, equipment, materials and other resources used in the program that may have alternative uses elsewhere in the economy. His calculations show that the net social costs of employment in the program ranged from about \$4,000 to \$5,000 per year per worker (in 1979 dollars). He argued that if the social and psychological benefits of the program are judged to exceed this value, then the program can be considered a socially efficient one.

Haveman and Christainsen (1978) argue that wage subsidies to the private sector may be more economically efficient than public-sector employment programs for a number of reasons: (1) private-sector employers already have a known production process and a set marketing channel for their products, whereas PSE programs are often undertaken with no clear definition of the expected output and productivity;

(2) wage subsidy programs in the private sector not only ensure that the produced output meets the conventional tests of consumer demand but they also create jobs directly in regular employment, so that workers are not making a transition from special temporary programs; and (3) a targeted marginal wage subsidy may stimulate labour demand for less than the marginal supply price of labour. By contrast, public-sector employment programs, in effect, subsidize labour costs by an amount at least equal to the marginal supply price of labour.

Second, how big is the "displacement effect" of the direct job-creation programs? One of the problems associated with these programs is that of displacement effects -- the reduction of employment resulting somewhere else from the programs' job-creation impacts. Since the main objective of these programs is employment creation, they must be assessed in terms of the net job-creation impact, defined as the difference in employment levels in the economy with the programs and without them. Net job creation under these programs is likely to be less than gross job creation mainly because many of the program participants would have been working even in the absence of the programs (Haveman, 1980).

Despite the relevance of this issue, only limited empirical evidence is available for Canada.¹¹ A recent Economic Council of Canada study (1982) reports, "the prominent community service nature of many PSE ventures suggests that the displacement effects are unlikely to be large. Our estimates of the fiscal substitution effect,¹² however, range between 50 and 70 per cent" (p. 76).

In the United States, although several econometric studies have estimated the magnitude of the displacement effect, their estimates vary widely. The National Planning Association study (1974) concluded that the net job creation is 54 new State and local government jobs per 100 PSE slots one year after the program is introduced. The implication is that the fiscal authorities were able to divert nearly 46 per cent of the PSE funds to other activities. Johnson and Tomola (1977) concluded a declining net employment impact for PSE, with approximately 37 jobs created four quarters after 100 PSE slots are provided, and no job creation at all six quarters after the program starts. Although their results are very sensitive to changes in the econometric methodology used (Wiseman, 1976), the short-run net job-creation effects were found to be larger than the long-run effects. Borus and Hamermesh (1978) found the ratio of net-to-gross job creation at between 40 to 60 per

cent after one year. This implies that about one-half of the PSE funds were diverted from job creation through the fiscal-substitution effect. They also point out that the estimates of the fiscal-substitution effect depend upon the assumptions, specifications, and data used.

There is not much evidence on the displacement effects of direct job-creation programs aimed at the private sector. In the United States, some attempts have been made to evaluate the net employment impact of the New Jobs Tax Credit (NJTC). Bishop and Haveman (1979) used a variety of time series regressions to estimate the net employment effect of the NJTC Program in the construction and retailing industries. They concluded that 20 to 30 per cent of the observed total employment increase in these industries were the result of the subsidy program. Perloff and Wachter (1979) concluded that the employment effects attributed to the NJTC appear to be substantial. While these studies measured net increases in employment within industries, they failed to consider the possible displacements in other sectors of the economy.

Third, do direct job-creation programs provide any work experience or training to enhance the future employability of program participants? It is generally argued that these

programs do not provide much training to improve the level of skills among participants (Haveman and Palmer, 1982), although to our knowledge, there is no empirical evidence on this issue.

Finally, to evaluate the effectiveness of wage credit programs on a macroeconomic basis, various attempts have been made to estimate the effects of these programs on aggregate employment, output, wage and price levels,¹³ and net government revenue. Fethke and Williamson (1976), using an aggregate model, discovered that for the United States a variable base-wage credit policy would have significant effects on employment, output, and prices, at a relatively small net cost to government. Kesselman, Williamson, and Berndt (1977) analyzed the relative effectiveness of an investment tax credit versus an employment tax credit. For the period 1962-71, they simulated the impact on U.S. manufacturing output of replacing the investment tax credit with an employment tax credit of an equivalent cost to the government. Their main conclusions were that total employment would have been from .5 to more than 1 per cent higher in many of the years under study and that use of capital services would have been from 1 to 6 per cent lower during the period. They also argued that an employment tax credit would have induced firms to substitute blue-collar workers

for capital and for white-collar workers. Recently, Burdett and Hool (1982) investigated some macroeconomic effects of employment subsidies within the context of a "disequilibrium" model. They concluded that employment subsidies are especially potent tools for achieving employment, price level, and distributional goals during both the upswing and downswing phases of the cycle, with aggregate demand policies being more effective at the trough and peak.

D. Objectives of the Dissertation

This study evaluates, from a microeconomic perspective, the effectiveness of the Employment Tax Credit (ETC) Program, which was designed to generate employment in the private sector in Canada during the period from April 1978 to March 1981. The program, although viewed primarily as a countercyclical measure, had some structural features. It provided a variable tax credit depending on the geographic area, to employers who provided jobs additional to their normal work force - that is, jobs that would not have been created without the subsidy provided by the program. The program had two objectives: (1) primarily, to stimulate incremental employment in the private sector; and (2) secondarily, to improve the future employability of the

participants above that which would have occurred in its absence. The details of the ETC Program are discussed in Chapter 7.

The principal questions posed in the study are: First, what is the social opportunity cost (SOCL) of a job created by the Employment Tax Credit Program? Is SOCL higher or lower than the value of the output produced by the job? In other words, is there an efficiency ground for subsidizing job creation in the various regions? Second, what are the displacement effects of such a program? What is its net or incremental employment effect?

To tackle these questions, a two-sector general equilibrium model of a region is developed. The model has two sectors with two types of labour: skilled labour in a permanent sector and unskilled labour in a temporary sector. The model then permits the movement of labour between sectors, and incorporates the costs of acquiring skills, unemployment insurance benefits, a minimum wage, and unemployment in the temporary sector. Unskilled workers move to the permanent sector according to the expected wage differential and the costs of acquiring skills. The model is then used to explore the implications of a wage subsidy designed to increase the number of jobs in the temporary

sector. The ability of the subsidy program to offset the pre-existing distortions in the economy results in an increase in the efficiency of resource allocation.

In addition, an attempt is made to investigate whether the Employment Tax Credit Program (ETCP) succeeded in increasing the post-program employability of the participants. This may occur as a consequence of the work experience or on-the-job training gained under the program. Although the model is not designed to formally account for this possibility, the data permit a crude test for the existence of this effect.

The empirical work employs a data base containing information on a 10 per cent sample of participants of the Employment Tax Credit Program (ETCP). Participants' pre-and post-ETCP employment and unemployment experience is obtained from the Longitudinal Labour Force Data Base (LFDB) of the Canada Employment and Immigration Commission (CEIC), covering the 1975-80 period.

E. Outline of the Dissertation

The thesis is divided into two parts. Part I contains the theoretical analysis and Part II is devoted to the empirical

analysis. In Part I, Chapter 2 provides the theoretical and analytical framework for the succeeding chapters. The sectoral production functions, labour endowments, expected wage receipts, and long-run equilibrium condition of the model are developed. Chapter 3 investigates the long-run consequences of a wage subsidy to the temporary sector; it also contains some comparative static analysis. In Chapter 4, we examine the short-run consequences of a wage subsidy in the temporary sector. A simulation example is provided to show the dynamic adjustment over time. Chapter 5 examines from a theoretical perspective the efficiency basis for job creation in the temporary sector under alternative assumptions about the marginal product of labour. The social opportunity cost of a job is derived and compared with the value of the output produced. The displacement effects and the net employment effects resulting from a wage subsidy are examined in Chapter 6.

In Part II, Chapter 7 is devoted to the description of the Employment Tax Credit Program (ETCP) and of the data used in the empirical analysis. The methodology and procedures, and the empirical results of the estimation of the social opportunity cost of a job are presented in Chapter 8. This chapter also examines the empirical efficiency basis of the ETCP and explores whether there is a case for differential

subsidization of labour between high-unemployment and low-unemployment regions. Chapter 9 describes the methodology and procedures, and the estimates of the displacement effects of the program. The estimates of its net employment effects are presented. The chapter also examines the dynamics of adjustment as a result of job creation in regional labour markets.

Finally, Chapter 10 summarizes the conclusions of the study. An appendix is devoted to the examination of the postprogram employability and earnings of the participants.

Table 1-1

Number of Jobs Created and Program Expenditure, by Program, Canada, 1971/72 to 1981/82

	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
Local Initiatives Program (LIP)											
Number of jobs created	82,300	86,876	30,157	31,810	40,880	43,083					
Program expenditure (\$ millions)	182.8	182.5	67.6	79.9	128.3	177.2					
Canada Works (CW)											
Number of jobs created							69,739	75,631	45,466	17,648	
Program expenditure (\$ millions)							320.6	188.1	86.3	86.5	
Economic Growth Component											
Number of jobs created								15,076	4,714		
Program expenditure (\$ millions)								28.4	18.5		
Local Employment Assistance Program (LEAP)											
Number of jobs created			1,534	1,856	1,639	1,804	2,219	3,006	6,882	6,807	
Program expenditure (\$ millions)			5.4	11.8	13.3	14.0	19.0	24.1	48.2		
Opportunities for Youth (OFY)											
Number of summer jobs created	27,832	29,864	37,382	27,525	29,312						
Program expenditure (\$ millions)	23.1	31.0	36.9	26.3	32.3						
Young Canadian Works (YCW) Program											
Number of summer jobs created							30,157	27,635	33,037		
Program expenditure (\$ millions)							43.6	42.5	52.4		
Summer Job Corps (SJC) Program											
Number of summer jobs created							5,348	6,413			
Program expenditure (\$ millions)							8.5	11.5			
Youth Job Corps (YJC) Program											
Student summer projects											
Number of summer jobs created									7,864		
Program expenditure (\$ millions)									7.1		
Year-round nonstudent projects											
Number of summer jobs created									8,419		
Program expenditure (\$ millions)									29.8		
Employment Tax Credit (ETC) Program											
Number of jobs created								19,811	50,786		
Program expenditure (\$ millions)									80.0		
Summer Youth Employment (SYE) Program											
Number of summer jobs created										95,336	
Program expenditure (\$ millions)										53.4	
Summer Canada (SC)											
Number of summer jobs created											18,823
Program expenditure (\$ millions)											34.5
Canada Community Development Program (CCDP)											
Number of jobs created										19,780	
Program expenditure (\$ millions)										108.5	
Canada Community Services Project (CCSP)											
Number of jobs created										1,636	
Program expenditure (\$ millions)										11.6	

1 Includes short-term jobs, numbering 3,174 and 1,574 for 1978/79 and 1979/80, respectively.

2 The program started in May 1981. The figures reported are tentative.

3 The figures reported are tentative.

Source: Economic Council of Canada (1982).

PART I: THEORETICAL ANALYSIS

CHAPTER 2

THEORETICAL FRAMEWORK: THE BASIC MODEL

Recent studies of unemployment in Canada suggest that an important component of the problem is one of sectoral chronic unemployment supported by unemployment insurance benefits.¹ The data upon which this conclusion is based reveal that a substantial proportion of measured unemployment is concentrated in a relatively narrow subset of industries or activities, all of them characterized by rather sharp seasonality (tourism, forestry), demand volatility (construction), or high incidence of casual employment (services). Characteristically, the employment-unemployment experience of individuals in these activities suggests that they experience repeated spells of unemployment with a significant concentration in long spells of unemployment.² At the same time, the other sectors of the economy appear to generate relatively little unemployment. The individuals working in these sectors are almost never unemployed. The difference between the experience of two sectors dictates that they be treated differently in economic analysis. Harberger (1980) describes these two sectors as a temporary sector (fishing, tourism, construction, etc.) and a permanent sector (the rest of the economy).

The basic model that we shall employ can be described as a two-sector model with unemployment. One of the two sectors is termed as "permanent" and the other is called the "temporary" sector. They have labour forces which, on average, have quite different employment and unemployment experiences. The permanent sector contains those individuals who, because of their occupation or seniority, are almost never unemployed. The temporary sector contains those people who are either unemployed or employed in jobs that are not expected to provide continuous employment. In the temporary sector, it is argued that the key factor causing unemployment is the existence of a fixed wage rate with some minimum floor above the equilibrium full-employment.³ The basic assumptions of the model are described below.

A. Assumptions

1. The model can be considered as a two-sector model of a region or a geographical market. Sector I (the permanent sector)⁴ employs L_1 skilled workers and $\bar{K}_1$ units of non-augmental factors (for example, natural resource endowments) specific to Sector I and Sector II (the temporary sector) employs N_2 unskilled workers along with a fixed supply of the

non-augmental factors $\bar{K}_2$.⁵ Each sector produces a different good. We assume that both sectors are competitive.

2. The region under consideration is assumed to be small and faces fixed output prices due to international trade.
3. In the skilled or permanent sector, the wage rate is determined by market prices to equate labour demand and supply. The wage rate in the unskilled or temporary sector is assumed fixed at a level above the equilibrium full-employment. The minimum floor to this wage is assumed to be determined by minimum wage laws. This results in unemployment in the unskilled sector.
4. For simplicity, we assume that the workers' utility function is linearly related to the expected value of wages and the value of leisure or non-market time.⁶ Thus, in the skilled sector (where full employment exists) utility depends only on the wage rate. In the unskilled sector, expected utility is a weighted average of the wage rate and the value of leisure or non-market time. Each worker is assumed

to have the same probability of securing employment so that the weights are respectively the probability of being employed and being unemployed. In the unskilled sector, workers are assumed to work for fixed hours and there is no trade-off between hours worked and productive home time or leisure. It is also assumed that the wage ($\bar{W}_2$) in the unskilled sector is higher than the value of non-market time (h), so that unskilled labour would prefer work at $\bar{W}_2$ to leisure. The workers in the unskilled labour market are all identical and all have homothetic tastes. The jobs are allocated on a random selection basis; i.e., all workers have an equal probability of obtaining the existing jobs. Then, the probability of being unemployed is the unemployment rate itself. The unemployment is determined by the difference between employment, N_2 , and the supply of labour L_2 in the unskilled sector.

5. In the spirit of the Harris and Todaro (1970) analysis, it is assumed that labour is risk-neutral and will acquire skills as long as the utility of the skilled labour minus the cost of acquiring skills exceeds the expected utility in the temporary

or unskilled sector. Thus mobility between sectors is the equilibrating mechanism. In order to move to the skilled sector from the unskilled sector, workers have to acquire skills at their own cost.

6. In each time period, labour retires at a natural rate δ from both sectors. Further, we assume that the labour force experiences new entries at the same rate δ in each time period. All new entrants are assumed to be unskilled. These assumptions ensure that the size of the total labour endowment in each time period does not shrink and that, in the absence of movement of unskilled workers, the proportion of unskilled workers in the workforce will grow. The length of calendar time defined as "period" in the model is arbitrary. The period structure in the model works in the following manner. At the beginning of any period, new entry and retirement take place. During the period, labour moves in response to expected utility differences between sectors. The end of the period then shows the equilibrium values for that period. At the beginning of the next period, the initial endowment of labour will consist of the equilibrium allocations of the previous period (i.e., the ending values of the

previous period) plus the natural retirement/growth in the labour force. This can be shown as follows:

$$\begin{aligned} L_{1(t)}^b &= (1-\delta) L_{1(t-1)}^e \\ L_{2(t)}^b &= (1-\delta) L_{2(t-1)}^e + \delta L(t-1) \\ &= (1-\delta) L_{2(t-1)}^e + \delta (L_{1(t-1)}^e + L_{2(t-1)}^e) \\ &= L_{2(t-1)}^e - \delta L_{2(t-1)}^e + \delta L_{1(t-1)}^e \\ &\quad + \delta L_{2(t-1)}^e \\ &= L_{2(t-1)}^e + \delta L_{1(t-1)}^e \end{aligned}$$

where

L = total labour endowment;

L_1 = the quantity of labour in the skilled sector;

L_2 = unskilled sector;

subscript t = the time period;

superscript b and e = the beginning and end of the period, respectively.

Because the total endowment of labour is historically determined and remains constant during each time period, it does not require subscripts and superscripts. Later in our analysis, we denote total labour endowment by $\bar{L}$.

7. For simplicity, it is assumed that the cost of acquiring skills is pecuniary and involves no time loss.
8. Unless specified otherwise, it is assumed that there are no transfers (e.g., unemployment insurance benefits) in the model.

Consider now the following formulation of the model.

B. The Model

Permanent Sector Production Function

$$(2-1) \quad X_1 = f_1(L_1, \bar{K}_1) \quad f_1' > 0; f_1'' < 0$$

Unskilled Sector Production Function

$$(2-2) \quad X_2 = f_2(N_2, \bar{K}_2) \quad f_2' > 0; f_2'' < 0$$

(where

X_1 = output of the permanent sector using skilled labour;

X_2 = output of the temporary sector using unskilled labour;

L_1 = the skilled labour used to produce X_1 ;

N_2 = the unskilled labour used to produce X_2 ;

$\bar{K}_1$ = the non-augmental factors specific to the permanent sector;

$\bar{K}_2$ = the non-augmental factors specific to the temporary sector;

f'_1 and f''_1 = the first and second derivatives of f_1
with respect to L_1 (f'_{L_1} and f''_{L_2});

f'_2 and f''_2 = the first and second derivatives of f_2
with respect to N_2 (f'_{N_2} and f''_{N_2}).

Equations (2-1) and (2-2) specify the production functions f_i , ($i = 1, 2$) which are assumed to exhibit the usual neoclassical properties.

Labour Endowment

$$(2-3) \quad L_1 + L_2 = \bar{L}$$

There is a labour constraint which states that the sum of skilled workers actually employed in the permanent sector (L_1) plus the unskilled labour force (L_2) must equal the total labour endowment ($\bar{L}$). Equation (2-3) can alternatively be written as

$$(2-3)' \quad L_1^b + L_2^b = L_1^e + L_2^e = \bar{L}$$

which states that at the beginning of any time period the sum of skilled workers (L_1^b) plus the unskilled labour force (L_2^b) must equal the sum of skilled workers (L_1^e) plus the unskilled labour force (L_2^e) at the end of that time period which, in turn, equals the total labour endowment ($\bar{L}$).

Wage Determination

Skilled-Labour Wage

$$(2-4)' \quad W_1 = P_1 \cdot f'_1$$

where W_1 , the skilled-labour wage, is equal to the value of the skilled-labour marginal product in the permanent sector. P_1 is the price of the permanent-sector output, X_1 .

Unskilled-Labour Wage

$$(2-5)' \quad W_2 = P_2 \cdot f'_2 = \bar{W}_2$$

The wage in the unskilled sector is equated with the value of marginal product of labour in the temporary sector because of profit maximization on the part of perfectly competitive producers. However, this wage is constrained to be equal to a fixed wage above the equilibrium full-employment. It is assumed that there is never an excess demand for labour at the fixed wage, $\bar{W}_2$. P_2 is the price of the temporary sector output, X_2 .

For simplicity, we normalize outputs so that these output prices are equal to unity (i.e., $P_1 = P_2 = 1$). Therefore, W_1 is the skilled real wage and $\bar{W}_2$ is the fixed real wage of

the unskilled labour. Thus, we can rewrite equations (2-4) and (2-5) as

$$(2-4) \quad W_1 = f'_1$$

$$(2-5) \quad \bar{W}_2 = f'_2$$

Utility

$$(2-6) \quad U_1 = W_1$$

where U_1 is the utility of an already skilled worker in the permanent sector and equals W_1 based on assumption (4). The expected utility of an unskilled worker in the temporary sector is given by

$$(2-7) \quad E(U_2) = \Pi \bar{W}_2 + (1-\Pi)h; \quad \Pi = N_2/L_2 < 1$$

where

$E(U_2)$ = the expected utility of an unskilled worker in the temporary sector;

Π = the probability of employment, or the proportion of time a worker is employed in the unskilled sector; this is equal to N_2/L_2 (unskilled employment in the temporary sector divided by the unskilled labour force);

$(1-\Pi)$ = the probability of unemployment in the unskilled sector $(1-N_2/L_2)$;

h = the value of non-market time or leisure.

The expected utility of an unskilled worker in the temporary sector, $E(U_2)$, is equal to the level of income when employed $(\Pi\bar{W}_2)$ plus the value of his leisure time when he is unemployed, $(1-\Pi)h$. Only in the case of full employment in the temporary sector (i.e., $\Pi=1$ or $N_2=L_2$) is the expected utility equal to the minimum wage (i.e., $E(U_2) = \bar{W}_2$).

Long-Run Equilibrium Condition

$$(2-8)' \quad U_1 = E(U_2) + C$$

or

$$(2-8) \quad f_1' - C = \Pi\bar{W}_2 + (1-\Pi)h$$

where C is the privately borne cost of acquiring skills for an unskilled worker. Equation (2-8), a long-run equilibrium condition, is derived from the hypothesis that workers in the temporary sector will become skilled and move to the permanent sector, as long as the utility of the skilled labour (net of the cost of acquiring skills) exceeds the expected utility in the temporary sector. Clearly, then, in

the long-run equilibrium the movement from the temporary to the permanent sector will cease when the expected utility to the (unskilled) worker from both sectors is equalized.

Thus, in our model movement between the sectors is a short-run or disequilibrium phenomenon. In long-run equilibrium, mobility ceases.

The equilibrium condition then is from the point of view of the unskilled worker whose decisions drive the model. It is his choice to stay unskilled and get $E(U_2) = \Pi \bar{W}_2 + (1 - \Pi)h$ or become skilled and earn $U_1 = (W_1 - C)$. It is assumed that C is fixed and irreversible i.e., a "sunk cost". Once skilled, the worker's choice is: stay in the skilled sector and get W_1 or move to the unskilled sector and get $\Pi \bar{W}_2 + (1 - \Pi)h$.

Thus we have eight equations and eight unknowns, X_1 , X_2 , L_1 , L_2 , N_2 , W_1 , U_1 , and U_2 . Given the values of the exogenous variables, $\bar{L}$, $\bar{W}_2$, h , and C , we can solve for the unknowns. Equation (2-8) determines the allocation of labour between the two sectors, given the technological assumptions that are made.

This model is a long-run equilibrium model, with endogenous mobility and skill acquisition. The short-run model is assumed to operate in the following manner.

Through time, the labour force in the economy allocates itself between the two sectors, until the expected utility (net of skill-acquiring costs) is equalized between the sectors. For example, if there were an increase in the supply of unskilled labour, movement to the skilled sector would continue until the long-run equilibrium condition (2-8) is satisfied. The reverse movement (that is the movement of skilled labour to the temporary sector) may occur if there is a situation where $W_1 < \Pi \bar{W}_2 + (1-\Pi)h$. This case is assumed to require only one time period. The skilled workers, however, may not necessarily move from the permanent to the temporary sector. In this case then, time is required for the accumulation of unskilled workers to restore the equality. Once the long-run equilibrium solution is reached, the implicit movement between periods caused by the retirement of the skilled labour force creates an expected utility difference, at the beginning of each period, that is just sufficient to induce enough movement to keep the labour force in the permanent sector constant. That is, the long-run equilibrium will be characterized by condition (2-8), $[W_1 - C = \Pi \bar{W}_2 + (1-\Pi)h]$ together with the explicit or induced movement of δL_1^* per period, where

δ = the rate of retirement in the labour force;

L_1^* = the initial long-run equilibrium quantity of the skilled labour.

The above discussion is illustrated in Figure 2-1. The horizontal axis represents the total quantity of labour in the temporary sector measured from the origin on the left (0_2); and employment in the permanent sector is measured from the origin on the right (0_1). MPL_2 (or $P_2 \cdot f'_2$) is the marginal productivity curve of unskilled labour in the temporary sector and MPL'_1 (or $P_1 \cdot f'_1 - C$) is the marginal product curve in the permanent sector, net of skill-acquiring costs. Since the skill-acquiring cost per worker is assumed to be a constant C , this curve is everywhere vertically below the true marginal product curve MPL_1 (or $P_1 \cdot f'_1$) by the distance C . This, then, represents the return that will be realized by a potential entrant. Workers who are already skilled have paid the sunk cost C and so earn $P_1 \cdot f'_1$. Initial equilibrium, given by condition (2-8), is shown in the diagram, where $0_2 N_2^*$ of unskilled labour is employed in the temporary sector and $0_1 L^*$ of skilled labour is employed in the permanent sector, and $[(W_1^* - C) = \Pi^* \bar{W}_2 + (1 - \Pi^*)h]$. Notice that in this equilibrium situation, W_1^* is greater than $[\Pi^* \bar{W}_2 + (1 - \Pi^*)h]$.

In this initial long-run equilibrium situation, the expected utility of an unskilled worker, $E(U_2)^*$, is given by

$$E(U_2)^* = \Pi^* \bar{W}_2 + (1-\Pi^*)h \quad \text{where} \quad \Pi^* = (N_2^*/L_2^*)$$

or $U_1^* = W_1^* - C$

At the beginning of the first period, the skilled labour supply reduces by δL_1^* and the supply of unskilled labour increases to $[L_2^* + \delta L_1^*]$. This is shown in Figure 2-1 by the new allocation L' . This increase in the size of the unskilled labour force reduces the probability of employment in the temporary sector from Π^* to Π_1 :

$$\Pi^* = (N_2^*/L_2^*) > \Pi_1 = \frac{N_2^*}{L_2^* + \delta L_1^*}$$

Therefore, in the temporary sector

$$E(U_2)^b = \Pi_1^b \bar{W}_2 + (1-\Pi_1^b)h < E(U_2)^*$$

In addition, the reduction in the size of the skilled labour force in the first period by δL_1^* , increases the marginal product of labour in the permanent sector and consequently, $(W_1^* - C)$ increases to $(W_1' - C)$. Therefore, at the beginning of this period, the following situation holds:

$$U_1^b = (W_1' - C) > (W_1^* - C) = \Pi^* \bar{W}_2 + (1-\Pi^*)h > \Pi_1 \bar{W}_2 + (1-\Pi_1)h = E(U_2)^b$$

As a consequence, explicit or induced movement takes place from the temporary to the permanent sector until δL_1^* workers have moved. By the end of the period, the long-run equilibrium is again achieved, with the values of Π , $E(U_2)$, W_1 , L_2 , and L_1 being identical to those registered at the end of the previous period. The constancy of the end-of-period values through time indicates a long-run equilibrium.

Consider the following example: suppose that the initial long-run equilibrium values are as shown in Column 1 of Table 2-1. At the beginning of the first period, the retirement in the labour force reduces L_1 by δL_1^* , which is equal to 300, assuming $\delta = .01$. L_2 increases by 300 to keep $\bar{L}$ constant. This reduces Π from .8 to .788, and the expected utility $E(U_2)$ decreases to \$146.68 from an initial equilibrium value of \$148. The production function in the permanent sector, which is assumed to be of the type $X_1 = A L_1^{.6} \bar{K}_1^{.4}$, suggests that 1 per cent reduction in L_1 increases W_1 by .4 per cent. Therefore, at the beginning of the first period, U_1 or $W_1 = \$158.63$ and $E(U_2) = \$146.68$. The difference between $[U_1 - E(U_2)]$ is greater than C (which is assumed to be \$10), so the induced or explicit movement begins. By the end of the first period, 300 workers move

from the temporary to the permanent sector, where the long-run equilibrium condition $[W_1^* - C = \pi^* \bar{W}_2 + (1 - \pi^*)h]$ again holds. Compared with the initial long-run equilibrium, nothing has changed except that an equilibrium movement of δL_1^* has taken place.

Figure 2-1
Long-Run Equilibrium in the Two Sectors

Notes: L^*L' = reduction in L_1 at the beginning of (during the) 1st period.

L^*L' = movement from temporary to permanent sector.

0_1L^* = initial long-run equilibrium value of L_1 = new long-run equilibrium value of L_1 .

Table 2-1

The Characteristics of Movement in the Labour Force:
Retirement and Entry

	Initial long-run equilibrium situation	First period	
		Beginning of the period	End of the period
1. Total labour force ($\bar{L}$)	50,000*	50,000	50,000*
2. Skilled labour force/jobs (L_1)	30,000*	29,700	30,000*
3. Unskilled labour force (L_2)	20,000*	20,300	20,000*
4. Unskilled labour jobs (N_2)	16,000*	16,000	16,000*
5. Π	.8*	.788	.8*
6. Unemployment rate in unskilled sector	20*	21.2	20*
7. $E(U_2) = \Pi \bar{W}_2 + (1-\Pi)h$	148*	146.68	148*
8. U_1 or W_1 (\$)	158*	158.63	158*
9. $U_1 - E(U_2)$ (\$)	10*	11.95	10*
10. $U_1 - E(U_2)$	=C*	>C	=C*
11. Induced or explicit movement from unskilled to skilled sector to maintain $U_1 - E(U_2) = C$	-	-	300*

Notes: The calculations are based on the following values:

$$\bar{W}_2 = \$170, h = \$60, C = \$10, \delta = .01.$$

The values of U_1 or W_1 are derived from the following
production function: $X_1 = A L_1^\alpha \bar{K}_1^\beta$, where $\alpha = .6$; $\beta = .4$; and
($\alpha + \beta$) = 1. The marginal productivity condition,
 $W_1 = A L_1^{-.4} \bar{K}_1^{.4}$, suggests that one per cent reduction in L_1
increases W_1 by .4 per cent.

CHAPTER 3

DIRECT JOB CREATION IN THE TEMPORARY SECTOR: LONG-RUN ANALYSIS

In the previous chapter, we have shown that our model can be used to solve the long-run equilibrium values of all the variables in the system and that the system is driven automatically to these values. In other words, the system is stable. In this chapter, we examine the long-run equilibrium values of labour supply, wage rates, employment, and unemployment in the presence of certain labour market policies.¹

First, however let us simplify matters by substituting all of the other equations of the model into (2-8) to yield the equilibrium supply of skilled labour (and the level of employment), L_1 , and unskilled labour force, L_2 , and employment in the temporary sector, N_2 :

$$(3-1) \quad f'_1 - C = (N_2/L_2)\bar{w}_2 + \{1-(N_2/L_2)\}h$$

The term on the left-hand side is the value of the marginal product of labour (or wage rate), net of skill acquiring costs, in the permanent sector (Sector I). N_2 is the level of employment in the temporary sector (Sector II) determined by marginal productivity and the fixed minimum wage rate in

Sector II. The denominator, L_2 , is the unskilled labour supply, which is equal to the total fixed labour endowment ($\bar{L}$) in the two sectors less the equilibrium supply of skilled labour (L_1) in the permanent sector. Equation (3-1) can be rewritten as

$$(3-2) \quad f'_1 = (N_2 / (\bar{L} - L_1)) (\bar{w}_2 - h) + h + C$$

With $\bar{w}_2$ fixed, employment in the temporary sector (N_2) is determined by the demand for labour (equation (2-5)). Thus, we may regard (3-2) as determining a value for L_1 , given the values of the exogenous variables in the system ($\bar{L}$, $\bar{w}_2$, h , C). It can then be seen from equation (3-2) that any change in the equilibrium supply of skilled labour (L_1) would depend upon a change in employment opportunities in Sector II (ΔN_2), the slope of the marginal product of labour curve in Sector I ($\Delta f'_1$), and on changes in the variables exogenous to the system (ΔL , Δh , ΔC).

I. Direct Job Creation in the Temporary Sector

Direct job creation measures - either through public service employment policy or employment subsidies - directly reduce the cost of hiring additional labour as perceived by potential employers. Indeed, in the case of public service employment, a 100 per cent subsidy of the wages of workers

in the temporary sector is provided, driving the cost of hiring additional such workers to zero. In this study, our interest mainly lies in examining the implications of a direct job creation policy in the temporary sector. It is not of much relevance to us as to which direct employment policy is implemented in creating jobs in the temporary sector. Throughout our analysis, therefore, it is assumed that a wage subsidy is an instrument chosen for the purpose of creating a targeted number of jobs in the temporary sector.

Let us now examine the effect of job creation through a wage subsidy in the temporary sector. Suppose that a subsidy is paid to the employers of unskilled labour at a rate s . The subsidy is assumed to be financed by non-distortionary taxes, and there are no collection costs for taxes or disbursement costs for subsidies.² This will reduce the employer cost of unskilled labour and lead to an increase in jobs for unskilled workers. Consequently, the probability of employment in the temporary sector will rise. Since the members of the temporary labour force will now have the expectation of obtaining work for more than a proportion Π^* of the time, this will lead to a reduction in movement to the skilled sector causing the unskilled labour force to increase (through births) and a reduction in the skilled labour force (through retirement). How does the

model achieve long-run equilibrium? Although the long-run solution is unique it is worth mentioning that adjustment will take place either through natural forces, i.e., retirement and deaths or reverse migration. The specific form of adjustment would depend on the size of C . This is discussed at greater length in Chapter 4.

In the presence of positive skill acquiring costs (C), how big are the changes that result from the movement between equilibrium positions? To answer this question, we return to the system of equations. In the presence of a wage subsidy, profit maximizing employers hire temporary workers until:

$$(3-3) \quad f_2' = \bar{W}_2 - s$$

This equation replaces equation (2-5) of the basic model. In the presence of the wage subsidy policy the system of equations of the basic model will then have the following appearance:

$$(3-4) \quad X_1 = f_1(L_1, \bar{K}_1) \quad f_1' > 0; \quad f_1'' < 0$$

$$(3-5) \quad X_2 = f_2(N_2, \bar{K}_2) \quad f_2' > 0; \quad f_2'' < 0$$

$$(3-6) \quad L_1 + L_2 = \bar{L}$$

$$(3-7) \quad f'_1 = w_1$$

$$(3-8) \quad f'_2 = \bar{w}_2 - ds$$

$$(3-9) \quad u_1 = w_1$$

$$(3-10) \quad E(u_2) = \pi \bar{w}_2 + (1-\pi)h$$

$$(3-11) \quad f'_1 - C = \pi \bar{w}_2 + (1-\pi)h \quad \text{or} \quad L_2(f'_1 - C) = N_2 \bar{w}_2 + (L_2 - N_2)h$$

To find out the change in employment and output of both sectors resulting from the wage subsidy in the temporary sector, we totally differentiate equations (3-4) to (3-8) and (3-11). Thus,

$$(3-12) \quad dx_1 = f'_1 dL_1 \quad (\text{assuming } d\bar{K}_1 = 0)$$

$$(3-13) \quad dx_2 = f'_2 dN_2 \quad (\text{assuming } d\bar{K}_2 = 0)$$

$$(3-14) \quad dL_1 + dL_2 = d\bar{L}$$

$$(3-15) \quad f''_1 dL_1 = dw_1$$

$$(3-16) \quad f''_2 dN_2 = d\bar{w}_2 - ds$$

$$(3-17) \quad f''_1 L_2 dL_1 + (f'_1 - C - h) dL_2 - (\bar{w}_2 - h) dN_2 = L_2 dC + N_2 d\bar{w}_2$$

The system of equations (3-12) to (3-17) can be rewritten in the following form:

$$(3-18) \begin{bmatrix} 1 & 0 & -f'_1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & -f'_2 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & f''_1 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & f''_2 & 0 \\ 0 & 0 & f''_1 L_2 & (f'_1 - C - h) - (\bar{W}_2 - h) & 0 & 0 \end{bmatrix} \begin{bmatrix} dX_1 \\ dX_2 \\ dL_1 \\ dL_2 \\ dN_2 \\ dW_1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 \\ L_2 & 0 & N_2 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} dC \\ d\bar{L} \\ d\bar{W}_2 \\ ds \end{bmatrix}$$

From equation (3-18), the basic determinant Δ is,

$$(3-19) \quad \Delta = f''_2 \{ (f'_1 - C - h) - f''_1 L_2 \}$$

Substituting for $(f'_1 - C - h)$ in equation (3-19) from equation (2-8), we get

$$(3-20) \quad \Delta = f''_2 \{ \Pi(\bar{W}_2 - h) - f''_1 L_2 \} < 0$$

since $f''_1 < 0$, $f''_2 < 0$, and $\Pi(\bar{W}_2 - h) > 0$.

Starting with equation (3-16), the change in employment in the unskilled sector due to a wage subsidy is expressed as:

$$f_2'' dN_2 = - ds$$

assuming $d\bar{w}_2 = 0$. Hence,

$$(3-21) \quad \frac{dN_2}{ds} = - \frac{1}{f_2''} > 0 \quad (\text{since } f_2'' < 0)$$

Equation (3-21) shows that, as a result of the subsidy in the temporary sector, the employment of that sector rises. What happens to employment (or the labour supply) in the skilled sector? To find this, let us solve equation (3-18) through Cramer's rule to get dL_1/ds . This is given below:

$$(3-22) \quad \frac{dL_1}{ds} = \frac{1}{f_2''} \left[\frac{(\bar{w}_2 - h)}{\Pi(\bar{w}_2 - h) - f_1'' L_2} \right] < 0$$

The sign of dL_1/ds is negative because $(\bar{w}_2 - h) > 0$, $f_1'' < 0$ and $f_2'' < 0$. Hence, a wage subsidy in the unskilled sector decreases the skilled labour supply (or employment). Before we explain this result intuitively, let us first determine the effect of the change in N_2 (jobs in the unskilled sector) on L_1 . Recall that N_2 in our model is determined by the exogenously given $\bar{w}_2$. An expression for dL_1/dN_2 can be derived as follows:

$$(3-23) \quad \frac{dL_1}{ds} = \frac{dN_2}{ds} \cdot \frac{dL_1}{dN_2}$$

Substituting equations (3-21) and (3-22) into equation (3-23) and solving for dL_1/dN_2 gives us

$$(3-24) \quad \frac{dL_1}{dN_2} = - \frac{(\bar{W}_2 - h)}{[\Pi(\bar{W}_2 - h) - f_1'' L_2]} < 0$$

The sign of dL_1/dN_2 is negative since $(\bar{W}_2 - h) > 0$ and $f_1'' < 0$. An increase in employment in the unskilled sector leads to less employment in the skilled sector.³ This result, along with that given by equation (3-22) has a simple intuitive explanation. With fixed $\bar{W}_2$, N_2 varies directly with the size of the subsidy. This increases the probability of employment or decreases the unemployment rate in that sector. Since this raises the expected utility in Sector II relative to Sector I, more unskilled workers are induced to stay in Sector II. Consequently, L_1 falls, causing an increase in the unemployment rate in Sector II and in the wage rate in Sector I. Since W_1 is rising, the unemployment rate in the temporary sector will not rise to its initial level. Thus, in the new long-run equilibrium, L_1 would be lower and W_1 higher than before.

The changes in output in both sectors due to a wage subsidy in the unskilled sector (dx_i/ds , where $i=1,2$) can also be obtained from equation (3-18). These are given below:

$$(3-25) \quad \frac{dx_2}{ds} = - \frac{f'_2}{f''_2} > 0 \quad (\text{since } f'_2 > 0, \text{ and } f''_2 < 0)$$

$$(3-26) \quad \frac{dx_1}{ds} = \frac{f'_1}{f''_2} \left\{ \frac{(\bar{w}_2 - h)}{\Pi(\bar{w}_2 - h) - f''_1 L_2} \right\} < 0$$

Equations (3-25) and (3-26) suggest that, as a result of the subsidy in the unskilled sector, the output of the unskilled sector rises and that of the skilled sector falls.

The preceding discussion of the long-run equilibrium effects of job creation through a wage subsidy in Sector II on the skilled labour supply (or employment) is illustrated in Figure 3-1. which is identical to Figure 2-1 as described in Chapter 2. The initial equilibrium, given by condition (2-8), is shown in the diagram where $O_2 N_2$ unskilled labour is employed in Sector II and $O_1 L$ skilled labour employed in Sector I, and $(W_1^* - C) = \Pi^* \bar{w}_2 + (1 - \Pi^*) h$.

Now assume that a wage subsidy is given to the employers of unskilled labour for job creation in Sector II. The immediate effect of this job creation is to decrease the unemployment rate of the unskilled labour or increase Π . This raises the expected utility in the unskilled sector relative to the skilled sector. Since members of the

Figure 3-1
Effects of Job Creation Through a Wage Subsidy
in the Temporary Sector

unskilled labour force now expect to work for a proportion of time greater than Π^* ; more potential skilled workers stay in that sector. L_1 falls, causing an increase in the unemployment rate in the unskilled sector and in the wage rate in the skilled sector. Since W_1 is rising, the unemployment rate in the unskilled sector will not rise to its initial level. Equilibrium is restored again when

$$W_1' - C = \Pi'' \bar{W}_2 - (1 - \Pi'')h$$

where W_1' is the new equilibrium wage rate in the skilled sector and $\Pi'' (> \Pi^*)$ is the new equilibrium value of Π . In the new long-run equilibrium situation, the skilled labour force has been reduced by LL' . Employment of unskilled labour has increased by $N_2 N_2'$. The curve $mrnp$ shows the increase in the expected utility in Sector II.

II. Other Comparative Statics

Before proceeding we will use equation (3-18) to determine the effects of changes in certain exogenous variables.

A. The Effect of a Change in the Fixed Wage ($\bar{W}_2$)

To determine the effect that a change in the fixed wage in the unskilled sector will have on employment in both

sectors, we solve (3-18) for $dN_2/d\bar{w}_2$ and $dL_1/d\bar{w}_2$. The expressions are given below:

$$(3-27) \quad \frac{dN_2}{d\bar{w}_2} = \frac{1}{f_2''} < 0$$

$$(3-28) \quad \frac{dL_1}{d\bar{w}_2} = - \frac{\{N_2 f_2'' + (\bar{w}_2 - h)\}}{f_2'' \{\Pi(\bar{w}_2 - h) - f_1'' L_2\}} > 0$$

Equation (3-27) shows that an increase in $\bar{w}_2$ causes unemployment to rise (or the demand for labour to fall) in the unskilled sector. The sign of $dL_1/d\bar{w}_2$ is ambiguous, because the bracketed expression in the numerator in equation (3-28) does not possess a unique sign. Compare this result with the earlier case where fixed wages in the temporary sector are reduced through a wage subsidy to employers and the sign of dL_1/ds is not ambiguous, as shown by equation (3-22).

The reason for difference in results in these two cases is the fact that lowering the fixed wage directly changes the incentive both to workers and employers whereas lowering it through a subsidy changes incentive only to employers. By substituting equation (3-27) into (3-28) and manipulating the results we get

$$(3-29) \quad \frac{dL_1}{d\bar{w}_2} = \frac{\{N_2 + (\bar{w}_2 - h) dN_2/d\bar{w}_2\}}{\{L_2 f_1'' - \Pi(\bar{w}_2 - h)\}}$$

The denominator in equation (3-29) is negative and $dN_2/d\bar{w}_2 < 0$. Thus,

$$(3-30) \quad \frac{dL_1}{d\bar{w}_2} > 0 \text{ as } \{N_2 + (\bar{w}_2 - h)dN_2/d\bar{w}_2\} < 0$$

or

$$(3-31)^5 \quad \frac{\bar{w}_2}{\bar{w}_2 - h} > \eta_2$$

where η_2 is the elasticity of demand for labour in the unskilled sector. An increase in $\bar{w}_2$ has two opposing effects: first, at a given unemployment rate in the unskilled sector an increase in $\bar{w}_2$ makes that sector a more attractive place in which to work; and second, an increase in $\bar{w}_2$ lowers the demand for labour causing unemployment to rise. This makes the unskilled sector less attractive. For a sufficiently high elasticity of demand for labour, an increase in $\bar{w}_2$ in the unskilled sector will induce more unskilled workers to move to the skilled sector. For this to occur the η_2 would have to exceed unity and exceed it by a greater amount the greater is the value of leisure (h) relative to wages in the unskilled sector. The smaller is η_2 and the larger is the value of leisure in the unskilled sector, the more likely it is that an increase in wages in

the unskilled sector will decrease the movement of labour from the temporary sector to the permanent sector.

B. The Effect of a Change in Labour Endowment ($\bar{L}$)

To examine the effect of a change in $\bar{L}$ on the long-run equilibrium value of the skilled labour supply, we solve for $dL_1/d\bar{L}$ from equation (3-18). We get

$$(3-32) \quad \frac{dL_1}{d\bar{L}} = \frac{\Pi(\bar{W}_2 - h)}{\{\Pi(\bar{W}_2 - h) - f_1^* L_2\}} > 0$$

Since $f_1^* < 0$ and $(\bar{W}_2 - h) > 0$, equation (3-32) implies $0 < \frac{dL_1}{d\bar{L}} < 1$.⁶

To explain this result let us suppose there is a once-and-for-all reduction in labour endowment ($\bar{L}$) through a reduction in the supply of unskilled labour. Analytically, the effect of such a reduction in labour endowment can be seen as equivalent to that of a new public-works project starting in the unskilled sector. The jobs that are created in this project are not those which the unskilled workers fill by random selection as in our basic model. The point to note is that the existence of these new government jobs does not alter the workers' perceptions of the probability of obtaining employment; their expectations are determined only by the number of previously existing jobs and the size of the sectors' labour force exclusive of those hired on the new project. With a fixed $\bar{W}_2$, employment (N_2) in Sector II

is fixed, and the immediate effect of such a decrease in $\bar{L}$ is to reduce the unemployment rate in Sector II. Since Π increases, this raises expected utility, $E(U_2)$, in Sector II relative to Sector I; more potential skilled workers stay in the unskilled sector causing a decrease in L_1 , an increase in W_1 , and increase in the unemployment rate in Sector II. Since W_1 is rising, the unemployment rate in Sector II will not rise to its initial level.⁷

The long-run effect of a reduction in labour endowment in Sector II is shown in Figure 3-2, which is similar to Figure 3-1. The initial equilibrium is shown where $0_2 N_2$ of unskilled labour is employed in Sector II and $0_1 L$ is employed in Sector I. The total unskilled labour supply in Sector II is $0_2 L$.

Now, assume that the total labour endowment ($\bar{L}$) is reduced by $0_2 0'_2$. Note that N_2 does not change ($0_2 N_2 = 0'_2 N'_2$). The immediate effect of this reduction is to increase the probability of employment from Π to Π' in Sector II. This raises the expected utility in Sector II relative to Sector I. If the condition $[W_1 - C < \Pi' \bar{W}_2 + (1 - \Pi)h]$ holds, more potential skilled workers stay in the unskilled sector and L_1 falls. At the final equilibrium, the unemployment rate in the unskilled market does not rise to its initial level, since $(dL_1/d\bar{L}) < 1$. The labour force in Sector II changes

Figure 3-2
Effects of a Reduction in Labour Endowment ($\bar{L}$)

from 0_2L to $0'_2L'$. The final equilibrium condition is shown where $W'_1 - C = \Pi''\bar{W}_2 + (1-\Pi'')h$.

Equation (3-32) can also be used to explain the results when there is a once-and-for-all increase in the endowment of labour ($\bar{L}$) through an exogenous increase in the supply of skilled labour. Analytically, this can be equated to a situation where skilled workers migrate from other regions into the skilled sector. The change in L_1 is identical whether one considers the increase in labour endowment ($\bar{L}$) through an exogenous change in the supply of skilled or unskilled labour. The endogenous nature of skills in our model ensures that the long-run implications are the same whether additional workers are skilled or not. However, in the short run the dynamics of adjustment would differ.

C. The Effect of a Change in the Cost of Acquiring Skills (C)

Assume that the government subsidizes the cost of acquiring skills (C) for the potential skilled workers. To find out the effect of a change in C on the skilled labour supply (L_1), we solve for (dL_1/dC) from equation (3-18). We get

$$(3-33) \quad \frac{dL_1}{dC} = - \frac{L_2}{\{\Pi(\bar{W}_2 - h) - f''_1 L_2\}} < 0.$$

(dL_1/dC) is negative since $f_1'' < 0$ and $(\bar{W}_2 - h) > 0$. The new equilibrium supply of skilled labour increases as a result of the reduction in C . This can be explained as follows. The immediate effect of a reduction in C is to induce unskilled workers to acquire skills, as the returns from being skilled, net of skill acquisition costs, are now higher for them. This will increase the flow of workers from the unskilled to the skilled sector, causing a reduction in the wage rate in the skilled sector and in the unemployment rate in the unskilled sector. In the new equilibrium, the W_1 would be lower, and L_1 will be higher, than in the initial equilibrium.

The long-run effect of a lower C is illustrated in Figure 3-3, which is conceptually similar to Figure 3-1. In the initial equilibrium, O_2N_2 unskilled labour is employed in Sector II and O_1L is employed in Sector I. The total supply of unskilled labour is given by O_2L . Suppose now that the cost to the unskilled worker of acquiring skills is lowered. In Sector I, the new marginal product curve, net of C , is given by MPL_1' . This raises the returns to the unskilled workers from being skilled equal to $(W_1' - C')$ resulting in a greater movement of unskilled workers to the skilled sector and lowering W_1 . Equilibrium is restored again when $W_1' - C' = \Pi' \bar{W}_2 + (1 - \Pi')h$ holds. W_1' is the new equilibrium wage rate in the skilled sector, and $\Pi' (> \Pi^*)$ is the new equilibrium value of Π .

Figure 3-3
Effect of a Reduction in the Cost
of Acquiring Skills

Sector II
Temporary Sector

Sector I
Permanent Sector

CHAPTER 4

DIRECT JOB CREATION IN THE TEMPORARY SECTOR: SHORT-RUN ANALYSIS

In this chapter, our objective is to describe the series of short-run equilibria present in the model when a program of direct job creation is introduced in the unskilled sector. The problem posed by the short-run equilibrium is interesting in itself. In the preceding discussion of the long-run, the dynamic process by which the system moved to a long-run equilibrium was ignored and the question of how long the equilibrating process would take was set aside. The present analysis focusses entirely on the short run, where the system does not have time to necessarily induce a complete equilibrium movement of workers between sectors in one period.

Starting from an initial long-run equilibrium, the model assumes that in the beginning of the first period the skilled labour supply is reduced by δL_1^* , and the size of the unskilled labour force is increased to $(L_2^* + \delta L_1^*)$. Consequently, the probability of employment in the unskilled sector is reduced from Π^* to Π_1 :

$$\Pi^* = (N_2^*/L_2^*) > \Pi_1 = N_2^*/(L_2^* + \delta L_1^*)$$

Let us now assume that at the beginning of the first period, additional employment (ΔN_2) through a direct job creation policy is created in the unskilled sector. The members of the unskilled labour force will now have a higher expectation of obtaining work. The new Π becomes Π'_1 :

$$\Pi'_1 = (N_2 + \Delta N_2) / (L_2^* + \delta L_1^*) > \Pi_1$$

In this situation, the expected utility, $E(U_2)$, in the unskilled sector increases.

On the other hand, the attrition in the skilled labour force at the beginning of the first period (δL_1^*) increases the marginal product of labour and, consequently, wages in the skilled sector. If the expected utility to an unskilled worker in the unskilled sector is greater than the returns (net of skill acquisition costs) from being skilled, unskilled workers will find Sector II a more attractive place to work. Consequently, a reduction in the movement to the skilled sector will cause the unskilled labour force to increase and the skilled labour force to decrease. The explicit or induced movement to the skilled sector does not take place because $U_1^e - E(U_2)^e < C$. At the end of the first period,

$$L_1^e(1) < L_1^*$$

$$L_2^e(1) > L_2^*$$

$$W_1' > W_1^*$$

where $L_1^e(1)$ and $L_2^e(1)$ represent the size of the skilled and of the unskilled labour force, respectively, at the end of the first period. W_1' denotes the new wage in the skilled sector at the end of the first period. Whether Π_1' would be greater than Π^* would depend upon the rate of retirement in the labour force (δ) and the size of the job creation activity (ΔN_2).

At the beginning of the second period,

$$L_1^b(2) = (1-\delta) L_1^e(1)$$

$$L_2^b(2) = L_2^e(1) + \delta L_1^e(1)$$

A reduction in L_1 would generate a further increase in W_1 , and an increase in L_2 would reduce the probability of employment (Π) in the unskilled sector. Since wages in Sector I are rising and the expected utility in Sector II decreasing, the differential between U_1 and $E(U_2)$ also decreases. If this differential is still less than C , no induced or explicit movement of unskilled labour takes place. The values of L_1 , L_2 , W_1 , and $E(U_2)$ at the end of

the second period will be the same as at the beginning of the period.

In the absence of any movement of unskilled labour to the skilled sector, since U_1 or W_1 increases and $E(U_2)$ decreases in each time period, the condition $U_1 - E(U_2) > C$ will eventually be reached. When this occurs, movement of labour from the unskilled to the skilled sector will take place until $U_1 - E(U_2) = C$ holds again at the end of the period. The beginning of the unskilled labour movement signals a new long-run equilibrium (denoted by $**$), in which $L_1^{**} < L_1^*$, $L_2^{**} > L_2^*$, $W_1^{**} > W_1^*$, $\Pi^{**} > \Pi^*$, and $E(U_2)^{**} > E(U_2)^*$. Only when the new long-run equilibrium is achieved will the short-run equilibrium solution be repeated continuously. That is, the number of individuals moving from unskilled to skilled sector will stabilize at the level equal to the rate of retirement of the skilled labour force. When each of ΔL_1^e , ΔU_1^e , $\Delta E(U_2)^e$ and ΔL_2^e are equal to zero, a new steady state will have emerged.

In the above discussion, the new long-run equilibrium is achieved through the adjustment of natural forces, i.e., retirement and deaths over time. In the long-run analysis of Chapter 3, it was mentioned that the long-run solution can also be achieved through a reverse migration process (i.e., a movement of labour from the permanent to the

temporary sector) and that the choice of adjustment process would depend on the size of C . To illustrate this point, let us consider the following cases:

Assume that the cost of acquiring skills (C) is very low (presumably zero or close to zero). If due to job creation the probability of employment (Π) in the temporary sector increases from Π^* to Π' , this would raise expected utility in that sector relative to the permanent sector. If a situation arises where the following condition holds

$$(4-1) \quad W_1^* < \Pi' \bar{W}_2 + (1-\Pi')h$$

then the long-run equilibrium will be achieved through reverse migration.

If the cost of acquiring skills (C) is high then the situation may be different. Starting from the long-run equilibrium condition, job creation in the unskilled sector will increase the probability of employment from Π to Π' . This would raise expected utility in the unskilled sector so that

$$W_1^* - C < \Pi' \bar{W}_2 + (1-\Pi')h$$

Since the cost of acquiring skills is high, it may be true that

$$(4-2) \quad W_1^* > \Pi' \bar{W}_2 + (1-\Pi')h$$

This condition rules out the possibility of any reverse migration from the skilled to the unskilled sector. The long-run equilibrium is restored through attrition from the permanent sector and entry into the temporary sector until the wage differential again restores the normal migration from the skilled to the unskilled sector. Since the expected utility is higher in the unskilled sector relative to the skilled sector explicit or induced movement equal to δL_1^* from the temporary to permanent sector will not take place.

Equations (4-1) and (4-2) describe the mobility conditions and the direction of movement of the labour force between two sectors. These conditions can be referred to as the "gold points" for movement of workers. Equation (4-1) describes the condition for "in-migration" into the temporary sector and the condition for "out-migration" from the temporary sector is given by equation (4-2).

Consider the following example: suppose that the values in column 1 of Table 4-1 characterize the initial long run equilibrium situation. At the beginning of Period 1, the retirement in the labour force reduces the labour supply of skilled labour by 1% ($\delta = .01$). To keep the total endowment of labour constant at 50,000, the size of the unskilled labour force increases by δL_1 . At the same time, suppose

that 1,500 jobs are created in the unskilled sector. As is shown in row 6 of the table, the unemployment rate ($1-\Pi$), which was 20 per cent in the initial long-run equilibrium situation, is lowered to 15 per cent. This raises the expected utility in the unskilled sector from \$148 to \$155.70. At the same time, the reduction in L_1 due to retirement increases wages in the skilled sector from \$158 to \$158.63. Since the differential between U_1 and $E(U_2)$ is less than C (\$10), no movement of unskilled labour is induced. The distribution of the labour force between sectors at the end of the first period is exactly the same as at the beginning of the period.

At the beginning of the second period, due to retirement and entry W_1 increases and $E(U_2)$ decreases as the unemployment rate ($1-\Pi$) increases. The differential between U_1 and $E(U_2)$ is still less than C . No movement of unskilled labour is induced. The situation at the end of Period 2 is unchanged relative to that at the beginning of the period. The process continues until the beginning of Period 5, when the differential between U_1 and $E(U_2)$ equals \$11.54, which is greater than C (\$10). This induces movement from the unskilled to the skilled sector, until $U_1 - E(U_2) = C$ holds again. During the fifth period, 220 workers move to the

skilled sector and, in the new long-run equilibrium situation, $L_1^{**} < L_1^*$, $L_2^{**} > L_2^*$, $\Pi^{**} > \Pi^*$, $W_1^{**} > W_1^*$ and $E(U_2)^{**} > E(U_2)^*$. The unemployment rate in the unskilled sector in this new situation is lower than its previous long-run equilibrium level. To confirm that this is a long-run equilibrium, we carry out the analysis for one additional period. At the beginning of the next period (Period 6, in our example) the movement in the labour force because of retirement and entry creates an expected utility difference of \$11.90 between the sectors. Because this differential exceeds the cost of training to the unskilled worker, movement begins from the unskilled to the skilled sector. As the skilled labour force increases wages start to decrease in the skilled sector, and $E(U_2)$ begins to increase in the unskilled sector. This process continues until $U_1 - E(U_2) = C$ holds again. By the end of this period, 288 workers migrate (which is equal to δL_1^{**}). That number is just sufficient to keep the size of the skilled labour force constant.

It can be seen from row 6 of Table 4-1 that the unemployment rate in the unskilled sector ($1 - \Pi$) in the new long-run equilibrium (17.6 per cent) is lower than its initial equilibrium value (20 per cent), due to the introduction of 1,500 unskilled jobs.

An interesting question is: What happens to the unemployment rate of the region? We find this out in the following way:

$$(4-3) \quad \text{Urate}_R^* = a \cdot \text{Urate}_{us}^* + b \cdot \text{Urate}_S^*; \quad a+b=1$$

where Urate_R is the regional unemployment rate and the superscript * denotes the initial equilibrium value, Urate_{us}^* is the unskilled sector unemployment rate and Urate_S^* is the skilled sector unemployment rate, a and b , respectively, denote the relative weight or size of the sector. In the example discussed in Table 4-1, $a=.4$ (i.e., $20,000/50,000$); $b=.6$ (i.e., $30,000/50,000$); $\text{Urate}_{us}^*=20\%$; and $\text{Urate}_S^*=0\%$. Therefore, $\text{Urate}_R^*=8\%$. After the introduction of 1,500 unskilled jobs, the new long-run equilibrium value of Urate_R^{**} is 7.5%, Urate_{us}^{**} is 17.6%, and that of Urate_S^{**} is 0%, where the superscript ** denotes the new long-run equilibrium value. Based on our example, this calculation suggests two important points: first, the introduction of a job creation program in the unskilled sector reduces the regional unemployment rate in the new equilibrium; and, second, the unskilled sector grows and the skilled sector shrinks as a result of this program (as $a^{**}>a^*$; and $b^{**}<b^*$).

The above discussion raises the issue of the circumstances in which an increase in unskilled jobs can lead to an increase in the unemployment rate. To examine this, we rewrite equation (4-3):

$$(4-4) \quad \text{Urate}_R = a \text{Urate}_{us} + b \text{Urate}_s$$

where

$$a = L_2/\bar{L}$$

$$b = L_1/\bar{L}$$

$$a + b = 1$$

$$\text{Urate}_s = 0; \text{ and } \text{Urate}_{us} = L_2 - N_2 / L_2$$

Hence

$$\text{Urate}_R = \frac{L_2 - N_2}{L_2} \cdot \frac{L_2}{\bar{L}}$$

$$(4-5) \quad \text{Urate}_R = \frac{L_2 - N_2}{\bar{L}}$$

Differentiating equation (4-5) with respect to N_2 , we get

$$(4-6) \quad \frac{\partial \text{Urate}_R}{\partial N_2} = \frac{1}{\bar{L}} \left(\frac{\partial L_2}{\partial N_2} - 1 \right) > 0$$

The unemployment rate in the region can increase if $\partial L_2 / \partial N_2 > 1$, that is, if the increase in the unskilled labour force is greater than the number of jobs created.

The discussion of the size of $\partial L_2 / \partial N_2$ also arises in later chapters.

Before we close this discussion, one question that must be answered is: In how many periods would the long-run equilibrium condition, $U_1 - E(U_2) = C$, be achieved? The answer depends upon the sensitivity of the explicit or induced mobility function inherent in the long-run equilibrium analysis. This, in turn, depends on the factors that determine the changes in U_1 and $E(U_2)$, given the size of C . These factors are the slope of the marginal product of labour curve in Sector I, the size of job creation (ΔN_2), and the value of δ . Based on this information, we can write the functional form for the speed of adjustment (λ) to long-run equilibrium condition as

$$\lambda = a(f_1'', \Delta N_2, \delta)$$

The predictions of this model are that λ will be higher:

- (i) the higher the slope of the marginal product of labour curve in Sector I;
- (ii) the smaller the size of job creation (ΔN_2);
- (iii) the higher the rate of retirement (δ) of the labour force.

Since the size of the job creation program was assumed to be relatively large and the slope of the marginal product of

labour curve relatively small in the preceding example, it is easy to see why it took so long to achieve the long-run equilibrium.

Suppose that the employment subsidy is regarded as a short-run countercyclical policy and is withdrawn at the end of Period 3. At the beginning of Period 4, 1,500 jobs in the unskilled sector will disappear. At the same time, the movement of the labour force because of retirement and entry will reduce L_1 to 28,818 and increase L_2 to 21,182. The Π at the beginning of the period will now be equal to .755, and the expected utility $[E(U_2)]$ will be \$143.05. The reduction in L_1 due to retirement will increase wages in the skilled sector to \$160.54. Since $U_1 - E(U_2) > C$, an explicit or induced movement of unskilled workers begins. By the end of Period 4, 1,182 workers have moved from the unskilled to the skilled sector, until the long-run equilibrium condition $[W_1 - C = \bar{W}_2 - (1 - \Pi)h]$ holds again. The new long-run equilibrium values for the skilled and the unskilled sectors are equal to their initial long-run equilibrium values (see Table 4-2).

Note that the long-run equilibrium is reached in one period when the jobs are withdrawn, while it takes five periods when jobs are introduced into the unskilled sector.

The explanation is simple: the introduction of additional jobs in the unskilled sector and the addition to the unskilled labour force through births (δL_1) cancel out their mutual effects on the probability of employment (Π) and thus on $E(U_2)$. As a result, the explicit or induced mobility function is not triggered, and no movement of unskilled labour to the skilled sector takes place. On the contrary, when jobs are withdrawn these two effects reinforce each other in the same direction, reducing Π - and hence $E(U_2)$ - dramatically. This triggers the explicit or induced mobility function, and unskilled labour starts moving to the skilled sector, until the long-run equilibrium is reached. In this case, it takes only one period to achieve the long-run equilibrium. Therefore, the length of the transition period depends on whether or not explicit or induced migration takes place.

Table 4-1
The Short Run and Long Run Implications of the Creation of 1,500 Jobs in the Unskilled Sector

	Initial long run equilibrium situation	period 1			period 2			period 3			period 4			period 5			period 6		
		b	e	a	b	e	a	b	e	a	b	e	a	b	e	a	b	e	a
1. Total labour force (L)	50,000*	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000**
2. Skilled labour force (jobs) (L_1)	30,000*	29,700	29,700	29,403	29,403	29,109	29,109	28,816	28,816	28,530	28,530	28,246	28,246	27,962	27,962	27,678	27,678	27,394	27,394**
3. Unskilled labour force (L_2)	20,000*	20,300	20,300	20,597	20,597	20,891	20,891	21,182	21,182	21,470	21,470	21,758	21,758	22,046	22,046	22,334	22,334	22,622	22,620**
4. Unskilled jobs (M_2)	16,000*	17,500	17,500	17,900	17,900	18,300	18,300	18,700	18,700	19,100	19,100	19,500	19,500	19,900	19,900	20,300	20,300	20,700	20,700**
5. h	.8*	.87	.87	.85	.85	.84	.84	.83	.83	.82	.82	.81	.81	.80	.80	.79	.79	.78	.78**
6. Unemployment rate in unskilled sector, (u) ($1-h$)	20*	13	13	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22**
7. $E(U_2) = h \bar{M}_2 + (1-h)h$	140*	155.70	155.70	153.50	153.50	151.30	151.30	149.10	149.10	146.90	146.90	144.70	144.70	142.50	142.50	140.30	140.30	138.10	138.10**
8. U_1 or M_1 ($\bar{U}$)	150*	150.63	150.63	159.27	159.27	167.91	167.91	176.54	176.54	185.18	185.18	193.82	193.82	202.46	202.46	211.10	211.10	219.74	219.74**
9. $U_1 - E(U_2)$ ($\bar{S}$)	10*	2.93	2.93	5.77	5.77	8.61	8.61	11.45	11.45	14.29	14.29	17.13	17.13	19.97	19.97	22.81	22.81	25.65	25.65**
10. $U_1 - E(U_2) \frac{1}{C}$ ($C=\$10$)	=C*	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	<C	=C**
11. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	288**

Notes: * denotes initial long run equilibrium values.
 ** denotes new long run equilibrium values.
 b stands for beginning of the period.
 e stands for the end of the period.
 The calculations are based on the following values: $\bar{M}_2 = \$170$, $h = .60$, $C = \$10$.
 The values of U_1 or M_1 are derived from the following production function $X_1 = A L_1^\alpha \bar{K}_1^{1-\alpha}$, where $\alpha = .6$, $\beta = .4$ and $(\alpha + \beta = 1)$. The marginal productivity condition $M_1 = A L_1^{\alpha-1} \bar{K}_1^{1-\alpha}$ suggests that one per cent reduction in L_1 increases M_1 by .4 per cent.

Table 4-2

Implications of Program Withdrawal at the Beginning of the Fourth Period

	Initial long run equilibrium situation	period 1		period 2		period 3		period 4	
		b	e	b	e	b	e	b	e
1. Total labour force ($\bar{L}$)	50,000*	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000**
2. Skilled labour force (jobs) (L_1)	30,000*	29,700	29,700	29,403	29,403	29,109	29,109	28,818	30,000**
3. Unskilled labour force (L_2)	20,000*	20,300	20,300	20,597	20,597	20,891	20,891	21,182	20,000**
4. Unskilled jobs (W_2)	16,000*	17,500	17,500	17,500	17,500	17,500	17,500	16,000	16,000**
5. π	.8*	.87	.87	.85	.85	.84	.84	.755	.8**
6. Unemployment rate in unskilled sector (%) ($1-\pi$)	20*	13	13	15	15	16	16	24.5	20**
7. $E(U_2) = \pi \bar{W}_2 + (1-\pi)h$	148*	155.70	155.70	153.50	153.50	152.40	152.40	143.05	148**
8. U_1 or W_1 (\$)	158*	158.63	158.63	159.27	159.27	159.90	159.90	160.54	158**
9. $U_1 - E(U_2)$ (\$)	10*	2.93	2.93	5.77	5.77	7.50	7.50	17.49	10.0**
10. $U_1 - E(U_2) \geq C$ ($C=\$10$)	$\sim C^*$	$< C$	$< C$	$< C$	$< C$	$< C$	$< C$	$> C$	$\sim C^{**}$
11. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-*	-	-	-	-	-	-	-	1182**

Notes * denotes initial long run equilibrium values.
 ** denotes new long run equilibrium values.
 b stands for beginning of the period.
 e stands for the end of the period.

The calculations are based on the following values: $\bar{W}_2 = \$170$, $h = \$60$, $C = \$10$.

The values of U_1 or W_1 are derived from the following production function $X_1^a = A L_1^a \bar{K}_1^b$, where $a=.6$, $b=.4$ and $(a+b=1)$. The marginal productivity condition $W_1 = a A L_1^{a-1} \bar{K}_1^b$ suggests that one per cent reduction in L_1 increases W_1 by .4 per cent.

CHAPTER 5

THE EFFICIENCY CASE FOR DIRECT JOB CREATION IN THE TEMPORARY SECTOR

In Chapter 3, we looked at the long-run and in Chapter 4 the short-run effects of direct job creation policy on employment. In this chapter, we will evaluate the efficiency effects of such a policy.¹ Can job creation programs provide any benefit to society? Or, in other words, is there a role for direct job creation policy? The test is, of course, whether it could raise the level of welfare. With flexible prices and in the absence of distortions, such policies would introduce inefficiency and lower welfare² (i.e., would constitute a net cost to society). However, the presence of minimum wages and unemployment insurance (UI) benefits can distort the labour market.³ Assuming that minimum wages and UI benefits exist for equity or non-efficiency reasons and that their magnitudes cannot be lowered, can a direct job creation program reduce their efficiency cost? It is assumed, at the same time, that such a policy does not adversely affect the distribution of income.

To evaluate the efficiency of a wage subsidy to the unskilled sector in this simple model, we derive the social opportunity cost of labour (SOCL)⁴ in the unskilled sector and compare it with $\bar{W}_2$ to establish whether a *prima facie* case can be made for subsidizing the use of labour in the unskilled sector. The central question, therefore, is: What is the social opportunity cost of labour in a sector (region) experiencing high levels of unemployment? The answer to this question will inform policy makers of the cost at which to evaluate labour in assessing government projects or programs designed to increase employment. Before we attempt to tackle this issue, a fundamental question is: Why is there a need for the concept of social opportunity cost? The answer to that question is that the need for such a concept arises when market prices do not fully reflect social opportunities. The simplest case of this is when the presence of a distortion (for example, a monopoly, or quotas) causes a divergence between the demand price and the marginal cost. In labour markets, the existence of distortions that cause unemployment, for example, may create a divergence between demand and supply prices or wage rates. According to Harberger (1971), the true purpose behind the use of social opportunity costs in

the evaluation of investment projects is that "where there is an excess of wages actually paid over social opportunity costs, this excess should be counted as part of the benefits of the project. Put another way, instead of counting against the project all of its wage costs, we charge it only with that part which represents the true social opportunity cost."

In the absence of any distortion, the fundamental determinant of the social opportunity cost of labour is the competitive supply price at which labour of a certain type will make itself available for employment in a particular area (Harberger, 1971; Jenkins and Kuo, 1978; Harberger, 1980).⁵ The question we are concerned with is: in the presence of unemployment, what is the social opportunity cost of labour (SOCL) required to fill a job in the unskilled or temporary sector in our model? So far in our model, we have ignored the effects of taxation and unemployment insurance (UI) benefits. Since these factors create labour market distortions, it is important to integrate their effects into the estimation of SOCL.

A. The Social Opportunity Cost of Labour in the Presence of Taxes and Unemployment Insurance Benefits

In the presence of taxes and unemployment insurance benefits, individuals will move between sectors until marginal utilities are equalized. This produces the long run equilibrium condition:

$$(5-1) \quad f'_1(1-t_1)-C = \pi f'_2(1-t_2)+(1-\pi)h+(1-\pi)b.d(1-t_2)$$

where, $f'_1 = W_1$ = the marginal product of skilled labour or the weekly pre-tax gross wage in the permanent sector;

t_1 = the average personal income tax rate on income W_1 ;

C = the weekly cost of acquiring skills borne privately;

$f'_2 = \bar{W}_2$ = the marginal product of unskilled labour or weekly pre-tax gross wage in the temporary sector;

Π = the proportion of time an individual is employed in the temporary sector;

$(1-\Pi)$ = the proportion of time an individual is unemployed;

h = the value of non-market or leisure time when unemployed;

b = the unemployment insurance benefit rate;

d = the proportion of time while unemployed that an unskilled worker expects to collect unemployment insurance benefits;

t_2 = the average personal income tax rate on income $\bar{W}_2$.

We assume that the financing of the UI and the job creation program is done by an external central fisc and, therefore, that t_1 , t_2 and b are parameters to our region.

As we shall see later, certain results obtained from equation (5-1) will be used in determining SOCL. To achieve

this, we use the following methodology. The social opportunity cost of hiring a worker in the temporary sector to fill a newly created job is the cost of achieving the output created by that job. This will include changes in the imputed value of non-market time and any skill-acquiring costs from not hiring an additional worker in the permanent sector due to the contraction of that sector. Note that in our analysis labour is the only variable factor. Therefore, SOCL is the cost of labour (or labour cost) for creating an additional job. The general expression for a change in social welfare (dz) from any comparative static change in our model is:⁶

$$(5-2) \quad dz = dX_1 + dX_2 + h(dL_2 - dN_2) + C.dL_2$$

where, dz = change in social welfare;

dX_1 = change in output in the permanent sector
valued at unit prices;

dX_2 = change in output in the temporary sector
valued at unit prices;

$h(dL_2 - dN_2)$ = change in unemployment in the temporary sector
and, hence, changes in leisure valued at h ;

2

$C \cdot dL_2$ = change in movement from the temporary to the permanent sector costed at C.

Since unemployment insurance (UI) benefits are simply a transfer they do not appear in equation (5-2).⁷ Consider now the change in societal welfare due to job creation in the temporary sector. Note that we do not consider here explicitly the change in societal welfare due to a wage subsidy in the temporary sector. Our interest here is to derive an expression for the social opportunity cost of a job created by the job creation program in the temporary sector. Recall that in our discussion in Chapter 3, we assume that a wage subsidy policy is chosen for the purpose of creating a targeted number of jobs in the temporary sector. The expression for the change in societal welfare resulting from job creation in the temporary sector can be derived by differentiating equation (5-2) with respect to N_2 (holding total labour endowment $\bar{L}$ constant). Thus,

$$(5-3) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = \frac{dx_1}{dN_2} + \frac{dx_2}{dN_2} + h \cdot \left(\frac{dL_2}{dN_2} - 1 \right) + c \frac{dL_2}{dN_2}$$

where, $\frac{dx_1}{dN_2}$ = loss of output in the permanent sector caused by job creation in the temporary sector;

$\frac{dx_2}{dN_2}$ = gain in output in the temporary sector;

$h(\frac{dL_2}{dN_2} - 1)$ = net change in leisure;

$c \frac{dL_2}{dN_2}$ = saving through non-training in the temporary sector.

Equation (5-3) can be written as:

$$\begin{aligned} \left. \frac{dz}{dN_2} \right|_L &= \frac{dx_1}{dL_2} \cdot \frac{dL_2}{dN_2} + \frac{dx_2}{dN_2} + h \frac{dL_2}{dN_2} - h + c \frac{dL_2}{dN_2} \\ &= \frac{dx_2}{dN_2} - \frac{dx_1}{dL_1} \cdot \frac{dL_2}{dN_2} + h \frac{dL_2}{dN_2} - h + c \frac{dL_2}{dN_2} \end{aligned}$$

(since $dL_2 = -dL_1$)

From equations (3-12) and (3-13) substituting for $\frac{dx_1}{dL_1}$ and

$\frac{dx_2}{dN_2}$ we get

$$\left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - f'_1 \frac{dL_2}{dN_2} + h \frac{dL_2}{dN_2} - h + c \frac{dL_2}{dN_2}$$

$$(5-4) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - h - (f'_1 - h - c) \frac{dL_2}{dN_2}$$

or,

$$(5-5) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = \bar{w}_2 - h - (f'_1 - h - c) \frac{dL_2}{dN_2}$$

The social cost of achieving the value of output produced by the new job, f'_2 , is then given by⁸

$$(5-6) \quad SOCL = h + (f'_1 - h - c) \frac{dL_2}{dN_2}$$

The interpretation of equation (5-6) is straightforward.

Job creation leads to additional employment (and output) in the temporary sector and to a decrease of employment (and output) in the permanent sector. The labour cost of creating an additional job is then given by the value of the

leisure lost by workers producing more output in the temporary sector plus the value of the return forgone by those workers by not moving to the labour-losing sector, $(f'_1 - h - C)$, multiplied by the shift of labour that occurs per unit of job creation (dL_2/dN_2) . If the new job creation simply reduces the pool of the unemployed in the unskilled sector and does not displace any other employment in the permanent sector - i.e., $(f'_1 - h - C) dL_2/dN_2 = 0$ - then, the social opportunity cost of labour is simply the value of leisure to the unemployed.

Since $dL_2/dN_2 = -dL_1/dN_2$, equation (5-6) can be rewritten as:

$$(5-7) \quad SOCL = h - (f'_1 - h - C)dL_1/dN_2$$

An expression for $\frac{dL_1}{dN_2}$ can be derived from the long-run equilibrium condition of our model given by equation (5-1) which can be rewritten as:

$$f'_1(1-t_1) - C = \left(\frac{N_2}{L_2}\right) \cdot f'_2(1-t_2) + \left(1 - \frac{N_2}{L_2}\right)h + \left(1 - \frac{N_2}{L_2}\right)b \cdot d(1-t_2)$$

or

$$(5-8) \quad f_1'(1-t_1) \cdot L_2 - C \cdot L_2 = N_2 f_2'(1-t_2) + (L_2 - N_2)h \\ + (L_2 - N_2)b \cdot d(1-t_2)$$

Totally differentiating equation (5-8), assuming $dC = df_2' = 0$, yields:

$$f_1''(1-t_1) \cdot dL_1 \cdot L_2 + dL_2 \cdot f_1'(1-t_1) - C dL_2 = dN_2 \cdot f_2'(1-t_2) \\ + (dL_2 - dN_2)h + (dL_2 - dN_2)b \cdot d(1-t_2)$$

and by rearranging, we get

$$f_1''(1-t_1)dL_1 \cdot L_2 + dL_2 \{f_1'(1-t_1) - C - h - b \cdot d(1-t_2)\} \\ = \{f_2'(1-t_2) - h - b \cdot d(1-t_2)\} dN_2$$

Substituting $-dL_1$ in place of dL_2 and dividing both sides by dN_2 yields:

$$\frac{dL_1}{dN_2} \{f_1''(1-t_1)L_2 - [f_1'(1-t_1) - C - h - b \cdot d(1-t_2)]\} \\ = [f_2'(1-t_2) - h - b \cdot d(1-t_2)]$$

Substituting in the above equation for $[f_1'(1-t_1) - C - h - b \cdot d(1-t_2)]$ from equation (5-1), we get

$$\begin{aligned} \frac{dL_1}{dN_2} &= \frac{[f_1''(1-t_1)L_2 - \pi[f_2'(1-t_2) - h - b \cdot d(1-t_2)]]}{[f_2'(1-t_2) - h - b \cdot d(1-t_2)]} \\ &= [f_2'(1-t_2) - h - b \cdot d(1-t_2)] \end{aligned}$$

Hence,

$$\frac{dL_1}{dN_2} = \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{[f_1''(1-t_1)L_2 - \pi[f_2'(1-t_2) - b \cdot d(1-t_2) - h]]}$$

or

$$(5-9) \quad \frac{dL_1}{dN_2} = \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{\{\pi[f_2'(1-t_2) - b \cdot d(1-t_2) - h] - f_1''(1-t_1)L_2\}}$$

or

$$(5-9)' \quad \frac{dL_2}{dN_2} = \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h] L_2}{\{\pi[f_2'(1-t_2) - b \cdot d(1-t_2) - h] - f_1''(1-t_1)L_2\}}$$

Substituting equation (5-9) into equation (5-7) gives:

$$(5-10) \quad SOCL = h + (f_1' - h - C) \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{\{\pi[f_2'(1-t_2) - b \cdot d(1-t_2) - h] - f_1''(1-t_1)L_2\}}$$

Substituting equation (5-10) back into equation (5-4) we get:

$$(5-11) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - \left[h + (f'_1 - h - C) \frac{[f'_2(1-t_2) - b \cdot d(1-t_2) - h]}{\{n[f'_2(1-t_2) - b \cdot d(1-t_2) - h] - f'_1(1-t_1)L_2\}} \right]$$

The question then is whether SOCL is greater or less than, or equal to, the wage rate - in other words, $\frac{dz}{dN_2} \gtrless 0$. One way to look at this problem is by considering a simple case where the expression for SOCL is derived under the assumption that there are no taxes and transfers in the model.

B. Job Creation and Change in Societal Welfare in the Absence of Taxes and Transfers

In the absence of taxes and transfers, the expression for the change in societal welfare caused by job creation in the temporary sector does not change and is given by equation (5-4). This is reproduced below.

$$\left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - h - (f'_1 - h - C) \frac{dL_2}{dN_2}$$

The above equation can be rewritten as:

$$(5-12) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - h + (f'_1 - h - C) \frac{dL_1}{dN_2}$$

The social cost of achieving f'_2 (the value of the output produced by the new job) is:

$$(5-13) \quad SOCL = h - (f'_1 - h - C) \frac{dL_1}{dN_2}$$

The expression for SOCL does not change in the absence of taxes and transfers. This does not mean that the absence of taxes and unemployment insurance (UI) does not alter the actual value of SOCL. If the presence of UI benefits increases dL_1/dN_2 , it correspondingly raises SOCL. That is, if the presence of UI causes an increase in the number of people staying in the temporary sector, then any increase in employment will cause a greater reduction in movement to the permanent sector, and hence SOCL will be greater.

The value of dL_1/dN_2 , in the absence of taxes and transfers, has already been derived earlier and is given by

equation (3-24). Since $\bar{w}_2 = f'_2$, equation (3-24) can be rewritten as:

$$(5-14) \quad \frac{dL_1}{dN_2} = - \frac{(f'_2 - h)}{\Pi(f'_2 - h) - f''_1 L_2}$$

Substituting equation (5-14) into equation (5-12) and equation (5-13) gives:

$$(5-15) \quad \left. \frac{dz}{dN_2} \right|_L = f'_2 - \left\{ h + (f'_1 - h - C) \frac{(f'_2 - h)}{\Pi(f'_2 - h) - f''_1 L_2} \right\}$$

$$(5-16) \quad SOCL = h + (f'_1 - h - C) \left\{ \frac{(f'_2 - h)}{\Pi(f'_2 - h) - f''_1 L_2} \right\}$$

As long as $\bar{w}_2 = f'_2 > f'_1 - C$ and $\bar{w}_2 > h$, then SOCL is greater than the value of leisure. If $\bar{w}_2 = f'_2 = h$, SOCL is equal to the value of leisure. Therefore, the necessary and sufficient condition for SOCL to be greater than the value of leisure is $\bar{w}_2 = f'_2 > h$.

Let us now consider some cases of special interest.

- (a) Special Case: $f_1''=0$ (i.e., constant marginal product of labour in the permanent sector)

It is easy to see from equation (5-16) that when $f_1''=0$ and $\bar{w}_2 > h$, SOCL equals $\bar{w}_2$ since $(f_1' - h - C) = \Pi(\bar{w}_2 - h)$ according to the equilibrium condition given by equation (2-8).⁹ The reason for $\text{SOCL} = \bar{w}_2$ is that $dL_1/dN_2 = 1/\Pi$, as can be seen from equation (5-14). This is the maximum value of dL_1/dN_2 , suggesting that for every job created in the temporary sector, $1/\Pi$ ($\Pi < 1$) workers stay in that sector.

- (b) General Case: $f_1'' < 0$ (i.e., diminishing marginal product of labour in the permanent sector)

If $f_1'' < 0$ and $\bar{w}_2 > h$, then from equation (5-14), it is clear that $|dL_1/dN_2| < |1/\Pi|$ and therefore, $\text{SOCL} < \bar{w}_2$. The SOCL in the declining marginal product case is less than in the constant marginal product case. The underlying reason is that for every job created in the temporary sector, the additional number of people who stay in the temporary sector and do not move to the permanent sector is lower in the diminishing marginal product case than in the constant marginal product case. The explanation is simple: job creation in the temporary sector raises the expected utility of the workers in that sector relative to those in the permanent sector. Workers in the temporary sector are

induced not to move to the permanent sector, L_1 falls causing an increase in the unemployment rate in the temporary sector and in the wage rate (W_1) in the permanent sector. Because W_1 increases (unlike the constant marginal product case) more workers will move to the permanent sector leading to less of a decrease in the permanent sector output.

- (c) Special Case: $f_1' = \infty$ (i.e., the slope of the marginal product of labour curve is infinite in the permanent sector)

If $f_1' = \infty$, it can easily be seen from equation (5-16) that SOCL equals h . The labour cost of creating an additional job is given by the value of the leisure lost by workers. This case represents an extreme situation. As higher utility induces workers in the temporary sector not to move to the permanent sector, L_1 falls and wages (W_1) rise such that enough workers move in from the temporary sector to keep L_1 unchanged. Hence L_1 does not change and no output is lost. Thus the cost of increasing output in the temporary sector is only the lost leisure of unskilled workers who now become employed.

The most important question, from our point of view, which we have not yet answered directly is whether societal welfare increases due to the creation of a job in the temporary sector. To see this, let us consider equation (5-15).

Notice that f'_2 represents the output (or benefit) produced by the new job and that the expression within brackets indicates the social cost of achieving that benefit. What, then, is the sign of dz/dN_2 ?

Let us now consider the conditions under which $\frac{dz}{dN_2} \gtrless 0$.

Case I: $\frac{dz}{dN_2} > 0$

This case would indicate that the change in societal welfare due to job creation in the temporary sector is positive. Alternatively, the market wage ($f'_2 = \bar{w}_2$) is greater than the SOCL. $\frac{dz}{dN_2} > 0$ can occur in the following circumstances:

(i) the necessary condition for $\frac{dz}{dN_2}$ to be positive is that $\bar{w}_2 > h$;

(ii) as long as $\bar{w}_2 = f'_2 > f'_1 - C$ and $\bar{w}_2 > h$ with some slope to the demand curve in the permanent sector, $\frac{dz}{dN_2}$ will be

positive. This happens because for any dN_2 , dL_2 is smaller. Consider for example the following subcases:

(a) If $\bar{W}_2 = f'_2 > f'_1 - C$ and $\bar{W}_2 > h$ and $f''_1 < 0$, then it can be easily seen from equation (5-15) that $\frac{dz}{dN_2} > 0$. The underlying

reasoning is that the number of additional people who stay in the temporary sector in response to job creation is lower relative to that in the constant marginal product case, and hence SOCL is smaller. Due to a lower L_1 in the permanent sector, W_1 is higher and the unemployment rate in the temporary sector does not return to its initial level. When compared with $\bar{W}_2$, SOCL is less than the market wage. This case can be illustrated with the help of Figure 5-1, where the demand curve for labour in the temporary sector is given by MPL_2^d and, in the permanent sector, by MPL_1^d . The initial equilibrium situation is described by the position where $W_1 - C = \Pi \bar{W}_2 + (1 - \Pi)h$ holds. In response to job creation in the temporary sector, more people stay there and in the new long-run equilibrium situation, the new L_1 is $O_1 L_2''$ and the new wage rate, net of skill acquisition costs, is $(W_1' - C)$. The net gain $[(\bar{W}_2 - h)dN_2]$ in the temporary sector is given by area $amcd^{10}$ and the net loss in output $[(f'_1 - h - C)dL_2]$ in the permanent sector is given by $a'm'n'd'$. If the additional jobs in the temporary sector are created at the minimum wage $\bar{W}_2$, then the triangle abm is also a net loss in output and

Figure 5-1

Downward Sloping Demand Curve for Labour
in the Permanent Sector and Net Gain
in Output Resulting from Job Creation
in the Temporary Sector

becomes a part of the social cost, unless it is assumed that an outside agency pays the equivalent of $\underline{abm}$ to employers to hire more N_2 and this is counted as a social (or regional) gain (i.e., there is no efficiency loss).

(b) The change in social gain will be at a maximum if the demand curve in the permanent sector is vertical (i.e., $f_1' = \infty$) and $\bar{W}_2 = f_2' > f_1' - C$ and $\bar{W}_2 > h$. It can be seen from equation (5-15) that $\frac{dz}{dN_2}$ would be equal to $f_2' - h$. That is, the cost of achieving output f_2' is just the value of leisure (h). In this case, SOCL is the value of leisure forgone, and there is no displacement of employment or output elsewhere.

Consider, for example, a case where the demand curve for labour is vertical in Sector I and is given by MPL_1 as shown in Figure (5-2). If the demand curve in Sector II is given by MPL_2^d , then the net gain in output $((\bar{W}_2 - h)dN_2)$ caused by job creation is the area $\underline{amcd}$, and there is no displacement of employment in Sector I. The underlying reason is that job creation in the temporary sector raises the expected utility of workers in that sector relative to those in the permanent sector. Workers in the temporary sector are induced not to move to the permanent sector, L_1 falls, causing an infinite change in the marginal product of labour in Sector I and hence in W_1 . In the new long-run equilibrium situation, enough workers from the temporary sector

Figure 5-2
Perfectly Inelastic Demand Curve for Labour
in the Permanent Sector and Net Gain in
Output Resulting from Job Creation
in the Temporary Sector

have moved to the permanent sector so as to keep the L_1 unchanged (i.e., $0_1 L_2^0$). The employment creation absorbs all the workers from the unemployed pool and the gain in social welfare is at its maximum.

If wages were flexible in both sectors and there were no distortions in the labour market, a policy of wage subsidy to the unskilled sector would lead to a welfare loss. The reason that our model predicts $dz/dN_2 > 0$ is the presence of distortion created by the existence of the minimum wage in the unskilled sector.

Case II: $\frac{dz}{dN_2} = 0$

This suggests that the change in societal welfare due to job creation in the temporary sector is zero. Alternatively, the market wage ($f'_2 = \bar{w}_2$) equals SOCL and no case can be made on efficiency grounds for subsidizing job creation in the temporary sector. It is argued that,

(i) the sufficient condition for $\frac{dz}{dN_2} = 0$ is that $f'_2 = h$ (i.e., the market wage equals the value of leisure);

Figure 5-3
Perfectly Elastic Demand Curve for Labour in
the Permanent Sector and Net Gain (or loss)
in Output Resulting from Job Creation
in the Temporary Sector

(ii) As long as $\bar{w}_2 = f'_2 > h$, $\frac{dz}{dN_2}$ can be zero, but only if the marginal product of labour is constant in the permanent sector (i.e. $f''_1 = 0$). If this is so, it can be easily seen from equation (5-14) that $\frac{dL_2}{dN_2} = \frac{1}{\Pi}$ (since $-dL_1/dN_2 = dL_2/dN_2$). The $\Pi < 1$, implies that $\frac{dL_2}{dN_2}$ is sufficiently greater than one. Thus, if $\bar{w}_2 > h$, and $f''_1 = 0$, then $\frac{dz}{dN_2} = 0$ since dL_2 is sufficiently greater than dN_2 .

This case is illustrated in Figure (5-3). The immediate effect of a wage subsidy to employers in the temporary sector is to decrease the unemployment rate of the unskilled labour or to increase Π . This raises the expected utility in the temporary sector relative to that in the permanent sector. Since members of the unskilled labour force now expect to work for a proportion of time greater than Π , more potential migrants stay in that sector. In order for the expectation of employment to eventually return to its initial level Π , $\frac{1}{\Pi}$ potential migrants must stay in the temporary sector for every job created. In the new long-run equilibrium situation, the supply of skilled labour has decreased to $0_1 L'_2$, and employment of unskilled labour has increased by $N^0_2 N'_2$. The unskilled labour supply in the temporary sector has risen to $0_2 L'_2$. Area amcd shows the net output gain [i.e., $(\bar{w}_2 - h)dN_2$], generated by the additional

employment in the temporary sector. On the other hand, rectangle a'b'c'd' shows the net output loss $[(W_1 - C - h)dL_2]$ in the permanent sector. Under the assumption of $f_1'' = 0$, it can be seen from equation (5-14) that $(\bar{W}_2 - h)dN_2 = (W_1 - C - h)dL_2$, since $-dL_1 = dL_2$. Since gains and losses offset each other exactly, no change in societal welfare is realized through job creation in the temporary sector (i.e., $\frac{dz}{dN_2} = 0$).

Case III: $\frac{dz}{dN_2} < 0$

This case would imply that the change in social welfare caused by job creation in the temporary sector is negative; or, alternatively, that $SOCL > \bar{W}_2$. Given the way we have set up our model (i.e., $\bar{W}_2 = f_2' > f_1' - C$, $\bar{W}_2 > h$, $f_1'' < 0$, $f_2'' < 0$) this is not possible. This can be shown as follows.

Equation (5-15) can be rewritten as:

$$(5-17) \quad \left. \frac{dz}{dN_2} \right|_L = (f_2' - h) - (f_2' - h) \frac{(f_1' - h - C)}{\{(f_1' - h - C) - f_1''L_2\}}$$

Equation (5-17) is obtained by substituting $(f_1' - h - C)$ for $\Pi(\bar{W}_2 - h)$ from equation (2-8). Then $dz/dN_2 < 0$ only if

$$(5-18) \quad \frac{(f_1' - h - C)}{\{(f_1' - h - C) - f_1''L_2\}} > 1$$

For $f_1' > h + C$, the maximum value of the ratio given by equation (5-18) is 1 (in cases where $f_1'' = 0$), otherwise it must be less than one. Therefore, it is not possible to have $dz/dN_2 < 0$.

Before closing this discussion of the change in societal welfare caused by job creation in the temporary sector, two issues deserve some attention. The value of leisure (h) does matter in determining the sign of dz/dN_2 . In other words, how would SOCL change with the changing value of leisure? To see this, let us rewrite equation (5-16) in the following way:

$$(5-19) \quad SOCL = h + (f_1' - h - C) \frac{(f_2' - h)}{(f_1' - h - C) - f_1'' L_2}$$

By doing some manipulations we can rewrite equation (5-19) as:

$$SOCL = - \frac{f_1'' L_2}{(f_1' - h - C) - f_1'' L_2} \cdot h + \frac{(f_1' - h - C)}{(f_1' - h - C) - f_1'' L_2} \cdot f_2'$$

or,

$$(5-20) \quad SOCL = a h + (1-a) f_2'$$

where

$$(5-20)' \quad a = - \frac{f_1'' L_2}{(f_1' - h - C) - f_1'' L_2} > 0$$

$$(1-a) = \frac{(f_1' - h - C)}{(f_1' - h - C) - f_1'' L_2} > 0$$

Let us differentiate equation (5-20) with respect to h , recognizing that when h changes we will have new equilibrium levels of L_1 and L_2 . For a higher value of h , we would expect L_2 to increase and L_1 to decrease in a new equilibrium.

$$(5-21) \quad \frac{\partial SOCL}{\partial h} = a - (f_2' - h) \frac{\partial a}{\partial h} \quad (\text{assuming } df_2' = 0)$$

Let us now determine the sign of equation (5-21). We know that $a > 0$, and $(f_2' - h) > 0$. To know the sign of the term $\partial a / \partial h$, let us differentiate equation (5-20)' with respect to h (assuming $\partial f_1'' / \partial h = df_2' = \partial C / \partial h = 0$).

$$\frac{\partial a}{\partial h} = - \frac{\{f_1'' \frac{\partial L_2}{\partial h} [(f_1' - h - C) - f_1'' L_2] - f_1'' L_2 [f_1'' \frac{\partial L_1}{\partial h} - 1 - f_1'' \frac{\partial L_2}{\partial h}]\}}{\{(f_1' - h - C) - f_1'' L_2\}^2}$$

$$(5-22) \quad \frac{\partial a}{\partial h} = \frac{f_1'' \frac{\partial L_1}{\partial h} [(f_1' - h - C) + f_1'' L_2] - f_1'' L_2}{\{(f_1' - h - C) - f_1'' L_2\}^2}$$

To find out the sign of dL_1/dh , let us differentiate the long-run equilibrium condition given by equation (2-8) with respect to h (assuming $dN_2/dh = d\bar{w}_2 = dC/dh = 0$)

$$f_1''(dL_1/dh) \cdot L_2 + f_1'(dL_2/dh) - C \cdot (dL_2/dh) = (dL_2/dh) \cdot h + L_2 - N_2$$

substituting $dL_1/dh = -dL_2/dh$ and rearranging we get,

$$dL_1/dh \{f_1'' L_2 - (f_1' - C - h)\} = L_2 - N_2$$

or

$$(5-23) \quad \frac{dL_1}{dh} = - \frac{L_2 - N_2}{(f_1' - C - h) - f_1'' L_2} < 0$$

In equation (5-22), we know that $f_1'' < 0$, $\partial L_1 / \partial h < 0$, $(f_1' - h - C) > 0$, and the denominator is positive. Hence the sign of $\partial a / \partial h$ is indeterminate and depends on the sign of term $[(f_1' - h - C) + f_1'' L_2]$.

If the term $[(f_1' - h - C) + f_1'' L_2]$ is negative (positive), the sign of $\partial SOCL / \partial h$ is positive (negative), suggesting that SOCL rises (decreases) and the gap between f_2' and SOCL decreases (increases) as the value of h increases. Intuitively it appears that SOCL must rise as h increases. The

explanation is simple. A high value of h , ceteris paribus, would induce more workers to stay in the temporary sector causing a lower L_1 and a higher W_1 in the new equilibrium. An additional job in the temporary sector will draw workers from more costly sources (i.e., higher W_1 and h).

The second issue is the additional social gain in output due to the increased productivity of the participants in the job creation program. In our analysis so far, the change in social welfare caused by job creation in the temporary sector does not include the additional future output that the program participants may be able to provide because of an increase in their productivity due to the contribution of the work experience or on-the-job training. This issue is dealt with at length in Appendix I.

C. Previous Research on SOCL

The social opportunity cost of labour (SOCL) to be used in project evaluation has generally been considered within the context of long-run equilibrium models that allow for interaction between regional labour markets. Recent important contributions in this area have been made by Harberger (1971, 1980); Jenkins and Kuo (1978); and Boadway and Flatters (1981).

Harberger in his 1971 paper presented analyses indicating the true measure of SOCL in the presence of unemployment. Following Harberger, Jenkins and Kuo (1978) developed a model of a regional labour market to evaluate the social opportunity cost of labour employed in permanent and temporary jobs. In their paper, the labour force is divided into two groups which, on average have quite different employment and unemployment experiences. The first group is termed the "permanent employment sector", where the workers, because of their (choice of) seniority or occupation, are almost never unemployed. The second group is called the "temporary employment sector", which contains those workers who are either unemployed or who are employed in jobs that are not expected to provide continuous employment. The model has two regions. One of the regions is characterized by slow economic growth and a high unemployment rate. It is assumed that wages in the slow-growth region are not determined by local labour market conditions but by outside forces, such as collective bargaining agreements and minimum wage laws. Migration takes place between the two regions in response to expected wage receipts, and it is assumed that migration occurs until an equilibrium is achieved in the labour market. There are no costs associated with migration and constant returns to labour are assumed.

According to Jenkins and Kuo, in the presence of taxes, unemployment insurance benefits, and migration between the two regions, the private supply price (PSP) of a worker in the temporary labour force or of a marginal migrant in the slow-growth region can be expressed as:

$$(5-24) \quad PSP = \pi \bar{w}_2(1-t_2) + (1-\pi)h + (1-\pi)b \cdot d(1-t_2)$$

where b is the unemployment insurance benefit rate, d is the proportion of time while unemployed that a person expects to collect UI benefits, t is the average personal income tax rate and the rest of the notation is as defined earlier in the text. Note that the private supply price (PSP) of a potential migrant is generally different in the region he is departing and in the region to which he is moving, while his level of utility in both regions is approximately equal.

The PSP of the same migrant in the alternative region can be given as:

$$(5-25) \quad PSP_a = \pi_a \bar{w}_{2a}(1-t_{2a}) + (1-\pi_a)h + (1-\pi_a)b_a d_a(1-t_{2a})$$

where the symbols refer to the same variables as in equation (5-24) above, with the addition of subscript a , which stands for the alternative region.

Jenkins and Kuo point out that in the presence of labour mobility, all of the externalities created by the process of labour migration should be included in the measurement of the social opportunity cost (SOC) of a migrant. Retaining a potential migrant in the slow-growth region will cause a welfare loss equal to the income taxes that would have been generated if he had moved to the high-income region, but there is also a welfare gain equal to the amount of any unemployment insurance payments that would have been paid to the worker if he had stayed in the other region.¹¹ The net externality (E) becomes:

$$(5-26) \quad E = \pi_a \bar{w}_{2a} t_{2a} - (1 - \pi_a) b_a d_a (1 - t_{2a})$$

Equation (5-26) describes an additional welfare cost to society that results from retaining a potential migrant and that must be added to the private supply price (PSP) of this migrant to constitute the social opportunity cost (SOC) of retaining him in the slow-growth region. The latter thus becomes:¹²

$$(5-27) \quad SOC = [\pi \bar{w}_2 (1 - t_2) + (1 - \pi) h + (1 - \pi) b \cdot d (1 - t_2)] +$$

$$[\pi_a \bar{w}_{2a} t_{2a} - (1 - \pi_a) b_a d_a (1 - t_{2a})]$$

Following Jenkins and Kuo, a distinction can be drawn between the social opportunity cost of retaining a potential migrant in the slow-growth region and the social opportunity cost of labour arising from filling alternative types of jobs. They point out that "the social opportunity cost of a migrant can be measured independently of the labour market dynamics that arise when different kinds of employment are made available. However, the social opportunity cost of labour is tied to the type of employment that is created and uses the value for the social opportunity cost of a migrant as one of the input parameters" (p. 224).

Consider the social opportunity cost of labour when one person-year of employment is created in the temporary sector of the slow-growth region. The workers in the temporary sector will now expect to obtain employment for more than a proportion Π of time. This will induce them not to migrate to the other region. A reduction in out-migration will cause the labour force in the temporary sector to increase. In order for the expectation of employment to eventually return to its initial level Π , $\frac{1}{\Pi} (>1)$ potential migrants must be retained in the temporary sector for every job created. An increase in employment actually increases the number of unemployed in the temporary sector, leading to a rise in the

consumption of leisure time equal to the proportion of time each retained migrant spends unemployed $(1-\pi)$, multiplied by the number of workers retained. Therefore, the social opportunity cost of labour that arises with the creation of a job in the temporary sector¹³ will be equal to $[\text{SOC} - (1-\pi)h] \frac{1}{\pi}$.

The model developed by Boadway and Flatters (1981) can be seen as an extension of the work conducted by Harberger and by Jenkins and Kuo. Boadway and Flatters develop a long-run comparative static framework for determining whether employment should be subsidized in poor regions of the economy. They present a two-region model, in which the migration of labour takes place from the poor (P) region to the rich (R) region in the presence of costs of migration, and with unemployment in the poor region being basically attributed to the minimum wage. Migration is treated as an equilibrium phenomenon. Workers migrate according to the expected wage differential in the two regions and to the costs of migration. Labour is assumed to be homogenous, and diminishing marginal returns to labour are assumed. The long-run equilibrium condition of their model is given by:

$$(5-28) \quad W_r = \pi \bar{W}_p + (1-\pi)h + m$$

where W_R and $\bar{W}_P$ are the wage rates in R and P regions respectively (the latter being fixed), Π is the probability of employment in P and is equal to N_P/L_P (employment divided by the labour force), h is the monetary value of leisure time while unemployed, and m is the per worker cost of migration.

Boadway and Flatters view the shadow wage rate in the poor region (P) in two alternate ways. They make a distinction between the "shadow price of labour" and the "shadow price of a job" which in their terminology is referred to as the "opportunity cost of a job". The shadow price of labour in region P is the value to the economy of having one more worker initially in that region or, equivalently, the cost of having one less worker. They view it as the change in the initial labour endowment in region P. They argue that "it would be the appropriate shadow wage rate to use on a project which has an effect on the labour market equivalent to the removal of workers." This concept corresponds precisely with the Jenkins and Kuo concept of the opportunity cost of a permanent job. The opportunity cost of a temporary job is defined as the opportunity cost to society of the net output and leisure forgone and of the net migration costs incurred when one job is created in region P.

This concept corresponds to what Jenkins and Kuo refer to as the opportunity cost of a temporary job and what we call the social opportunity cost of labour (SOCL).

Boadway and Flatters have shown that the creation of a job in region P has labour market effects that are quantitatively different from those of an identical reduction in that region's labour endowment. Their conclusions suggest that in the absence of tax and transfers, and assuming $f_r'' < 0$ and $f_p'' < 0$, the shadow price of labour is less than the market wage, implying the existence of a case for subsidization of labour use in region P. This conclusion also holds if the marginal product of labour is assumed to be constant - what they refer to as the "Harberger case". This result is identical to that derived by Jenkins and Kuo.

Again assuming $f_r'' < 0$ and $f_p'' < 0$, the opportunity cost of a job (or SOCL, in our terminology) is less than the market wage, and a case can be made, on efficiency grounds, for subsidizing job creation in region P. In the constant marginal product case ($f_r'' = 0$, $f_p'' = 0$), the opportunity cost of a job is equal to the market wage and no case can be made, on efficiency grounds, for subsidizing job creation in region P. This result is identical to that obtained by Jenkins and Kuo.

Boadway and Flatters also calculate the shadow price of labour and the opportunity cost of a job in the presence of taxes and a self-financing UI scheme. They include a budget balance equation of the following kind:

$$(5-29) \quad t(L_r + N_p) = b(L_p - N_p)$$

It is assumed that UI benefits are paid at the rate b per unemployed worker and that these are financed by a tax at the rate t per employed worker in both sectors. Their results, like ours, do not give unambiguous predictions as to whether both the shadow price of labour and the opportunity cost of a job can be greater or lower than the market wage.

Now let us compare our methodology and the results we have obtained with those of Jenkins and Kuo (1978) and of Boadway and Flatters (1981). Our expression for the SOCL associated with creating a job in the temporary sector, derived under the assumption of constant marginal product of labour (i.e., $f_1''=0$, $f_2''=0$) is identical to that derived by Jenkins and Kuo. This can be shown as follows. Following Jenkins and Kuo's methodology, the private supply price (PSP) of a worker in the temporary sector in our model, with taxes and unemployment insurance benefits, can be expressed as:

$$(5-30) \quad PSP = \pi \bar{W}_2(1-t_2) + (1-\pi)h + (1-\pi)b.d(1-t_2)$$

The net externality (E) generated by retaining a potential skilled worker in the temporary sector involves a welfare loss equal to the income taxes that would have been generated if he had moved to the permanent sector.

$$(5-31) \quad E = W_1 t_1$$

Thus, the social opportunity cost associated with retaining a potential skilled worker in the temporary sector becomes:¹⁴

$$(5-32) \quad SOC = \pi \bar{W}_2(1-t_2) + (1-\pi)h + (1-\pi)b.d(1-t_2) + W_1 t_1$$

Under the assumption of constant marginal product of labour, for every job created in the temporary sector, the number of workers who stay in that sector and do not move to the permanent sector ($\partial L_1 / \partial N_2$) equals $1/\pi$. Thus, an increase in employment by one job actually increases the number of the unemployed in the temporary sector, leading to a rise in the consumption of leisure time that is equal to the proportion of time each retained worker spends unemployed $(1-\pi)$, multiplied by the number of workers retained $(1/\pi)$. Therefore, the SOCL that arises with the creation of a job in the temporary sector will be:

$$(5-33) \quad SOCL = [SOC - (1-\pi)h]1/\pi$$

substituting for SOC from equation (5-32),

$$\begin{aligned} SOCL &= \{[\pi\bar{w}_2(1-t_2) + (1-\pi)h + (1-\pi)b \cdot d(1-t_2) + w_1t_1] - (1-\pi)h\} \cdot \frac{1}{\pi} \\ &= [\pi\bar{w}_2(1-t_2) + (1-\pi)b \cdot d(1-t_2) + w_1t_1] \cdot \frac{1}{\pi} \end{aligned}$$

This expression for the SOCL associated with creating a job in the temporary sector, derived using the Jenkins and Kuo methodology, is identical to that derived in our model from equation (5-10) assuming constant marginal product of labour ($f'_1=0$) and substituting in that the value of $(f'_1 - h - C) = [\pi f'_2(1-t_2) - \pi h + (1-\pi)bd(1-t_2) + f'_1t_1]$ from equation (5-1).

Notice that the results derived from the analyses of Jenkins and Kuo and of Boadway and Flatters are conceptually similar to those derived from our model. However, there are a few striking differences, which are outlined below.

First, the models developed by Jenkins and Kuo and by Boadway and Flatters derive the social opportunity cost of labour associated with the creation of a job in the presence of migration across regions, whereas our model focuses on the issue within the context of a regional labour market.

Second, in the Jenkins and Kuo model, as in ours, the labour force is divided between two sectors - the permanent-employment sector and the temporary-employment sector. However, these two sectors do not interact with each other in their analysis; whereas the main focus of our analysis is the interaction between these two sectors of the labour force from a long-run human capital perspective. Moreover, Jenkins and Kuo's analysis does not assume that there are any costs associated with migration. They implicitly assume an infinitely elastic supply of migrants. Furthermore, their treatment of the value of leisure time has been criticized by Dewolf and Sugden (1979).

Finally, the work by Boadway and Flatters is definitely an extension of the Jenkins and Kuo analyses. The Boadway and Flatters' model assumes that all the shocks in the system (for example, job creation) are viewed as taking place before the migration equilibrium gets worked out (that is, in a disequilibrium situation). In contrast to this assumption, comparative static results are derived from the long-run equilibrium condition of the model. In their model, increases in employment in region P may induce physical reverse migration from region R to region P if job creation is viewed as taking place after the equilibrium migration. In that case, if physical reverse migration takes place, the

SOCL will be higher relative to the case where there is no reverse migration. The reason is that in the former case there is an increase in migration costs as a result of reverse migration, while in the latter case there is a reduction in migration costs. In our model, physical reverse migration from the permanent to the temporary sector will take place only if the size of the job creation program in the temporary sector is very large.¹⁵ Moreover, C is treated as a sunk cost even if reverse migration occurs. If reverse migration occurs, the expression for SOCL will be:

in the Boadway and Flatters model,¹⁶ $SOCL = (f'_1 - h + m) \frac{dL_p}{dN_p} + h;$

and in our model: $SOCL = (f'_1 - h) \frac{dL_2}{dN_2} + h$

Thus, the value of SOCL in the Boadway and Flatters model is higher than it will be in our model. The difference arises mainly because the role of skill-acquiring costs in our model is different than that of migration costs in the Boadway and Flatters model.

CHAPTER 6

EMPLOYMENT EFFECTS OF A DIRECT JOB CREATION
POLICY IN THE TEMPORARY SECTOR

The analysis of the previous chapter indicated that if the social opportunity cost (SOCL) of creating an additional job in the temporary sector is less than the value of the output produced by the new job then the welfare of the economy would improve. The focus of this chapter is to investigate the long-run overall employment effects of a direct job creation policy in the temporary sector.

Our analysis has shown that job creation in the temporary sector increases employment in that sector and decreases the supply of skilled labour in the permanent sector. Consequently, job creation in the temporary sector leads to a reduction of employment in the permanent sector. Assuming there is no excess demand for labour in the permanent sector - i.e., that the sector is in equilibrium - the decreased supply of skilled labour will increase wages in that sector. Within the context of our model, these considerations imply that a program emphasizing job creation in the presence of unemployment may simply be reducing the supply of skilled workers. The question that then arises is: What happens to

total employment in the economy? Does it increase, decrease, or remain constant?

In terms of our model, the total employment E in both sectors of the economy is given by

$$(6-1) \quad E = N_2 + L_1$$

where N_2 and L_1 denote employment in the temporary and permanent sectors, respectively. Total differentiation of equation (6-1) gives:

$$dE = dN_2 + dL_1$$

or,

$$(6-2) \quad dE = \left(1 + \frac{dL_1}{dN_2}\right) dN_2$$

where, dE = the change in total employment in the region;

dL_1/dN_2 = the change in employment in the permanent sector per unit of job creation in the temporary sector;

dN_2 = the new jobs created in the temporary sector.

Thus,

$$(6-3) \quad dE \gtrless 0 \quad \text{as} \quad \frac{dL_1}{dN_2} \gtrless -1$$

Whether total employment in the region would increase, decrease, or remain constant would depend on the value of dL_1/dN_2 . The lower (greater) the negative value of dL_1/dN_2 , the larger (smaller) will be the long-run employment effect of the program. Note that in our analysis $dL_1/dN_2 < 0$ may mean that some new entrants to the labour market are now discouraged from moving to the permanent sector. Now let us explore what conditions lead to $dL_1/dN_2 \gtrless -1$.

In the presence of taxes and UI benefits, an expression for dL_1/dN_2 has already been derived earlier and is given by equation (5-9) in Chapter 5.

$$(6-4) \quad \frac{dL_1}{dN_2} = - \frac{[f'_2(1-t_2) - b \cdot d(1-t_2) - h]}{\{ \Pi [f'_2(1-t_2) - b \cdot d(1-t_2) - h] - f''_1(1-t_1)L_2 \}}$$

where $f'_2(1-t_2) > b \cdot d(1-t_2) + h$, that is, the unemployment insurance benefits net of taxes plus the value of leisure time when unemployed is lower than the market wage net of taxes when employed.

Now let us consider the following cases:

Case I: $f_1'' = 0$ (i.e., constant marginal product of labour in the permanent sector)

In the case of constant marginal product of labour in the permanent sector, the value of dL_1/dN_2 will be at its maximum. It can be easily seen from equation (6-4) that dL_1/dN_2 equals $-1/\Pi$. For every job created in the temporary sector, $1/\Pi$ (>1) workers are induced not to move to the permanent sector. Since dL_1/dN_2 is negative and greater than one ($\Pi < 1$), dE would be negative (<0). Thus, in this case job creation in the temporary sector will cause the total employment of the region in the long run to fall relative to its initial equilibrium value. This case was also briefly mentioned in Chapter 4.

Case II: $f_1'' = \infty$ (i.e., the slope of the marginal product of labour curve in the permanent sector is infinite)

In the special case in which the demand curve for labour is vertical in the permanent sector (i.e., $f_1'' = \infty$), dL_1/dN_2 will have its smallest value which is zero and the long-run employment effect will be at its maximum. That is, $dE = dN_2$ when, $dL_1/dN_2 = 0$.

Case III: General Case, $f_1'' < 0$ (i.e., diminishing
marginal product of labour
in the permanent sector)

It can be seen from equation (6-4) that in the general case, i.e., when there are diminishing returns to labour, $-dL_1/dN_2 < 1/\Pi$.¹ Since $\Pi < 1$, equation (6-2) implies two possibilities. In the first case, $dE < dN_2$ (or $dE > 0$), that is, the change in the total employment of the region is lower than the total number of jobs created in the temporary sector. In the second case, $dE < 0$, that is, it is possible that dE may be negative suggesting that as a result of job creation in the temporary sector, the total employment of the region in the long-run may be lower relative to its initial equilibrium value. Thus, in the diminishing marginal product case total employment in the region may increase, remain constant or decrease in the long run as a result of job creation in the temporary sector.²

We know from an earlier chapter that the long-run change in societal welfare is always positive in the general case. Thus, even if $dE < 0$ i.e., the total employment of the region declines, the social welfare of the economy will increase. This gain in social welfare is obtained because the job creation policy in the temporary sector reduces the

efficiency cost of the existing distortions created by the presence of fixed wages and taxes.

The above discussed cases establish bounds on the value of dL_1/dN_2 , which are given by:

$$0 \leq \left| dL_1/dN_2 \right| \leq \left| 1/\Pi \right|$$

Before closing this discussion of the long-run employment effects of the wage subsidy to the temporary sector, it will be interesting to know under what circumstances the value of dE will be equal to zero. That is, the conditions under which the net addition to the employment of a region in the long-run as a consequence of job creation in the temporary sector will be zero. From equation (6-2), it can be seen that if, $dL_1/dN_2 = -1$, then $dE = 0$. Therefore, the problem boils down to tracing out the conditions under which $dL_1/dN_2 = -1$.

In the absence of taxes and transfers, the expression for dL_1/dN_2 has already been derived in Chapter 5 and is given by equation (5-14).

$$(6-5) \quad \frac{dL_1}{dN_2} = \frac{(f'_2 - h)}{\Pi(f'_2 - h) - f''_1 L_2}$$

Since $(f'_1 - C - h) = \Pi(f'_2 - h)$, as can be seen from the equilibrium condition (2-8), and $f''_1 = dw_1/dL_1$, equation (6-5) can be rewritten as:

$$(6-6) \quad \frac{dL_1}{dN_2} = \frac{(\bar{w}_2 - h)}{\left\{ \frac{dw_1}{dL_1} \cdot L_2 - \Pi(\bar{w}_2 - h) \right\}}$$

where dw_1/dL_1 is the slope of the demand curve for labour in the permanent sector. If the value of dL_1/dN_2 is set equal to -1 then,

$$-\left\{ \frac{dw_1}{dL_1} \cdot L_2 - \Pi(\bar{w}_2 - h) \right\} = (\bar{w}_2 - h)$$

or,

$$(6-7) \quad -\frac{dw_1}{dL_1} \cdot \frac{L_1}{w_1} = \frac{L_1}{L_2} (1 - \Pi) \cdot \left(\frac{\bar{w}_2 - h}{w_1} \right)$$

and

$$(6-8) \quad \epsilon = \frac{dL_1}{dw_1} \cdot \frac{w_1}{L_1} = \frac{L_2}{L_1} \cdot \frac{w_1}{(1 - \Pi)(\bar{w}_2 - h)}$$

Notice that equation (6-8) gives us the long-run value of the wage elasticity of employment or the elasticity of demand for labour (ϵ) in the permanent sector that would make $dE=0$. Through equation (6-8), we can find a crucial value of the wage elasticity of employment of skilled labour which would constrain the value of dL_1/dN_2 equal to -1.

So far our analysis has focused on the long-run employment effects of a wage subsidy to the temporary sector. In the short run, i.e., the time period when the system does not have time to induce movement of workers from temporary to the permanent sector, $dL_1/dN_2=0$. Therefore, the impact effect of the job creation program will be equal to dN_2 (i.e., $dE=dN_2$). For a detailed short-run analysis of a direct job creation policy in the temporary sector, the reader may refer to Chapter 4.

SUMMARY OF THE THEORETICAL ANALYSIS

In concluding the theoretical part of this thesis, the following statements can be made on the basis of the foregoing chapters on the employment, output and efficiency effects of direct job creation in the temporary sector.

(i) Direct job creation in the temporary sector can be justified on efficiency criteria if the social opportunity cost of a job (SOCL) is less than the wage rate in that sector. The model suggests that the total output and welfare of the economy can be increased by subsidizing the use of labour in the temporary sector (i.e., $dz/dN_2 > 0$) under the assumptions of diminishing marginal product of labour in the permanent sector; $\bar{w}_2 > h$; and no distortions in the permanent sector.

(ii) Because of the reduction in employment in the permanent sector resulting from direct job creation in the temporary sector, total employment in the economy may increase, remain constant or decrease. The model allows us to predict under what conditions total employment will increase.

The rest of this thesis is devoted to an empirical investigation of whether a direct job creation program can be supported on efficiency grounds; and the impact such a program may have on total employment in the region. This involves the estimation of the following factors:

(a) The social opportunity cost of a job as given by equation (5-10):

(b) The net employment effect of the program both in the short- and long-run.

This involves estimation of a set of components:

(i) the probability of finding alternative employment for program participants (Π);

(ii) the proportion of time a program participant is expected to receive UI benefits when unemployed (d);

(iii) the marginal value of leisure time when unemployed, in the presence of the cost of acquiring skills;

(iv) wages in the skilled sector (w_1); the average tax rates in both sectors (t_1 and t_2); the cost of acquiring skills (C); the unemployment insurance benefit rate (b); the size of the temporary sector (L_2); the number of temporary sector workers employed (N_2); and the slope of the labour demand curve in the permanent sector (f_1'').

PART II: EMPIRICAL ANALYSIS

CHAPTER 7

THE DATA

DATA SOURCES

A. Program Population: the Employment Tax Credit Program (ETCP)

The data used in the empirical analysis were obtained from a recent job creation program in Canada. In March 1978, the federal government introduced the Employment Tax Credit Program (ETCP) to generate employment in the private sector of the economy. The program had two objectives:

- (i) the main objective was "to stimulate incremental employment in the private sector";
- (ii) a secondary potential by-product of the program was "to improve future employability of participants above that which would have occurred in its absence."

The program provided a tax credit of \$1.50, \$1.75, or \$2.00 an hour, depending on the geographic area, to employers who create jobs additional to their normal work force - i.e., that would not have existed without the program.¹ The program was authorized by the Employment Tax Credit Act, which set out its basic structure.²

According to the (modified) program,³ an eligible employer may claim the tax credit for each hour of eligible employment by an eligible worker up to a maximum of 40 hours per week for a period not exceeding 12 months. In general terms:

- an "eligible employer" is a person who has been carrying on business in Canada for more than 52 weeks immediately preceding the date of participation in the ETCP, except a person operating an employment or temporary help agency where the employees are required to work for or under the supervision of another employer;

- an "eligible worker" is a Canadian citizen or permanent resident of working age who has been unemployed and registered with a Canada Employment Centre as actively seeking work for two weeks or more;

- an "eligible employment" is any employment created which meets the following conditions: (a) the job created is the result of the tax credit offered by the program - i.e., the employment is additional to the normal workforce of the employer; (b) the hours of work per week available to the eligible worker are normally not less than 35; (c) the job pays at least the appropriate minimum wage or

an hourly wage that exceeds the rate of the tax credit by \$0.25 per hour if the job is not subject to minimum wage legislation; (d) the employment lasts for a minimum of three consecutive months; and (e) the employment is not directly subsidized by any other government program;

- recovery of the tax credit is made by deducting it from the firm's federal income tax. If a firm is paying its taxes by installment, it may deduct, at the time of each payment, the amount of tax credit for which it has become eligible but which it has not yet claimed. If a firm's federal income tax is less than the total amount of the tax credit earned in the year, the firm may carry all or part of the tax credit forward, up to a maximum of five years. However, the tax credit is neither transferable nor refundable.

Employers were given detailed instructions on how to calculate the size of their "normal work force" - the standard against which they are to compare the number of their employees during each week of the ETCP agreement in order to determine their allowable tax credit for a given week. Briefly stated, two types of "normal work force" are identified - namely, a basically "non-fluctuating" work force, and a "fluctuating" work force (the latter refers to

work forces that have increased by over one-third during a 12-month period). All firms who normally employ less than 10 persons are, however, considered as having "non-fluctuating" work forces.

The original expectation that the ETCP might be able to create close to 50,000 jobs per year was not realized during its first year of operation. Only 16,711 jobs were approved under the program during the 1978/79 fiscal year. However, the program gained momentum, and in the 1979/80 fiscal year the initially "expected" target of 50,000 jobs annually was attained. Table 7-1 shows the number of hirings approved under the program, by quarter, from April 1978 to March 1980.

The bulk of these jobs were located in the two large provinces of Central Canada. Table 7-2 below gives the details of participation by province.

Looking at the distribution of ETCP hirings by industry (Table 7-3), the manufacturing industry was significantly over-represented in the program when compared to its share of total employment. While manufacturing accounts for approximately 20 per cent of total employment, its share of ETCP hirings was 52.5 per cent. Conversely, the service

industries, with only 36.4 per cent of the ETCP hirings, were under-represented when compared to their share of total employment.

Women were under-represented on the program by comparison to their share of the unemployed. Only about one-third of the ETCP employees were women, while their share of the unemployed was 45 per cent. More than half of all participants (54 per cent) were under 25 years of age, with 35 per cent being between the ages of 20 and 24.

Computerized administrative records were kept for each employee and employer participating in the program. Basically, data from the Agreement (EMP 2204) and the Notice of Hiring Form (EMP2280) were used to create a master file at the national headquarters. The base period adopted for the study covers approximately the first two years of the program, from April 1978 to December 1979. For the period April 1978 to March 1980, the population of the program totalled 65,573 employee participants. The program was terminated at the end of March 1981.

(B) Program Sample

A 10 per cent sample was drawn from the program population. This sample numbered 6,486 employee participants covering the same time period as the program population - March 1978 to December 1979. Additional information on this sample of ETCP participants and their pre- and post-ETCP employment and unemployment experience was obtained from the Longitudinal Labour Force Data Base (LFDB) of the Canada Employment and Immigration Commission (CEIC) covering the 1975-80 period.⁴ The file is based on four administrative data sources: a Record of Employment (ROE) file, T-4 supplementary files from Revenue Canada, the Status Vector file [a derivative of the Benefits and Overpayments file (BNOP)], and the Social Insurance Number Master File. When an individual terminates employment, he or she receives a Record of Employment (ROE) which must be presented to a Canada Employment Centre in order to be eligible for unemployment compensation benefits. This statement contains information on an individual's employment history with a particular firm. The Status-Vector file contains a rich amount of information on individuals who collected unemployment insurance (UI) benefits over the 1972-80 period. Owing to the almost universal nature of the UI program, one is able to generate unemployment histories of individuals over

time. Since UI payments are reported for income tax purposes, employment information can also be generated from data from the income tax system. From these and other sources, it is possible to piece together information on individual work histories over time, including employment and job termination history, and UI claim history. This data base contains information on the labour market experiences of 10 per cent of Canadian workers. The sample LFBD file contains information on 1.4 million workers. There are about 30 million records in the longitudinal file.

Table 7-1

ETCP Hirings Approved, by Quarter

<u>Quarter Ending in:</u>	<u>Number Starting Work</u>
June 1978	3,681
September 1978	3,338
December 1978	4,126
March 1979	8,766
June 1979	21,123
September 1979	11,876
December 1979	8,456
March 1980	9,331

Source: Canada Employment and Immigration Commission
(CEIC).

Table 7-2

Distribution of RTCP Jobs by Province, April 1978-March 1980

<u>Province</u>	<u>Number of Jobs</u>
Newfoundland	873
Nova Scotia	1,521
Prince Edward Island	463
New Brunswick	1,975
Quebec	25,429
Ontario	22,323
Manitoba	1,582
Alberta and North West Territories	2,119
Saskatchewan	987
British Columbia and Yukon	8,301
Canada	65,573

Source: CEIC.

Table 7-3

Distribution of ETCP Hirings by Industry

<u>Industry</u>	<u>Employment 1979 * Program Hirings</u>	
	<u>%</u>	<u>%</u>
Primary industries	7.3	3.4
Manufacturing	20.0	52.4
Construction	6.2	7.7
Transportation, communica- tions, other utilities	8.7	2.3
Trade	17.4	19.3
Finance, insurance, real estate	5.3	2.3
Community, business, and personal services	28.4	12.4
Public administration	6.8	--
Total	100.0	100.0

Source: CEIC.

CHAPTER 8

METHODOLOGY, PROCEDURES AND EMPIRICAL RESULTS OF ESTIMATING THE SOCIAL OPPORTUNITY COST OF A JOB (SOCL)

Direct job creation in the temporary sector can be justified on efficiency grounds if the social cost of creating a job is less than the social benefits generated by that job. In our model this will be the general case. The model then indicates that total output and welfare of the economy can be increased by subsidizing the use of labour in the temporary sector.

In the presence of taxes and UI benefits, the expression for the change in societal welfare resulting from job creation in the temporary sector has already been derived in Chapter 5 and is given by equation (5-11).

$$(8-1) \quad \left. \frac{dz}{dN_2} \right|_{\bar{L}} = f'_2 - \{h + (f'_1 - h - C) \frac{[f'_2(1-t_2) - b \cdot d(1-t_2) - h]}{\{h[f'_2(1-t_2) - b \cdot d(1-t_2) - h] - f''_1(1-t_1)L_2\}}\}$$

where f'_2 is the value of the output produced by the new job, and the social cost of achieving that output is defined as the social opportunity cost of a job (SOCL). The SOCL is a measure of the output that the workers could have produced

in some other job (in the context of our model, a skilled job) -- or, when not employed, the value that they would have placed on their leisure time. The expression for the SOCL in our model is given by:

$$(8-2) \quad \text{SOCL} \Big|_{f_1'' < 0} = h + (f_1' - h - C) \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{\{\pi[f_2'(1-t_2) - b \cdot d(1-t_2) - h] - f_1''(1-t_1)L_2\}}$$

Under the assumption of constant marginal product of labour in the permanent sector (i.e., $f_1'' = 0$), the expression for SOCL becomes:

$$(8-3) \quad \text{SOCL} \Big|_{f_1'' = 0} = h + (f_1' - h - C) \frac{1}{\pi}$$

Further, if the slope of the marginal product of labour curve in the permanent sector is assumed to be infinite (i.e., $f_1'' = \infty$), the SOCL is given by:

$$(8-4) \quad \text{SOCL} \Big|_{f_1'' = \infty} = h$$

The rest of this chapter is devoted to the estimation of (social opportunity cost of a job created under the Employment Tax Credit Program (ETCP) between April 1978 and December 1979. To measure the social opportunity cost, equations (8-1) to (8-4), we need to estimate a set of components. These components include:

- (i) the probability of finding alternative employment for ETCP workers (Π);
- (ii) the proportion of time an ETCP worker is expected to receive UI benefits when unemployed (d);
- (iii) the marginal value of leisure time when unemployed, in the presence of the cost of acquiring skills.
- (iv) wages in the skilled sector (W_1); the average tax rates in both sectors (t_1 and t_2); the cost of acquiring skills (C); the UI benefit rate (b); the size of the temporary sector (L_2); the number of temporary sector workers employed (N_2); and the slope of the labour demand curve in the permanent sector (f_1'). The estimation and determinants of these variables are covered in some detail in the rest of this chapter.

The chapter uses a linked longitudinal Labour Force Data Base (LFDB) that is composed from a number of administrative data files. The LFDB contains micro-historical data on the labour market experience of a 10 per cent sample of all "insured" workers.¹ A sample of 2,359 Employment Tax Credit Program (ETCP) participants who joined the program sometime during the approximately first two years (i.e., April 1978 to December 1979) and who had at least one episode of employment during the period from 1975 to the ETCP joining date, was drawn from the LFDB.² Using the administrative records of the Unemployment Insurance Commission (UIC) and the Records of Employment (ROE), a week-by-week labour force activity profile for each ETCP worker, showing the employment, unemployment, and out-of-the labour force status, is established. The weekly incidents are then converted into employment, unemployment, and out-of-the labour force spells.³ Based on this information, we are able to estimate the probability of finding alternative employment, and the proportion of unemployed time ETCP workers are expected to collect UI benefits.

A. Estimation of the Probability of Finding Employment

To estimate the probability that ETCP workers will find employment, we calculate the proportion of labour force time

ETCP workers were employed during the period from January 1975 to the ETCP joining date. Hence, for each ETCP participant in our sample, we construct an employment index as follows:

$$\Pi = (\text{Total number of weeks the participant was employed during the years from 1975 to the program joining date}) / (\text{Total number of weeks in the labour force during that period}).$$

This Π may be interpreted as the individual's employment rate or the probability of finding employment. Table 8-4 shows by selected characteristics the proportions of labour force time ETCP participants in our sample, were employed. For Canada as a whole, the employment experience of the participants is uniform by sex and age. As might be expected, the relatively high rates of unemployment in Newfoundland translate into a very low probability of employment (.477). In Alberta, on the other hand, the probability of employment was relatively high (.805).

The probability of finding employment (Π) is expected to depend on several variables describing the characteristics of the individuals and their jobs. In general functional form, the model is

$$(8-5) \Pi = f(\text{Sex}, \text{Age}, \text{Age}^2, \text{Urate}, \text{Occupation}, \text{Province}, \text{Industry})$$

where Sex is a dichotomous variable, equal to 1 for males and 0 for females. Age is the age of the ETCP participant at the beginning of 1975; Age² is the square of the participant's age; Urate is the average unemployment rate during the period under consideration; Occupation, Province and Industry are dummy variables which take the value of 1, if the Occupation/Province/Industry occurred most during the spells and 0 otherwise. The detailed variable mnemonics are given in Table 8-7.

Due to sex differentials in unemployment rates, we include the variable, Sex, in the estimations.⁴ As younger people are expected to be engaging in more job search, to have less saleable work experience, to have fewer financial responsibilities, and to have a lower opportunity cost of time, we would expect $(\partial \Pi / \partial \text{Age}) > 0$. There may be some non-linearity in Age, which may be captured by introducing Age². We would expect that increases in age beyond a given point would have a lesser impact on their employment behaviour. Older workers are also expected to be less attractive to new employers, if they lose their jobs. Hence, we would expect $(\partial \Pi / \partial \text{Age}^2) < 0$. Since a worsening of aggregate economic conditions would lower the probability of employment, we

would expect $\partial \Pi / \partial \text{Urate} < 0$. Casual empirical evidence suggests that an individual living in Newfoundland or New Brunswick would tend to have a relatively lower probability of employment than one living in Alberta. If it is true, we would expect a negative coefficient for the province dummies, as Alberta is the category missing in the estimations. Severe unemployment is observed in primary industries - namely, forestry, farming, and fishing - largely because of their seasonal pattern of activities. In general, we would expect a positive coefficient on the industry dummy variables, with primary industries (IND 9) as the category missing in the estimations.

The dependent variable in equation (8-5) is a fraction varying between 0 and 1. If equation (8-5) is written as a linear function, the population regression model is

$$(8-6) \quad Y_i = E(Y_i) + \epsilon_i = \Pi_i + \epsilon_i = X_i' \beta + \epsilon_i$$

where the probability Π_i in equation (8-5) is the expectation of Y conditional on the values of independent variables, the vector β contains the parameters to be estimated, and X_i represents the factors included in equation (8-5) influencing the probability of employment of individual i .

As Goldberger (1964) and others have noted, equation (8-6) does not constrain Π_i to lie between 0 and 1. It is also characterized by heteroscedastic residuals.

An alternative which constrains Π_i to lie between zero and one is to write equation (8-6) as a logistic function.⁵

$$(8-7) \quad \Pi_i = \frac{e^{X_i' \beta}}{1 + e^{X_i' \beta}}$$

Equation (8-7) can be written in the "log odds ratio" form:

$$(8-8) \quad \ln \left(\frac{\Pi_i}{1 - \Pi_i} \right) = X_i' \beta$$

Equation (8-8) implies that β can be interpreted as the derivative of the logarithm of the odds in favour of employment of individual i . This equation is used in the empirical analysis.

As Amemiya and Nold (1975) have pointed out, the standard logit model (equation 8-8) should be modified to include an equation error, which can be interpreted as a surrogate for omitted variables. An additional issue discussed in Berkson (1951, 1953) is that since frequencies are used in constructing the log odds ratio, the logit equation will have

heteroscedastic residuals. If these frequencies are based on independent samples from binomial populations, the estimator of the true log odds ratio will have an asymptotic variance which is approximately equal to ω_i , defined as $\omega_i = \sigma^2 + [N_i \pi_i (1 - \pi_i)]^{-1}$, where σ^2 is the variance of the equation error and N_i is the number of total weeks in the labour force.⁶ The variance σ^2 can be estimated consistently as

$$s^2 = \left(\frac{1}{T} \right) \{ \sum_i (p_i - X_i' b)^2 - \sum_i [1 / (N_i \pi_i (1 - \pi_i))] \}$$

where T is the number of observations ($i=1, \dots, T$), p_i is the log odds ratio, and b is a vector of logistic parameters estimated by ordinary least squares (OLS).

In an effort to obtain efficient parameter estimates and consistent standard errors, the logistic model was fitted by weighted least squares (WLS). The value of $(\omega)^{-1/2}$ used to multiply each variable prior to least squares estimation was calculated with N_i equal to the total number of weeks an individual spent in the labour force.⁷ The value of ω_i is given by

$$\omega_i = s^2 + \frac{1}{N_i \pi_i (1 - \pi_i)}$$

Alternatively, we can write

$$(8-9) \quad \omega_i = -\left(\frac{1}{T}\right) \left\{ \sum_i (p_i - X_i' b)^2 - \sum_i [1/(N_i \pi_i (1-\pi_i))] \right\} \\ + \frac{1}{N_i \pi_i (1-\pi_i)}$$

The WLS and OLS logit estimates of β are presented in Table 8-2:

The findings in Table 8-2 are for the most part as expected. The results imply that during the period 1975 until the ETCP joining date, male workers had a substantially and significantly higher probability of being employed than females. Among several explanations to support this evidence one possibility is to interpret this as representing discrimination in productive opportunities.⁸ The coefficients on Age and Age² are of the correct sign and significantly different from zero. The national unemployment rate is not surprisingly associated with a lower individual employment probability. Keeping in mind positive as well as negative deviations, it should come as no surprise that the national Urate depresses the individual employment probability. The eastern provinces (including Quebec) show a relatively lower individual employment rate than in Alberta. The industry variables are not statistically significant.

The overall explanatory power of the equation is good, as R^2 is equal to .41, and the F statistic is 67.55 (significant at the 99 per cent confidence level).⁹ These findings suggest, in general, that the socio-economic characteristics of the ETCP participants are important determinants of their employment (unemployment) behaviour. Finally, the OLS results in Table 8-2 are nearly identical to those obtained using WLS.

The estimated coefficients from the WLS regression and the mean values for the whole sample of the independent variables (other than provinces) can be plugged into the logistic function, given by equation (8-7) to provide estimates of the average probability of finding alternative employment, by province. In adjusting the mean probability of employment (Π) to changing aggregate economic conditions, we use the average national Urate for the year 1979. Table 8-3 presents the provincial estimates of the probability of finding alternative employment for ETCP workers in the year 1979.

The provincial estimates of the probability of finding alternative employment reveal major disparities, consistent with observed unemployment statistics. It is estimated that in Newfoundland, the ETCP workers, on average, would have

spent 51 per cent of their labour force time in alternative jobs had ETCP not intervened. In Alberta, on the other hand, participants would have spent an average of 74 per cent of the time in alternative employment in the absence of ETCP.

B. Estimation of the Proportion of Time a Person Expects to Receive UI Benefits While Being Unemployed (d)

To estimate the proportion of time an ETCP participant expects to receive unemployment insurance (UI) benefits while being unemployed (d), we calculate the proportion of time ETCP workers received UI benefits during the period from 1975 to the ETCP joining date. For each of 2,359 ETCP participants in our sample, we construct an UI index as follows:

$$d = (\text{Total number of weeks ETCP participant received UI benefits during the period from 1975 to the program joining date}) / (\text{Total number of weeks unemployed during that period}).$$

Table 8-4 shows the proportion of unemployed time ETCP workers with differing selected characteristics received UI benefits. The data suggest that ETCP workers received UI benefits, on average, for 88 per cent of their unemployed

time. The variation in this percentage by sex or age group is very small. Although the minimum entrance requirement for regular and special UI benefits is linked to regional unemployment rates,¹⁰ the proportion of unemployed time ETCP workers received UI benefits does not vary significantly among provinces. As might be expected, the value of d is highest for Newfoundland (.914) and lowest for Alberta (.785).

Several independent variables which describe the characteristics of the individuals, jobs, UI benefits and the labour market conditions are used to estimate d . The general functional form of the model used for estimation is:

$$(8-10) \quad d = f(\text{sex, age, age}^2, \text{Urate, WB, } \Pi, \text{Occupation, Province, Industry})$$

A relatively high weekly replacement ratio (WB), defined as the ratio of average weekly UI benefits to the average weekly wage, is expected to lower the individual's incentive to find another job quickly, thus it is expected that d would be higher. If Π can be treated as a measure of individual's employment experience and labour force attachment then it is expected that their search intensity would be higher and unemployment duration will be probably lower because they will be able to land a job quickly. It is

expected that the overall effect of higher Π would be to reduce d .

In Table 8-5 we report a statistical analysis of the influence of these factors using a logistic function

$$(8-11) \quad d_i = \frac{e^{X_i' \beta}}{1 + e^{X_i' \beta}}$$

Equation (8-11) can be expressed in the "log odds ratio" form:

$$(8-12) \quad \ln \left(\frac{d_i}{1-d_i} \right) = X_i' \beta$$

The coefficients for variables (sex, age, age² and the Urate) are of the expected sign and generally statistically significant. Age, the unemployment rate and the replacement ratio all have a positive influence on the proportion of unemployed time individuals expect to receive UI benefits. The significant negative coefficient on the sex variable indicates that, ceteris paribus, the proportion of unemployed time female ETCP participants receive UI benefits is higher than that for their male counterparts.¹¹ The Π variable has a significant negative coefficient. The coefficients for the eastern provinces (including Quebec) are positive and generally statistically significant. Note that Alberta is the missing category in the estimation. The

negative coefficient for the industry variables suggests that the proportion of unemployed time for which UI benefits are received is lower for all the industries compared with that for primary industries, comprising forestry, farming and fishing - the missing category in the estimations.

Table 8-6 presents the provincial estimates of the mean proportion of unemployed time ETCP participants expected to receive UI benefits for the year 1979. These are obtained by using the estimated coefficients from the WLS regression and the mean values of the independent variables (other than provinces) and the logistic function (equation 8-11). The results in Table 8-6 suggest that the proportion of unemployed time ETCP workers expect to receive UI benefits varies between 80 per cent (for Manitoba and Saskatchewan) and 87 per cent (for Newfoundland and New Brunswick).

C. Estimation of the Value of Non-Market or Leisure Time When Unemployed in the Presence of the Cost of Acquiring Skills

According to the CEIC Task Force Report (1981), the workers' incentive for accepting temporary employment is intensified by two factors. First, the existence of unemployment insurance benefits ensures that the workers' gross-of-tax earnings will not decrease proportionately as their time employed is shortened. Second, progressive

personal income taxes reduce the incentive for incremental employment. Thus, temporary sector employment offers a "package", the components of which are: the net of tax wages for the proportion of the time employed; the net of tax unemployment insurance benefits for the proportion of time unemployed; and the value of non-market or leisure time when unemployed. The weekly private supply price (PSP^t) of a worker in the temporary sector can be expressed as,

$$(8-13) \quad PSP^t = \pi \bar{w}_2(1-t_2) + (1-\pi)h + (1-\pi)b.d.(1-t_2)$$

where the notation has the same meaning as defined earlier in Chapter 5. It is assumed here that the workers in the temporary sector are generally unskilled or low-skilled.

In a competitive labour market where the wage rate is determined by equating demand and supply of labour, one might expect that the after-tax market wage is equal to the net of tax unemployment insurance (UI) benefits the worker receives when not working plus the value of leisure time. If so, the value of non-market or leisure time when unemployed can be determined from the following expression:

$$(8-14) \quad W(1-t_1) = b.d(1-t_1) + h$$

where W is a competitive weekly wage; t' is marginal personal income tax rate, and the remaining notation has the same meaning as in equation (8-13). This model presumes that individuals are indifferent between working and non-working activities and all unemployment is voluntary.

In the presence of a wage above the equilibrium full-employment level in the temporary sector, the net of tax wage rate per period for individuals will be greater than the net of tax UI benefits received plus the value of non-market or leisure time when unemployed. The workers would prefer to work more than they now can at the high wage, and some may be unemployed until after they have exhausted their UI benefits. At this high wage the total labour demanded will be less than the labour supplied. Thus, in such a non-competitive labour market the marginal value of a unit of individual's leisure time may be less than the difference between the after-tax wage rate while employed and the after-tax UI benefits while unemployed. Denoting the ratio of actual regulated wage rate to the competitive rate as α , we can express equation (8-14) as:

$$(8-15) \quad W(1-t') = \alpha \{b.d(1-t') + h\}$$

where α is equal to 1 when W is a competitive wage and is greater than 1 when the market wage rate is set above the

competitive rate. From equation (8-15), solving for h , gives:

$$(8-16) \quad h = \{(W/\alpha) - b.d\} (1-t')$$

This is precisely the procedure which Jenkins and Kuo (1978) follow to calculate the value of leisure time for individuals when unemployed. In their model, they set the value of α equal to $4/3$ assuming that the existing wage rates in the slow-growth region (Cape Breton Island) are one-third higher than the competitive wage rate. Their estimates suggest that the value of leisure time for workers in Cape Breton Island when unemployed is \$37.40 per week in 1976 dollars or approximately 26 per cent of pre-tax gross wages.

In Jenkins and Kuo's model, it is assumed that workers are homogeneous and there are no skill acquisition costs (i.e., $C=0$). We do not adopt the above methodology to calculate the value of non-market or leisure time when unemployed for ETCP participants in our sample because of the presence of positive skill acquiring costs. In our model, the workers in the temporary sector can acquire skills at their own cost and move to the permanent sector in response to wage (or utility) differentials. The weekly

private supply price of an individual in the permanent sector is given by the following expression:

$$(8-17) \quad PSP^D = W_1(1-t_1)$$

where, W_1 is the weekly competitive wage in the permanent sector, and t_1 is the average personal income tax rate. The long-run equilibrium condition of our model is defined as,

$$(8-18) \quad W_1(1-t_1) - C = \Pi \bar{W}_2(1-t_2) + (1-\Pi)b \cdot d(1-t_2) + (1-\Pi)h$$

where, C represents the privately borne cost of acquiring skills on a weekly basis and the rest of the symbols retain their meaning as defined earlier. We calculate the value of non-market or leisure time when unemployed for ETCP participants in our sample from equation (8-18). The expression for calculating h is given by

$$(8-19) \quad h = \frac{1}{1-\Pi} \{W_1(1-t_1) - C - [\Pi \bar{W}_2 + (1-\Pi)b \cdot d](1-t_2)\}$$

The calculation of this essentially involves:

- (i) estimating Π , which has already been estimated earlier in this chapter. The mean estimated values of Π for the ETCP workers in the year 1979 are reported in Table 8-3;

- (ii) estimating d -- already estimated earlier in this chapter. The mean values of d for ETCP workers in the year 1979 are reported in Table 8-6;
- (iii) determining the weekly wage rate in the temporary sector;
- (iv) determining the weekly cost of acquiring skills;
- (v) determining the weekly wage rate in the permanent sector;
- (vi) determining the values of tax parameters, t_1 and t_2 ;
- (vii) determining the weekly UI benefit rate (b).

The values of the parameters contained in items (iii) to (vii) above, are calculated, in turn, in the following manner.

The weekly wage earned in alternative jobs in the temporary sector ($\bar{W}_2$) is assumed to be the same as that given by the ETCP weekly wage. To the best of our knowledge, the latter wage was not significantly different from the former in the corresponding province. The ETCP weekly wage for the individuals in our sample is obtained from T-4 data on UI insurable earnings. As there is a "cut-off" point for UI premiums above which the premium rate

remains the same - a maximum of \$265 per week earnings in 1979¹² - data on wages below this maximum reflect actual wages, while those above understate the actual amount. The average ETCP weekly wage for the year 1979 by province is reported in Table 8-8. The 1979 ETCP weekly wage was higher for British Columbia (\$207.20) and Alberta (\$198.20) and lower for Manitoba (\$158.79) and Atlantic provinces (ranging from \$152.80 to \$160.78), except New Brunswick (\$171.03). The ETCP wage in Quebec and Ontario was slightly higher than that in Saskatchewan (\$173.95).

In equation (8-18), C represents the cost of acquiring skills (borne by workers). Broadly defined, C represents investment in the acquisition of skills or in the improvement of worker productivity and is reflected by a wage differential between skilled and unskilled labour. Unfortunately, data on skill acquisition costs are scarce in Canada. However, some scanty evidence exists on the cost of employer-based training. We make use of this information to assign a value to C in our model. To do so, we assume that workers buy training services from the firm. If a training employer sells his "product" (i.e., training services) he would presumably charge workers on the basis of his costing procedure after adding a markup for risk and profit.

According to Becker (1962), under competitive conditions, all of the firm's costs will be charged to the worker if the

training increases his future productivity in other firms just as much as in the firm in which he is training. Some fraction of costs will not be charged to the worker if the training contains elements of specificity, that is, if it increases the worker's future productivity in the training firm more than in other firms.

The cost of training consists of personnel costs and payment to personnel (all wage payments, bonuses, commissions), other personnel costs (UIC, pension, allowances), fees paid for external training, building costs and services, production costs, administrative costs, transportation expenses, and costs for materials and tools. We assume that all these direct and indirect costs of training are charged to the worker since he buys training services from the firm. Although various basic and often controversial issues are involved in calculating the cost of training, Currie, Coopers and Lybrand Ltd. (1978) have calculated the total net operating costs per apprentice machinist over four years in Ontario. Based on instructor wage costs, the net operating cost per trainee is \$31,356 over four years (see Table 8-9).

Schuyff (1980) has also estimated the cost of training an apprentice in various occupational categories in British

Columbia. These costs are shown in Table 8-10. The results show the total cost to be highest for an industrial instrumentation mechanic at around \$55,000 and lowest for a hotel cook at about \$6,300.

To calculate the value of C on a weekly basis, we first consider the Ontario Study for Machinists which shows \$31,356 as the cost of training over four years. To convert this figure to a weekly flow basis, it is assumed that the trainee borrows \$31,356 either from the capital market or from the employers (i.e., the sellers of training) and pays back the total amount of the loan over 15 years at a 10 per cent nominal rate of interest compounded annually. We assume 15 years to be a reasonable period for repaying the loan. With these assumptions, the worker would pay \$79.60 per week or \$4,139.20 per year for 15 years at a 10 per cent compounded annual rate of interest (r).¹³ Thus the value of C equals \$79.60 per week. Another way to look at the problem is that the trainee accepts a lower wage by an amount of \$79.60 per week for 15 years after he has acquired skills.

The British Columbia study estimated the cost of training an apprentice machinist to be \$33,421 over four years. Following the procedure described just above, the value of C

on a weekly flow basis comes to \$84.84 per week or \$4,411.68 per year.

In applying the value of C in our calculations, we assume that the weekly value of C , calculated on the basis of the Ontario study, is applicable to Ontario, Quebec, and the Atlantic provinces. Further, we assume that the weekly value of C , based in the British Columbia cost calculations, is applicable to British Columbia and the other western provinces.¹⁴

The variable W_1 in equation (8-18) denotes the competitive wage in the permanent sector. To assign a value to it, we look at the skilled wage for machinists in the non-unionized sector, by province, for the year 1979 (Table 8-11). This is because our estimate of C pertains to the cost of training for machinists.

One point which needs to be clarified at this stage is why we look at the skilled wage in the non-unionized sector and not in the unionized sector. The reason is that the probability of employment in the unionized skilled sector may not be equal to one. If union employees receive a higher wage than do non-unionized employees, one would expect average

variable costs to be higher (absent productivity differences between the two sets of workers). Therefore the unionized firm is more likely to shut down in a period of reduced demand than is the non-unionized firm, i.e., layoffs are more likely. Based on the United States experience Medoff (1979) has found that adjustment through layoffs is substantially greater in unionized firms than in comparable non-unionized firms.¹⁵

(vi) The vast majority of workers in the ETCP were under 24 years of age and 73 per cent had no dependents. Therefore, in estimating the average tax rate of these workers it is assumed that none had dependents. Given their wages and family situation, the average rate of income tax applicable to these workers in the temporary sector (t_2) is assumed to be approximately 12 per cent for the year 1979. The values of t_1 for the same period are assumed to be approximately 20 per cent on weekly wage rates less than \$300, and 25 per cent on weekly wage rates of \$300 and more.

(vii) Finally, the value of b , the weekly benefit rate, is assumed to be 60 per cent of claimants' average weekly insurable earnings (i.e., $b = .6\bar{W}_2$). Under the current UI program, the rate of weekly benefit payable equals 60 per

cent of claimants' average weekly insurable earnings during the last 20 weeks of their qualifying period. For claimants with fewer than 20 weeks insurable employment, the rate of benefit is 60 per cent of their average insurable earnings during all the weeks of insurable employment.¹⁶

When the values of all these variables/parameters are plugged into equation (8-19), we obtain the weekly values of non-market or leisure time (h) while unemployed for the ETCP workers for the year 1979. The values are shown in column (4) of Table 8-12. These results show that the weekly value of non-market or leisure time for ETCP workers while unemployed ranges between 4.52 and 39.46 per cent of pre-tax gross weekly wages. The value is lowest in the Atlantic provinces, except Nova Scotia, and highest in the western provinces. The values for Nova Scotia, Quebec and Ontario are little more than 30 per cent of pre-tax gross wages.¹⁷

These results are very interesting, though not unexpected findings. First, the marginal value of leisure is not independent of the amount of time a person spends working. The higher is the amount of unemployed time, ($1-\Pi$), the lower is the marginal value of leisure. That is, the marginal value of leisure is not independent of the amount of leisure a worker enjoys. Second, when the values of h

are plotted against the provincial unemployment rates (see Figure 8-1), a clear negative relationship emerges¹⁸ indicating that the marginal value of leisure is lowest in those provinces where unemployment is highest.¹⁹ In the literature on job creation, this is used as an important argument for taking jobs to the depressed regions (Sugden and Williams, 1978, pp. 99-112).

Notice that the estimates of the value of non-market time when unemployed (h) may be biased to the extent that the values of C we used in calculations are over- or under-represented.

D. Specification of Other Variables Required for the Estimation of SOCL

In order to estimate the social opportunity cost of an ETCP job in the year 1979, in accordance with equations (8-2) to (8-4), we still need information regarding the size of the temporary sector (L_2); total employment in the temporary sector (N_2); and the slope of the labour demand curve in the permanent sector (i.e., f_1).

To determine the size of the labour force in the temporary sector, we draw upon the work done by Glenday and Jenkins (June, 1981), a paper prepared for the CEIC Task Force (July, 1981). In their work, they set out two related rules to segment the Canadian labour force into temporary and permanent sectors.

They define as temporary sector A those workers who experience an unemployment spell of 4 weeks or more in duration at least once every 4 years. Temporary sector B is a broader classification. It includes all those workers who experience an unemployment spell of one week or more in duration at least once in every 4 years. Under these criteria temporary sector A workers will be a subset of temporary sector B. All these workers not in the temporary sector are classified as being part of the permanent sector of the Canadian labour force.

Using the UIC-ROE data set for 1972 to 1979, they classified members of the Canadian labour force according to these criteria and related the temporary sector to the actual size and composition of the Canadian labour force in 1979.

In Table 8-13 the proportion of the Canadian labour force and those of each region which can be classified as temporary sector are presented according to the two criteria. Under the more restrictive definition (type A), they find that 24 per cent of the Canadian labour force is of this type. Temporary sector B workers make up 36 per cent of the total Canadian labour force.

As between regions, they find that the size of the temporary sector A ranges from 16 per cent of the total labour force in Oshawa and Edmonton to a high of 46 per cent of the labour force in Newfoundland and Northeast New Brunswick. Likewise, the size of the temporary sector B ranges from 27 per cent of the labour force in Edmonton to 58 per cent of the labour force in Newfoundland. If a comparison is drawn between the relative sizes of the temporary sectors in the traditional slow growth regions and the normal labour market regions, then it is found that under both classifications the relative size of the temporary sector is about 15 percentage points higher on average in the former as compared with the latter regions, or approximately 70 per cent larger by criterion A and 40 per cent larger by B.

Based on the results presented in Table 8-13 we present in column (1) of Table 8-14 the proportion of all workers in the labour force who could be classified in the temporary sector. These numbers are based on temporary sector A criteria. If we were to adopt a broader definition of temporary sector (i.e., B criteria), the percentage would increase somewhat. Column (2) of this table shows the total Canadian labour force in 1979. Column (3) shows the temporary sector labour force under A criteria (L_2). Since we have already estimated the proportion of labour force time these individuals are employed (Π) by province (see Table 8-3), multiplying this factor with the temporary sector labour force (column (3)) yields the total number of employed workers in the temporary sector (N_2). The values are shown in column (5).

The next step is to estimate the value of f_1^* . This value is derived from the following expression:

$$(8-20) \quad \epsilon = \frac{dL_1}{dW_1} \cdot \frac{W_1}{L_1}$$

where ϵ is the long-run wage elasticity of employment or the elasticity of demand for labour in the permanent sector. From equation (8-20), we can derive the value of dW_1/dL_1 which is given by

$$(8-21) \quad f_1^* = \frac{dW_1}{dL_1} = \frac{W_1}{\epsilon L_1}$$

where W_1 is the wage rate and L_1 represents total employment in the permanent sector. To estimate ϵ , a labour demand equation is estimated which is identical to the one in the RDX model of the Bank of Canada. The data for the variables included in equation (8-22) below are utilized from the RDXF data bank maintained by the Bank of Canada.²⁰ The equation is estimated for the private non-farm sector of the Canadian economy, for the first quarter (Q1) of 1962 through the first quarter of 1979:

$$(8-22) \quad \log L = a_0 + a_1 \log L^* + a_2 \log L_{-1} + a_3 \log W_{4QMA} \\ + a_4 \log Q + e$$

where L = paid employees in industrial composite, millions of people;

L^* = desired level of paid employment in industrial composite, millions of people;

L_{-1} = paid employees in industrial composite lag one quarter;

W_{4QMA} = real four quarter moving average of
compensation per week, in dollars;

Q = gross private business product, in 1971
dollars (excluding agriculture and non-
commercial business);

e = random disturbance term.

Based on a priori expectations, the signs of the coefficients of the variables in equation (8-22) are expected to be: a_1, a_2 and $a_4 > 0$, $a_3 < 0$.

The estimated equation is as follows:

$$\begin{aligned} \log L = & -1.51575 + .129379 \log L^* + .546217 \log L_{-1} \\ & (8.81) \quad (3.89) \quad (11.74) \\ & -.16938 \log W_{4QMA} + .264034 \log Q \\ & (5.94) \quad (8.79) \end{aligned}$$

$$\begin{aligned} \bar{R}^2 &= 0.999 \quad \text{RMS (root mean square error)} = .0045 \\ \text{DW} &= 1.632 \end{aligned}$$

Figures in parentheses under the regression coefficients are t-values. The equation has an excellent fit and in general, all diagnostic statistics appear fairly promising. The regression coefficients have the expected signs and are statistically significant at the conventional acceptance levels.

The short-run (one-year) elasticity of labour demand with respect to change in wages, holding output (Q) and capital stock (r) constant is -.17. Although there is not much Canadian evidence on this issue, the estimated value is in broad conformity with the estimates derived from studies conducted in the U.S. In a short survey of the U.S. results, Hamermesh (1976) suggests that the likeliest short-run (one-year) employment-wage elasticity is -.15, holding output and price of capital constant. The average long-run wage elasticity of employment, calculated as $(a_3/1-a_2)$, is -.373.²¹

The f_1^* is calculated as,²²

$$(8-23) \quad f_1^* = - \frac{W_1}{.373 L_1}$$

Table 8-15 presents the estimates of f_1^* by province. The values range from .0002 (for Ontario) to .0059 (for Newfoundland).

E. Estimation of the Social Opportunity Cost of an ETCP Job (SOCL)

With the information specified in the previous sections, we are in a position to estimate the social opportunity cost of a job (equations (8-2) to (8-4)) created under the

Employment Tax Credit Program (ETCP). The results of the estimation of these equations are presented in Tables 8-16 and 8-17.

Table 8-16 shows the estimated weekly SOCL of an ETCP job under the assumption of diminishing marginal product of labour in the permanent sector of the economy (i.e., $f_1' < 0$, equation (8-2)). In equation (8-2), the SOCL contains two components. First, the value of leisure time of unemployed individuals in the temporary sector, and second, the value of the net output foregone in the skilled sector multiplied by the shift of labour that occurs per unit of job creation. The estimated value of these two components is shown in columns (1) and (2), respectively. The sum of these two components or the SOCL is shown in column (3). Column (4) shows the ETCP wage ($\bar{W}_2$). In this analysis, ETCP's real contribution to output is assumed to be equivalent to the wage received by ETCP participants.

We find that in 1979 the SOC of an ETCP job was lowest in Newfoundland (\$26.74 per week) and New Brunswick (\$41.43) followed by Nova Scotia (\$59.59), Manitoba (\$73.17), Quebec (\$77.28), Ontario (\$81.43) and Saskatchewan (\$79.12). In British Columbia this cost was \$88.46 per week. The cost was highest in Alberta (\$93.50 per week).

Two observations can be made from Table 8-16. First, under the assumption of diminishing marginal product of labour in the permanent sector, the value of net output forgone in the permanent sector due to the shift of labour that occurs per unit of job creation (column 2) varies between \$6.69 (for British Columbia) to \$33.85 per week (for New Brunswick). It appears that the value of non-market or leisure time (h) is the major determinant of the value of output foregone in the permanent sector since the value of h is lowest for New Brunswick and highest for British Columbia. Second, the social opportunity cost of an ETCP job (SOCL) is inversely related to the provincial unemployment rate (see Figure 8-2). In high unemployment provinces (Newfoundland, Nova Scotia, and New Brunswick) the social cost of creating an ETCP job is relatively lower and the cost is higher for the low unemployment provinces (Ontario, Saskatchewan, British Columbia, and Alberta).²³ Based on the evidence presented in Table 8-16, the main result is that the SOCL is less than the ETCP wage in each of the provinces.

Based on the empirical findings presented above, it is concluded that so long as $f_1' < 0$, direct job creation in the temporary sector is justifiable on efficiency grounds in all provinces.²⁴

The social opportunity cost of an ETCP job calculated under the assumption of constant marginal product of labour in the permanent sector ($f_1^w = 0$) is shown in Table 8-17. The SOCL is greater than the market wage in each province.²⁵ Hence no case can be made for direct job creation in the temporary sector on efficiency grounds.

If it is assumed that a vertical demand curve for labour exists in the permanent sector, that is $f_1^w = \infty$, the SOCL will be given by the value of leisure, as shown in column (1) of Table 8-16 or 8-17. Obviously, the societal gain would be at a maximum since the difference between the value of output produced, as given by column (4) in these tables, and the social cost of achieving that output, as given by column (1), is greatest.

Finally, in the general case where the subsidization of labour in the temporary sector is justified on efficiency grounds, it would be interesting to know whether the per worker employment incentive should be higher in high unemployment provinces than in low unemployment provinces. To determine the appropriate relative rates of subsidization of labour (implicit in the SOCL) in the provinces, it is necessary to compare the difference between SOCL and the ETCP wage between provinces. The results are presented in

Table 8-18 and Figure 8-3. These results do indicate a systematic positive relationship between the provincial unemployment rates and the difference between the ETCP wage and the SOCL, (ETCP Wage - SOCL).²⁶ This states that the per worker employment incentive should be higher in high unemployment provinces. The ETCP provided a tax credit of \$1.50, \$1.75 or \$2.00 an hour, depending on the unemployment rates in the geographic areas.

Table 8-1

Proportion of Labour Force Time Employed (Π) by Selected Characteristics, ETCP Participants: 1975 until program joining date

	Proportion of Labour Force Time Employed (Π)
Total	.669
<u>Sex</u>	
Male	.672
Female	.660
<u>Age^a</u>	
<19 years	.669
20-24 years	.667
25-44 years	.665
45-64 years	.646
<u>Province</u>	
Newfoundland	.477
Prince Edward Island	.588
Nova Scotia	.618
New Brunswick	.482
Quebec	.607
Ontario	.733
Manitoba	.801
Saskatchewan	.740
Alberta	.805
British Columbia	.727

a - age at the beginning of 1975.

Source: CEIC, Sample ETCP file linked with the LFDB, 1975-78/79.

Table 8-2

Determinants of the Probability of Finding Alternative Employment:
ETCP Participants, 1975 until the program joining date
Dependent Variable: $\ln (\pi/1-\pi)$

Coefficients of	Estimates OLS (t-Statistics)	Estimates WLS (t-Statistics)
Intercept	1.692 (9.00)	1.817 (8.96)
Sex	.301 (5.16)	.309 (5.22)
Age	.050 (4.11)	.043 (3.57)
Age ²	-.0006 (3.36)	-.0005 (2.89)
Urata ^a	-.214 (17.11)	-.216 (17.53)
<u>OCCUPATION^b</u>		
OCC 1	-.099 (0.57)	-.071 (0.42)
OCC 2	-.045 (0.36)	-.024 (0.20)
OCC 3	-.180 (1.22)	-.178 (1.24)
OCC 4	-.495 (3.66)	-.478 (3.61)
OCC 5	-.724 (5.31)	-.718 (5.45)
OCC 6	-.218 (1.53)	-.215 (1.56)
OCC 7	-.219 (1.92)	-.222 (2.06)
OCC 8	-.596 (5.60)	-.542 (5.05)
OCC 9	-.357 (2.16)	-.316 (1.97)
OCC 10	-.463 (3.17)	-.466 (3.86)
OCC 11	-.241 (0.61)	-.266 (0.69)

3

PROVINCES^b

NFLD	-.870 (4.26)	-.919 (4.57)
NS	-.380 (1.98)	-.423 (2.22)
NB	-.870 (5.85)	-.932 (6.26)
PEI	-.051 (1.74)	-.511 (1.78)
QUEBEC	-.348 (3.41)	-.422 (4.01)
ONT	.112 (1.08)	.050 (0.48)
MAN	.092 (0.53)	.046 (0.26)
SASK	.043 (0.22)	.012 (0.06)
BC	.180 (1.55)	.127 (1.07)

INDUSTRY^b

IND 1	-.006 (0.03)	.069 (0.31)
IND 2	.120 (1.23)	.077 (0.84)
IND 3	.006 (0.05)	-.054 (0.47)
IND 4	-.167 (0.88)	-.232 (1.33)
IND 5	.117 (1.10)	.045 (0.45)
IND 6	.243 (1.48)	.125 (0.81)
IND 7	.123 (1.12)	.036 (0.35)
IND 8	.119 (0.86)	-.036 (0.27)

R ²	.41	.41
F Ratio	67.55	50.14
No. of Observations	2317	2317
Mean of the Dependent Variable (unweighted)	1.136	1.136

a Denotes Average National Urate for the period under consideration.

b Denotes the occupation, industry, and province of the individual which occurred most during the spells.

Table 8-3

Mean Estimated Probability of Finding Alternative
Employment for ETCP Workers by Province: 1979

Province	Mean Estimated Probability of Finding Alternative Employment (mean Π)*
Newfoundland	.51
Nova Scotia	.52
New Brunswick	.63
Prince Edward Island	.58
Quebec	.64
Ontario	.71
Manitoba	.73
Saskatchewan	.75
British Columbia	.74
Alberta	.74

* Based on the estimated coefficients from the WLS regression reported in Table 2 and the mean values of independent variables for those individuals who joined the Employment Tax Credit Program (ETCP) in the year 1979.

Table 8-4

Proportion of Unemployed Time (d) ETCP Workers Received
Unemployment Insurance Benefits: 1975 until program
joining date

	Proportion of Unemployed Time ETCP Workers Received UI Benefits (d)
<hr/>	
Total	.876
<u>Sex</u>	
Male	.875
Female	.876
<u>Age^a</u>	
<19 years	.866
20-24 years	.874
25-44 years	.882
45-64 years	.897
<u>Province</u>	
Newfoundland	.914
Prince Edward Island	.899
Nova Scotia	.884
New Brunswick	.907
Quebec	.886
Ontario	.849
Manitoba	.789
Saskatchewan	.817
Alberta	.785
British Columbia	.869

a - age at the beginning of 1975

Source CEIC, Sample ETCP file linked with the LFDB, 1975-78/79.

Table 8-5

Determinants of the Proportion of Unemployed Time ETCF Participants Received Unemployment Insurance Benefits (d), 1975 Until the Program Joining Date
Dependant Variable: $\ln(d/1-d)$

Coefficients of	Estimates	Estimates
	OLS (t-Statistics)	WLS (t-Statistics)
Intercept	-.167 (1.20)	-.123 (0.81)
Sex	-.095 (2.26)	-.129 (2.87)
Age	.018 (2.12)	.020 (2.28)
Age ²	-.0002 (1.35)	-.0002 (1.31)
Urate ^a	.184 (13.95)	.167 (12.63)
WB	.0009 (1.06)	.0001 (0.12)
Π	-.002 (2.83)	-.002 (2.60)
<u>OCCUPATION^b</u>		
OCC 1	-.005 (0.04)	-.068 (0.57)
OCC 2	.174 (2.02)	.108 (1.28)
OCC 3	.183 (1.79)	.130 (1.31)
OCC 4	.123 (1.31)	.073 (0.82)
OCC 5	.356 (3.79)	.307 (3.44)
OCC 6	.167 (1.67)	.114 (1.19)
OCC 7	.046 (0.60)	-.002 (0.03)
OCC 8	.237 (3.08)	.188 (2.56)
OCC 9	.173 (1.49)	.100 (0.91)
OCC 10	.237 (2.74)	.150 (1.84)
OCC 11	-.303 (1.12)	-.378 (1.42)

PROVINCES^b

NFLD	.558 (4.04)	.590 (4.13)
NS	.363 (2.77)	.377 (2.77)
NB	.492 (4.92)	.483 (4.46)
PEI	.032 (0.16)	.197 (0.98)
QUEBEC	.324 (4.71)	.375 (4.59)
ONT	.016 (0.23)	.049 (0.60)
MAN	-.186 (1.58)	-.222 (1.65)
SASK	-.194 (1.43)	-.158 (1.05)
BC	-.002 (0.03)	.023 (0.25)

INDUSTRY^b

IND 1	-.013 (0.08)	-.057 (0.36)
IND 2	-.152 (2.45)	-.188 (2.87)
IND 3	-.149 (1.90)	-.197 (2.46)
IND 4	-.042 (0.36)	-.067 (0.56)
IND 5	-.151 (2.24)	-.184 (2.56)
IND 6	-.024 (0.23)	-.023 (0.21)
IND 7	-.084 (1.20)	-.109 (1.47)
IND 8	-.062 (0.70)	-.075 (0.79)

R ²	.49	.40
F Ratio	65.63	44.69
No. of Observations	2287	2287
Mean of the Dependent Variable (unweighted)	1.155	1.155

a Denotes Average National Urate for the period under consideration.

b Denotes the occupation, industry, and province of the individual which occurred most during the spells.

Table 8-6

Mean Estimated Proportion of Unemployed Time ETCP Workers
Expect to Receive UI Benefits (d) by Province: 1979

Province	Mean Estimated Proportion of Unemployed Time ETCP Workers Expect to Receive UI benefits (d)*
Newfoundland	.87
Nova Scotia	.86
New Brunswick	.87
Prince Edward Island	.82
Quebec	.85
Ontario	.81
Manitoba	.80
Saskatchewan	.80
British Columbia	.81
Alberta	.81

* Based on the estimated coefficients from the WLS regression reported in Table 5 and the mean values of independent variables for those individuals who joined the Employment Tax Credit Program (ETCP) in the year 1979.

Table 8-7

Guide to Variable Mnemonics

- Sex : If male equals one, 0 otherwise
- Age : Age of an individual in years at the beginning of 1975
- PEMP : Proportion of labour force time spent in employment, 1975 till the beginning of the estimation period
- Urate : National Unemployment rate
- ETCP : ETCP participant=1, Otherwise 0 (control group)
- ETCP WKS : Number of weeks spent in the ETCP
- APE : Change in the probability of employment between ETCP participants and control group: one year before the ETCP and one year after
- EWKS_t : Total weeks of employment per completed spell (at time t)
- EWKS_{t-1} : Total weeks of employment in the previous spell (at time t-1)
- W_t : Average weekly wage at time t (in the current employment spell)
- W_{t-1} : Average weekly wages at time t-1 (in the previous employment spell)
- WB : Replacement ratio (average weekly UI benefits/average weekly wage)
- Π : Proportion of labour force time employed

Occupation

- OCC1 : Managerial and Professional = 1, otherwise 0
- OCC2 : Clerical and Related = 1, otherwise 0
- OCC3 : Sales = 1, otherwise 0
- OCC4 : Services = 1, otherwise 0
- OCC5 : Processing = 1, otherwise 0
- OCC6 : Machining and related = 1, otherwise 0
- OCC7 : Product fabricating, assembling, repairs = 1, otherwise 0
- OCC8 : Construction Trades = 1, otherwise 0
- OCC9 : Transport Equipment operating = 1, otherwise 0
- OCC10 : Material-handling & related (nec) = 1, otherwise 0
- OCC11 : Other crafts and equipment operating occupations = 1, otherwise 0
- OCC12 : Primary Occupations - missing category in regressions (Includes farmers and farm workers; fishermen, trappers and hunters; loggers and related workers; miners, quarrymen and related)

Table 8-7 (cont'd)

Provinces

NFLD : Newfoundland = 1, otherwise 0
PEI : Prince Edward Island = 1, otherwise 0
NS : Nova Scotia = 1, otherwise 0
NB : New Brunswick = 1, otherwise 0
QUE : Quebec = 1, otherwise 0
ONT : Ontario = 1, otherwise 0
MAN : Manitoba = 1, otherwise 0
SASK : Saskatchewan = 1, otherwise 0
BC : British Columbia = 1, otherwise 0 (includes Yukon)
Missing category in regressions - Alberta (includes
North-West Territory)

Industry

IND1 : Mines, quarries and oil wells = 1, otherwise 0
IND2 : Manufacturing = 1, otherwise 0
IND3 : Construction = 1, otherwise 0
IND4 : Transportation, communication and other utilities = 1,
otherwise 0
IND5 : Trade (retail and wholesale) = 1, otherwise 0
IND6 : Finance, Insurance and Real Estate = 1, otherwise 0
IND7 : Community, Business and Personal Services = 1,
otherwise 0
IND8 : Public Administration = 1, otherwise 0
IND9 : Primary Industries (farming, forestry and fishing) --
missing category in regressions

Table 8-8

The Mean ETCP Weekly Wage by Province ($\bar{W}_2$): 1979

Province	Average ETCP Weekly Wage (1979\$)
Newfoundland	152.80
Nova Scotia	158.47
New Brunswick	171.03
Prince Edward Island	160.78
Quebec	182.41
Ontario	176.57
Manitoba	158.79
Saskatchewan	173.95
British Columbia	207.22
Alberta	198.20

Source CEIC, Sample ETCP file linked with the LFDB,
1975-78/79.

Table 8-9

Total Net Operating Costs per Apprentice Over Four
Years Based on Instructor Wages Costs

	Incorporating Instructor Wage Costs-
Trainee Wages	55,859
Instructor Wages	14,115
Gross Direct Costs	69,974
Less: \$ Apprentice Productivity	55,076
Direct Wage Costs	14,898
Net Operating Costs*	31,356

* The direct wage costs, less subsidies, plus overhead, equal the net operating costs. Overhead consists of 18 separate items. The net operating costs per apprentice per period were calculated for each company. When these are averaged, with weighting according to strata, the overall Net Operating Costs are obtained.

Source Currie, Coopers and Lybrand Ltd. (1978).

Table 8-10

Estimated Cost Range of Training an Apprentice in Selected Trades (four-year total) in British Columbia

Trades	Total Cost
Plumber (construction)	25,126
Plumber (long-term maintenance)	31,097
Machinist (metal)	33,421
Cook (B.C. Hotels)	6,301
Horticulturalist (landscapers)	22,290
Horticulturalist (BCBC)	24,971
Graphic Arts (engraver-newspaper)	38,074
Partsman	19,217
Industrial Instrumentation Mechanic (metal)	54,948

Source Schuyff (1980).

Table 8-11

Skilled Hourly Wage for Machinists in the Non-Unionized Sector by Province, 1979

Province	Wage Rate (\$ hr)	Weekly Wages (\$)
Newfoundland	6.26	235.37
Nova Scotia	6.97	266.95
New Brunswick	6.42	249.10
Prince Edward Island	—*	—*
Quebec	7.45	289.80
Ontario	7.96	303.62
Manitoba	7.41	276.39
Saskatchewan	7.92	293.04
British Columbia	9.70	352.11
Alberta	9.55	341.10

* Data for Prince Edward Island is not available from Labour Canada.

Source Based on "Wage Rates, Salaries and Hours of Labour", October 1979, Labour Canada.

Table 8-12

The Weekly Value of Leisure Time When Unemployed
for ETCP Workers: 1979

Province	(1-n)	$W_1(1-t_1)-C$ (1979 \$)	$(\overline{W}_2 + (1-n)b.d)(1-t_2)$ (1979 \$)	Value of h per week** (1979 \$)	Value of h as a per- centage of ETCP pre-tax gross wage (% of $\overline{W}_2$)
	col. (1)	col. (2)	col. (3)	col. (4)	col. (5)
Newfoundland	.49	108.70	102.97	11.69	7.65
Nova Scotia	.37	133.96	114.48	52.65	33.23
New Brunswick	.48	119.68	115.97	7.73	4.52
Prince Edward Island	.42	—*	111.30	—	—
Quebec	.36	152.24	132.20	55.67	30.52
Ontario	.29	148.12	132.22	54.83	31.05
Manitoba	.27	136.27	120.11	59.85	37.70
Saskatchewan	.25	149.59	133.18	65.64	37.73
British Columbia	.26	179.24	157.98	81.77	39.46
Alberta	.26	170.99	151.11	76.46	38.58

* Data for W_1 is not available for Prince Edward Island.

** Calculations based on equation (8-19) of this chapter.

Figure 8-1

WEEKLY VALUE OF LEISURE TIME WHILE BEING UNEMPLOYED
AND
UNEMPLOYMENT RATES BY PROVINCE
FOR ETCP MEMBERS, 1979

Table 8-13

Relative Importance of Temporary Workers
in Regional Unemployment (Based on 1979)

Regions	Temporary Worker Classification	Proportion of all Workers in Labour Force
	A	.24
CANADA	B	.36
	A	.46
NEWFOUNDLAND	B	.58
	A	.36
CAPE BRETON	B	.47
	A	.19
HALIFAX	B	.30
	A	.46
N.E. NEW BRUNS	B	.57
	A	.30
SHERBROOKE	B	.44
	A	.23
SHAWINIGAN	B	.38
	A	.19
MONTREAL	B	.29
	A	.35
SEPT-ILES	B	.45
	A	.17
TORONTO	B	.29
	A	.26
WINDSOR	B	.42
	A	.16
OSHAWA	B	.28
	A	.26
KINGSTON	B	.38
	A	.28
TIMMINS	B	.43
WINNIPEG &	A	.17
N. MAN.	B	.31
SASKATOON &	A	.18
N. SASK	B	.28
	A	.16
EDMONTON	B	.27
	A	.17
CALGARY	B	.29
	A	.32
VANCOUVER	B	.47
	A	.32
DAWSON CREEK	B	.46

Source Glenday and Jenkins (June, 1981).

Table 8-14

Size of Temporary Sector Labour Force by Province, 1979

Province	Proportion of Labour Force in the Temporary Sector col. 1	Total Labour Force (1979) col. 2	Total Temporary Sector Labour Force (L ₂), 1979 col. 3	Proportion of Time Employed in the Temporary Sector (n) col. 4	Employed Temp- orary Sector Labour Force (N ₂) col. 5
		(,000)	(,000)		(,000)
Newfoundland	.46	207	101.43	.51	51.73
Nova Scotia	.33	352	116.16	.52	73.18
New Brunswick	.35	280	98.00	.63	50.96
Prince Edward Island	.35	53	18.55	.58	10.76
Quebec	.26	2,878	748.28	.64	478.90
Ontario	.22	4,289	943.58	.71	669.94
Manitoba	.17	478	81.26	.73	59.32
Saskatchewan	.18	433	77.94	.75	58.46
British Columbia	.32	1,223	391.36	.74	289.61
Alberta	.17	1,015	172.55	.74	127.69

Source Economic Review, Department of Finance, April 1982 and our estimates.

Table 8-15

The Values of the Slope of the Labour Demand Curve in the Permanent Sector (f_1'') by Province

Province	f_1''
Newfoundland	-.0059
Nova Scotia	-.003
New Brunswick	-.0036
Prince Edward Island	-
Quebec	-.0003
Ontario	-.0002
Manitoba	-.0018
Saskatchewan	-.0022
British Columbia	-.0011
Alberta	-.001

* These values are based on the long run elasticity of demand for labour which is estimated to be -.373.

Table 8-16

Social Opportunity Cost of Creating an ETCP Job, 1979
(dollars per week) (Estimates according to equation (8-2), $f_1 < 0$)

Province	$h(\$)$ col. 1	$(f' - h - C)$ col. 2 (\$)	$\frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{[h(f_2'(1-t_2) - b \cdot d(1-t_2) - h) - f_1'(1-t_1)L_2]}$ col. 3	ETCP Wage (W_2) (\$) col. 4
Newfoundland	11.69	15.05	26.74	152.80
Nova Scotia	52.65	6.94	59.59	158.47
New Brunswick	7.58	33.85	41.43	171.03
Prince Edward Island	—	—	—	160.78
Quebec	55.67	21.61	77.28	182.41
Ontario	54.79	26.64	81.43	176.57
Manitoba	59.85	13.32	73.17	158.79
Saskatchewan	65.34	13.48	79.12	173.95
British Columbia	81.77	6.69	88.46	207.22
Alberta	76.46	17.04	93.50	198.20

* Data for W_1 or f_1' is not available for Prince Edward Island.

Figure 8-2

SOCIAL OPPORTUNITY COST OF AN ETCP JOB
(ASSUMING $f_1'' < 0$)
AND PROVINCIAL UNEMPLOYMENT RATE, 1979

Table 8-17

Social Opportunity Cost of Creating an ETCP Job, 1979
(dollars per week) (Estimates according to equation (8-3), $f_1^* = 0$)

Province	$h(\$)$	$(f_1^* - h - C) \cdot \frac{1}{\pi}$	SOCL (\$)	ETCP Wage ($\bar{W}_2$) (\$)
	col. 1	col. 2	col. 3	col. 4
Newfoundland	11.69	282.51	294.20	152.80
Nova Scotia	52.65	213.81	266.46	158.47
New Brunswick	7.58	311.38	318.96	171.03
Prince Edward Island	—*	—	—	160.78
Quebec	55.67	241.45	297.24	182.41
Ontario	54.79	238.35	293.14	176.57
Manitoba	59.85	180.41	240.26	158.79
Saskatchewan	65.64	190.08	255.72	173.95
British Columbia	81.77	251.08	332.46	207.22
Alberta	76.46	242.97	319.43	198.20

* Data for W_1 or f_1^* is not available for Prince Edward Island.

Table 8-18

Comparison of ETCP Wage and SOCL: ETCP Participants, 1979
(dollars per week)

Province	Provincial Unemployment Rate (%)	(ETCP Wage-SOCL) (assuming f ₁ < 0) (\$)
Newfoundland	15.4	126.06
Nova Scotia	10.2	98.88
New Brunswick	11.1	129.60
Prince Edward Island	11.3	—
Quebec	9.6	105.13
Ontario	6.5	95.14
Manitoba	5.4	85.62
Saskatchewan	4.2	94.83
British Columbia	7.7	118.76
Alberta	3.9	104.70

Figure 8-3
NET BENEFIT (ETCP WAGE-SOCL) PER ETCP JOB
(ASSUMING $f_1'' < 0$)
AND PROVINCIAL UNEMPLOYMENT RATE, 1979

(ETCP Wage - SOCL)
per week

UNEMPLOYMENT RATE (PROVINCIAL)

CHAPTER 9

METHODOLOGY, PROCEDURES AND EMPIRICAL RESULTS OF
ESTIMATING THE NET EMPLOYMENT EFFECT OF THE PROGRAM

As a general proposition the reduction in employment in the permanent sector resulting from direct job creation in the temporary sector means that the total employment in the economy may increase, remain constant, or decrease. In our model, direct job creation program in the temporary sector induces an additional unskilled worker to be hired, but simultaneously reduces employment by some amount in the permanent sector of the economy. The model predicts that the size of the permanent sector will shrink as a result of job creation in the temporary sector. The size of this effect is an empirical question.

These offsetting impacts can be referred to as displacements. In each case the effect is to create a gap between the total number of workers hired through the program and the net increment to employment in the economy. This gap expressed as a ratio of the gross number of workers hired or subsidized is referred to as the displacement effect. The net employment impact of the policy is the total employment in the economy with the program less the total employment without the program.

The chapter is devoted to the estimation of net incremental employment created by the Employment Tax Credit Program (ETCP) during the period April 1978 to December 1979. Table 9-1 shows the total number of jobs created under the ETCP by province. The bulk of these jobs (about 73 per cent) was created in the provinces of Quebec and Ontario. The participation of the Atlantic provinces in the ETCP was relatively low. Our focus in this chapter is to estimate (i) the long-run net employment effect due to the ETCP, and (ii) the dynamic labour market response due to job creation by tracing out the direct and indirect effects over time.

A. Estimation of Long-Run Employment Effect of the ETCP

The expression for the change in total employment (dE) as a result of job creation in the temporary sector has already been derived in Chapter 6 and is given by equation (6-2).

$$(9-1) \quad dE = (1 + dL_1/dN_2) dN_2$$

where dL_1/dN_2 = the change in employment in the permanent sector per unit of job creation in the temporary sector;

dN_2 = total new jobs created in the temporary sector.

In the presence of taxes and UI benefits, the expression indicating the long-run value of dL_1/dN_2 in the general case is given by:

$$(9-2) \quad \left. \frac{dL_1}{dN_2} \right|_{f_1'' < 0} = - \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{\Pi [f_2'(1-t_2) - b \cdot d(1-t_2) - h] - f_1''(1-t_1)L_1}$$

where f_1'' represents the slope of the labour demand curve in the permanent sector.

Under the assumption of constant marginal product of labour in the permanent sector (i.e., $f_1''=0$), the expression for dL_1/dN_2 becomes:

$$(9-3) \quad \left. \frac{dL_1}{dN_2} \right|_{f_1''=0} = - \frac{[f_2'(1-t_2) - b \cdot d(1-t_2) - h]}{\Pi [f_2'(1-t_2) - b \cdot d(1-t_2) - h]} = - \frac{1}{\Pi}$$

If it is assumed that the permanent sector has a vertical demand curve for labour, that is the equilibrium value of dL_1/dN_2 will equal zero.

To estimate the long-run employment effect of the ETCP, we need to estimate dL_1/dN_2 given by equations (9-2) and (9-3). The calculation of this essentially involves: wages in the

temporary sector ($\bar{W}_2 = f_2'$); the average tax rate in both sectors (t_1 and t_2); the unemployment insurance benefit rate (b); the size of the temporary sector (L_2); total employment in the temporary sector (N_2); the slope of the demand curve for labour in the permanent sector (f_1''); the probability of finding alternative employment for ETCP workers (Π); and the proportion of time an ETCP worker is expected to receive UI benefits when unemployed (d). The estimation procedure and determinants of these variables/parameters are covered in some detail in Chapter 8. In this section, we simply intend to use those values to estimate dL_1/dN_2 (equations (9-2) and (9-3)). The results of the estimation of these equations are presented in Table 9-2.

Column 1 in Table 9-2 shows the estimated values of dL_1/dN_2 under the assumption of a diminishing marginal product of labour in the permanent sector of the economy (i.e., $f_1'' < 0$, equation 9-2). As a consequence of job creation in the temporary sector the unskilled workers stay in that sector as long as the total returns in that sector are greater than the returns, net of skill acquisition costs, in the permanent sector. Column 1 shows, in equilibrium, the number of unskilled workers who do not move to the permanent sector for each job created in the temporary

sector. These values are relatively small but the variation between provinces is noticeable as the values range from .0361 (for British Columbia) to .1726 (for New Brunswick).

Column 2 of Table 9-2 shows the values of dL_1/dN_2 under the assumption of constant marginal product of labour in the permanent sector ($f_1''=0$). As a result of job creation in the temporary sector the unskilled workers stay in that sector as long as the expected proportion of time spent in working is greater than Π . Therefore, in equilibrium, the number of unskilled workers who stay in the temporary sector for each job created will be equal to $1/\Pi$. The job loss in the permanent sector is greater than one for every job created in the temporary sector. The job loss in the permanent sector per unit of job creation in the temporary sector is maximum in the high-unemployment provinces, ranging from 1.59 in New Brunswick to 1.96 in Newfoundland. The values for the low-unemployment provinces (Ontario and the West) are in the range of 1.30 to 1.40. The value for Quebec is 1.56. The implication of this finding is that if the provinces have a perfectly elastic demand curve for labour in the permanent sector, then job creation in the temporary sector will lead to a significant reduction in skilled labour supply some time in the future.

Now let us estimate the long-run net employment effect of the ETCP. In doing so, we make two assumptions. First, all the jobs created by the ETCP (dN_2) are incremental i.e., no jobs are subsidized that would already be produced without the subsidy. This assumption is made to rule out any displacement that may occur in the temporary sector. In the literature, it is generally assumed that some sort of displacement occurs within the sector in which jobs are created. For example, some firms may reduce their regular employment to take advantage of the subsidy. In our model, it is assumed that displacement occurs in the other sector of the region and no displacement within the sector in which the jobs are created. Second, it is assumed that some of the new jobs created by the program may be filled directly by unemployed workers. But even where these jobs are filled by workers who were previously employed, it is assumed that unemployment is reduced eventually by the number of jobs that have been created by the program. Thus, it is argued that as formerly employed workers fill these newly created jobs in the temporary sector, their previous employers will fill the vacated positions and a chain of vacancies is accordingly created in the labour market which ultimately must be filled from the ranks of the unemployed. This argument that all of the labour employed in these newly created jobs should be treated as reducing unemployment by

an equal amount is often referred to as the "chain-reaction" or "trickle-down" principle.¹

When the values of dL_1/dN_2 are plugged into equation (9-1), we find the long-run net employment effect of the ETCP. This is shown in Tables 9-3 and 9-4.

Table 9-3 shows the long-run net employment effect of the ETCP by province under the assumption of diminishing marginal product of labour in the permanent sector of the economy. Column 1 shows the total number of new jobs created under the ETCP (dN_2) during the period April, 1978 to March, 1980. Column 2 shows total job loss in the permanent sector as a result of job creation in the temporary sector ($(dL_1/dN_2) \cdot dN_2$). Column 3 shows the long-run net employment effect as a percentage of total new jobs created. Column 4 shows the displacement effect defined as the gap between the total number of new jobs created under the ETCP and the loss in employment in the permanent sector, and this gap is expressed as a proportion of the gross number of new jobs created. Assuming that all the jobs created under the ETCP were incremental, the long-run net employment effect of the ETCP varies between 82.74 (for New Brunswick) and 96.39 per cent (for British Columbia). Consequently, the displacement effect is very small ranging from 3.61 per cent for British Columbia to 17.27 per cent for New Brunswick.

Under the assumption of constant marginal product of labour in the permanent sector of the economy, the long-run net employment effect of the ETCP is negative (Table 9-4). That is, job creation in the temporary sector reduces the total employment in the economy in the long run. The negative effect is greatest in the high-unemployment provinces and lowest in the low-unemployment provinces. Obviously, the displacement effect is much bigger than 100 per cent. These findings suggest that $dE < 0$. This finding is consistent with that suggested by our theoretical framework.

Finally, under the assumption of a vertical demand curve for labour in the permanent sector of the economy (i.e., $f_1' = \infty$), the long-run net employment effect due to ETCP is 100 per cent since there is no displacement effect associated with the job creation (i.e., $dL_1/dN_2 = 0$). This case would suggest that $dE = dN_2$.

B. Estimation of Long-Run Elasticity of Demand for Labour (ϵ) in the Permanent Sector that will constrain $dL_1/dN_2 = -1$ and $dE = 0$

In Chapter 6, we explored the conditions under which the long-run net employment effect resulting from job creation in the temporary sector will be zero. It was shown that if

the expression for the elasticity of demand for labour with respect to the real wage in the permanent sector (ϵ) is given by equation (6-8), then $dL_1/dN_2 = -1$ and $dE=0$.

$$(9-4) \quad \epsilon \left| \begin{array}{l} = \frac{L_2}{L_1} \cdot \frac{W_1}{(1-\pi)(\bar{W}_2-h)} \\ dE=0 \end{array} \right.$$

Table 9-5 shows the estimates of the crucial value of the elasticity of demand for labour with respect to the real wage in the permanent sector. The results suggest that in all provinces the demand for labour curve in the permanent sector must be sufficiently elastic to generate the results $dL_1/dN_2 = -1$ and the long-run net employment effect of the program to be 0 ($dE=0$). The crucial values of ϵ range from -2.1191 (for Manitoba) to -5.0801 (for British Columbia).

C. Estimation of the Employment Effect of the ETCP: Short-Run Analysis and Dynamics Over Time

In the preceding discussion of the estimation of long-run employment effects of the ETCP, we have ignored the transition process between long-run equilibria. That is, we were not interested in the question of how long the adjustment process will take. The theoretical analysis of the short-run equilibrium has been discussed in detail in Chapter 4. In this section we wish to apply the data from the ETCP to the short-run model to provide an example of how this model

can be used to estimate the level of employment in the temporary sector, and the size of the skilled labour force for each period, and how long it takes to obtain the new long-run equilibrium, that is, when the workers move from the temporary to the permanent sector.

Consider, for example, the Quebec region where it is assumed that the situation before job creation by the ETCP represents initial long-run equilibrium. In this situation, the total labour force ($\bar{L}$) of the region is 2,878,000 which is composed of 2,129,720 skilled workers (L_1) and 748,280 unskilled workers (L_2). The situation is represented in the first column of Table 9-6. The probability of employment in the temporary sector (Π) is equal to .64, which is calculated as (N_2/L_2). Note that Π has been estimated econometrically in Chapter 8. Table 8-3 in that chapter shows the mean estimated probability of employment by province. Since Π is assumed to be identical for all the members of the temporary sector, this also represents the employment rate of the unskilled labour force.

The weekly private supply price of a worker in the temporary sector is expressed as,

$$(9-5) \quad E(U_2) = \Pi \bar{W}_2 (1-t_2) + (1-\Pi)h + (1-\Pi)b \cdot d(1-t_2)$$

The initial values of the various variables/parameters contained in equation (9-5) have already been estimated in Chapter 8. For the Quebec region, these initial values are:

$$\begin{aligned}\pi &= .64 \\ \bar{w}_2 &= \$182.41 \text{ per week} \\ t_2 &= 12 \text{ per cent} \\ h &= \$55.67 \text{ per week} \\ b &= .6\bar{w}_2 \\ d &= .85\end{aligned}$$

When these values are inserted into equation (9-5), the expected utility $E(U_2) = \$152.24$ per week.

The weekly private supply price of an individual in the permanent sector, is given by the expression,

$$(9-6) \quad U_1 = \bar{w}_1 (1 - t_1)$$

where, for Quebec region,

$$\begin{aligned}\bar{w}_1 &= \$289.80 \text{ per week} \\ t_1 &= 20 \text{ per cent}\end{aligned}$$

Thus $U_1 = \$231.84$.

The first column of row 12 in Table 9-6 shows the difference between $U_1 - E(U_2)$ which equals \$79.60. This difference is exactly equal to the cost of acquiring skills (C) which is estimated to be \$79.60. Therefore, in this initial situation there is no movement of workers from temporary to the permanent sector and this situation is characterized as the initial equilibrium situation.

At the beginning of the first period, the following events take place: first, the retirement of the labour force (δ) reduces the supply of skilled labour by 1 per cent (i.e., by 21,297), since it is assumed that $\delta = .01$. Second, to keep the total labour force constant at 2,878,000, the size of the unskilled labour force increases by δL_1^* (i.e., by 21,297) through new entry. Finally, 25,429 jobs are created in the temporary sector. As is shown in row 5 of the table, the value of Π increases from .64 to .6553. The unemployment rate ($1 - \Pi$) of the temporary sector, which was 36 per cent in the initial equilibrium situation, is lowered to 34.47 per cent. This raises expected utility in the temporary sector from \$152.24 to \$152.60. At the same time, the reduction in L_1 because of retirement increases gross wages in the permanent sector from \$289.80 to \$297.57. Note that based on the estimated long-run wage elasticity of employment (or elasticity of demand for labour), which

equals $-.373$, it is derived that a one per cent reduction in L_1 will increase wages by 2.681 per cent in the permanent sector. Since the differential between $\{U_1 - E(U_2)\}$ is greater than C ($\$79.60$), induced or explicit movement of workers from temporary sector to the permanent sector begins. By the end of period one, $18,800$ workers move from the temporary to the permanent sector where the long-run equilibrium condition $\{W_1(1-t_1) - C = \pi \bar{W}_2(1-t_2) + (1-\pi)h + (1-\pi)b.d(1-t_2)\}$ again holds.² Compared with the initial long-run equilibrium the following changes have taken place:

- (i) the level of employment in the region is higher;
- (ii) the unemployment rate in the region is lower;
- (iii) the size of the permanent sector is lower.

This suggests that creating unskilled jobs in the region will improve the overall level of employment and the unemployment rate in the region, while the size of the skilled labour force is reduced.

Note that at the beginning of the first period, $25,429$ jobs were created. In the long run, the net employment impact of the program declines to $22,632$ jobs. Thus, the long-run employment effect of the program is lower than the

short-run effect. In the short run, when additional jobs are created in the temporary sector, the existing unskilled workers will be finding new jobs faster than is required for them to be willing to stay in that sector. Therefore, individuals do not move out of the temporary sector. This causes the labour force in the temporary sector to increase in addition to the normal labour force growth (which equals δL_1^*). As these new workers search for work along with the existing workers they will start to find jobs at the expense of the existing workers and will thus increase the amount of time the previous workers spend being unemployed between jobs in the temporary sector. In the permanent sector, employment is reduced through normal skilled labour attrition (equal to δ) causing the wages to increase in that sector. In the long run, the average proportion of time spent being employed and unemployed by the workers in the temporary sector will return to their new equilibrium level, as the workers move from the temporary to the permanent sector. The level of employment in the permanent sector will not get back to its initial level since the unemployment rate in the temporary sector is lower than before. Thus, when all the adjustments are complete, the long-run employment effect of the program is smaller than its short-run employment effect (i.e., the total number of jobs created).

In Table 9-6, it is shown that all the adjustments are complete by the end of one period and long-run equilibrium is achieved. This is based on the assumption that $\delta = .01$ (one per cent). If we assume that $\delta = .005$ (half per cent), the long-run equilibrium is still achieved by the end of the first period. Thus, the rate of attrition of the skilled labour force (δ) does not seem to be a very significant determinant of the speed of adjustment towards long-run equilibrium.

In Chapter 4, it was argued that the speed of adjustment depends on the slope of the marginal product of labour curve in the permanent sector (f_1''), the size of the job creation program (ΔN_2), and the value of δ . In the illustrative simulation presented in Table 4-2 of Chapter 4, it took five periods to obtain long-run equilibrium. When we perform the same exercise in Table 9-6 with the actual data, it takes only one period to achieve long-run equilibrium. The obvious question that arises is, why it took so long in the illustrative simulation to achieve the long-run equilibrium. A comparison of the two simulations suggests that the size of the job creation program and the rate of attrition of the skilled labour force do not play a very significant role in affecting the speed of the adjustment. It is the slope of the demand curve for labour in the permanent sector (f_1'').

2

which is the most significant factor in affecting the speed of adjustment. In the illustrative simulation (Table 4-2 in Chapter 4), it was assumed that a one per cent reduction in the skilled labour force increases wages in the permanent sector by .4 per cent. This implies that the wage elasticity of employment in the permanent sector is -2.5, or that the demand curve for labour in that sector is highly elastic. This is not the case in reality. In Table 9-6 of this chapter, where the actual data is used for simulation, it turns out that the demand curve for labour in the permanent sector is relatively inelastic (the elasticity being -.373). The simulation is derived on the basis that one per cent reduction in the skilled labour force increases wages in that sector by 2.681 per cent. It can therefore be concluded that the smaller the elasticity of demand for labour with respect to wages (or the wage elasticity of employment), the greater would be the speed of adjustment towards the long-run equilibrium, ceteris paribus.

When a similar analysis is carried out for the provinces of Ontario, Newfoundland and Alberta, it is found that for these provinces as well the adjustments are complete by the end of the first period. The results are presented in Tables 9-7 to 9-9.

Note that in our above analysis it is assumed that the skills are obtained instantly, that is, no time loss is involved in acquiring skills. The adjustment process would obviously be delayed if an assumption is made regarding the time required in acquiring skills.

D. A Traditional Way of Estimating Net Employment Effect of the ETCP

As argued earlier, to measure the net employment effect of a direct job creation program, one needs to know the extent to which the creation of job opportunities for some individuals is associated with reductions in the employment of others. In the literature on job creation, to measure the net job creation impact generally a partial equilibrium analysis is conducted. These partial analyses of the net job creation impacts of direct job creation measures have, by and large, neglected economic repercussions beyond the enterprises (activities) directly affected by the policy, inquiring only into the behavioural response of the activities subsidized.³ Net job creation in this context, then, refers to the displacement response only in the impacted activities.⁴

In the partial analysis, the incremental employment effect of the program is estimated in a different way. The

question generally posed is, to what extent are the jobs created by the job creation program incremental? That is, is the apparent increase in employment 'real', or does part of it represent additional hiring that would have occurred anyway? What this implies is a comparison of the actual development with that which would have occurred in the absence of the job creation program. To assess this it would be required to find out whether employers who availed themselves of the subsidy, for example, have actually changed their behaviour or whether they have simply used the subsidy to finance hirings which otherwise they would have financed by their own means. In these models, therefore, the calculation of the incremental employment effect of the program is based on the assumption that there is some financial displacement within the sector in which jobs are created. Schmid (1979) points out that workers of non-subsidized firms may have to be dismissed because of the comparative disadvantage of these firms and a lack of general demand. The spirit of the incrementality of employment in these models is that the net new jobs created in the sector are less than those asserted to be created. Thus, the subsidy may generate a windfall to employers, in that it is paid on jobs that were not induced by the subsidy.

In contrast to the traditional approach for estimating the incrementality of employment, our model assumes that employers do not change their behaviour and that there is no growth in the model to generate new jobs in the absence of the job creation program. In our model, therefore, it is assumed that all the jobs created in the temporary sector are incremental and any financial displacement in that sector is ruled out. The labour market displacements occur only in the permanent sector and it is this phenomenon which has been estimated earlier in the chapter.⁵

The most common way to measure the financial displacement in the sector in which jobs are created or the degree of incrementality of employment is to conduct an employer survey. To assess the net employment effect of the ETCP, an employer survey was conducted by the Canada Employment and Immigration Commission (CEIC). When asked would they have hired anyone in the absence of the tax credit program, approximately 62 per cent of the employers said they would not have done so. This suggests that there is a possibility that 62 per cent of jobs were "above planned growth" levels.⁶ Due to methodological weaknesses -- e.g., potential bias in employers' responses, little statistical control for other impacts on employment, etc., little reliance can be placed on survey results. These surveys,

however, do indicate that employers feel that their hiring decisions are affected by the subsidy.

In order to develop a more objective approach to assess the incremental employment impact of the job creation program, Haveman and Krutilla (1968) in their monograph on the evaluation of public policies suggested the following methodology. The approach focuses on the following question: Given that the job is incremental, what is the probability that the individual hired under the program would have found a job anyway somewhere else? In other words, the approach attempts to measure the probability that those who were employed under the program would have found alternative employment in the absence of the program. The approach assumes that, at a given rate of aggregate unemployment, an unskilled worker's probability of employment (PE) indicates the likelihood that he would have been employed anyway.

To estimate the incremental employment effect of the ETCP, assuming that financial displacement occurred within the temporary sector, we adopt the methodology utilized by Haveman and Krutilla.⁷ Their methodology is essentially concerned with developing a procedure for estimating the probability of employment (PE) in the absence of actual data

on the PE of the program participants. The approach assumes that the probability of employment of a newly hired individual who comes from the ranks of the unemployed can be estimated as a function of the measured unemployment rate. A major criticism of this approach is that assumptions are made regarding the general shape of the probability function⁸ because no empirical research has yet been completed to measure precisely the probability function that is required.

Little empirical work, to our knowledge, has been undertaken in Canada to calculate the actual probability of employment of a specific worker. To calculate the probability of employment of the ETCP participants we use the ETCP data linked with the longitudinal Labour Force Data Base (LFTB). The data base has already been described in detail in an earlier chapter. For a sample of 2,359 ETCP participants who joined the program sometime during the first two years (i.e., April 1978 to December 1979) and who had at least one episode of employment during the period 1975 to the ETCP joining date, we are able to calculate the proportion of labour force time they were employed during that period. Hence for each ETCP participant in our sample we construct an employment index as follows:

Π = (Total number of weeks participant was employed during years 1975 to the program joining date)/(Total number of weeks in labour force during that period).

This Π may be interpreted as the individual's employment rate or the probability of employment. The probability of employment (Π) is expected to depend on several variables which describe the characteristics of the individuals and their jobs. In general functional form the model is

$$(9-7) \Pi = f(\text{Sex}, \text{Age}, \text{Age}^2, \text{Urate}, \text{Occupation}, \text{Province}, \text{Industry})$$

This equation has already been estimated in Chapter 8 and the regression results were reported in Table 8-2 of that chapter. To calculate the average probability of finding alternative employment (Π), we use the same procedure as described earlier, except that the mean values of the Urate used in calculating mean Π now refer to the average Urate of the ETCP joining year. Table 9-10 presents the estimates of the mean probability of employment of ETCP workers by provinces obtained from using this approach. It is estimated that in Newfoundland, the ETCP workers, on an average, would have spent 49 per cent of their labour force time in alternative jobs had ETCP not intervened. In Alberta, on the other hand, 72 per cent of the labour force

time of participants would have been spent in alternative employment in the absence of ETCP.

Overall, the estimates indicate that 67 per cent of participants' time would have been spent in alternative employment in the absence of the program, leaving 33 per cent as the estimated incremental employment due to the program, assuming that the jobs themselves were additional to the hiring firms' work forces. This analysis would then suggest that ETCP created only 21,639 net jobs over the period April, 1978 to March, 1980 as opposed to the 65,573 jobs claimed to have been created. Based on the traditional approach, this estimate can be treated as a measure of the short-run incremental employment effect of the ETCP.

Based on the incremental employment impact calculated according to the traditional approach, we calculate the cost from the policy maker's perspective of creating an incremental work year of ETCP employment by province (see Table 9-11). The costs per incremental work-year created vary substantially from province to province ranging from \$7,635 in Newfoundland to \$13,131 in Saskatchewan, with the national average cost being \$9,555. These cost estimates take into account that only 33 per cent of ETCP created jobs represent incremental job creation. Note that these

estimates may be slightly over-represented to the extent that they do not take into account the increased tax revenues generated by additional employment, or the reduced transfer payments.

Bishop and Haveman (1979) in the U.S. used a variety of time series regressions to estimate the net employment effect of the New Jobs Tax Credit Program in the construction and retailing industries. They concluded that 20 to 30 per cent of the observed total employment increase in these industries was due to the subsidy program. In the U.K., to evaluate the net employment impact of the Small Firms Employment Subsidy program, a comparison of employment increases in subsidized firms with those in a sample of control firms not receiving the subsidy was made. In addition, an employer's survey was also conducted. Results from both methods indicated that 40 per cent of the subsidized workers were actually hired as a result of the subsidy. A French study of the First National Pact also concluded that the net employment impact was in the range of 15 to 40 per cent.

In Canada, the average person-year cost per net regular public service employment (PSE) job is estimated to be approximately \$14,000, depending upon the magnitude of the

fiscal substitution effect, which is estimated to be in the range of 50 to 70 per cent.⁹ Although there is no other Canadian study to our knowledge which sheds light on the issue of fiscal substitution effects, the average person-year cost of PSE job creation is approximately \$8,000 by OECD (1980) estimates and \$7,500 by CEIC Task Force (1981) estimates. These cost estimates compare favourably with an average person-year cost of about \$20,000 by OECD estimates for jobs created via generalized government purchases or tax cuts, and up to \$30,000 through quotas and other forms of trade restrictions (CEIC Task Force Report, 1981). Johnson and Tomola (1975) have calculated for the U.S. that the cost of creating a job through government purchases is \$18,600 after four quarters, through a tax cut, \$19,700 (after eight quarters); and through a PSE program in which 54 per cent of jobs funded represent net job creation, \$14,500.

The average person-year cost per net regular PSE job appears high when compared to that in the private sector. Based on the traditional approach our estimates suggest the average person-year cost per net job through the Employment Tax Credit Program in the private sector was \$9,555. This cost estimate takes into account the displacement effect estimated to be 67 per cent.¹⁰ Estimates of the cost per job for wage subsidy programs in the U.S. range from \$8,000 to \$10,000 (Hammermesh, 1978).

Table 9-1

Distribution of ETCP Jobs by Province, April 1978 - March 1980

Province	Number of Jobs Created in the Temporary Sector
Newfoundland	873
Nova Scotia	1,521
New Brunswick	1,975
Prince Edward Island	463
Quebec	25,429
Ontario	22,323
Manitoba	1,582
Saskatchewan	987
British Columbia	8,301
Alberta	<u>2,119</u>
Canada	65,573

Source: CEIC.

Table 9-2
Loss of Employment in the Permanent Sector Per Unit of ETCP Job Creation in the
Temporary Sector: The Long-Run Equilibrium Values of dL_1/dN_2

Province	dL_1/dN_2^* (according to equation 9-2, $f_1'' < 0$) Column 1	dL_1/dN_2^* (according to equation 9-3, $f_1'' = 0$) Column 2
Newfoundland	.1044	1.96
Nova Scotia	.0624	1.92
New Brunswick	.1726	1.59
Prince Edward Island	-	-
Quebec	.1398	1.56
Ontario	.1574	1.41
Manitoba	.1012	1.37
Saskatchewan	.0946	1.33
British Columbia	.0361	1.35
Alberta	.0948	1.35

* The values of dL_1/dN_2 have a negative sign.

Table 9-3

The Long-Run Net Employment Effect of the ETCP (under the assumption of $f_1' < 0$)

Province	Jobs Created in the Temporary Sector by the ETCP during the period April, 1978 to March, 1980 dN_2 Column 1	Job Loss in the Permanent Sector due to Job Creation in the Temporary Sector $(dL_1/dN_2) \cdot dN_2$ Column 2	Long-Run Net Employment Creation, dE $[(col.1 - col.2)/col.1] \cdot 100$ Column 3	Displacement Effect $[(col.2)/(col.1)] \cdot 100$ Column 4
Newfoundland	873	91	89.58	10.42
Nova Scotia	1,521	95	93.75	6.25
New Brunswick	1,975	341	82.73	17.27
Prince Edward Island	463	-	-	-
Quebec	25,429	3,555	86.02	13.98
Ontario	22,323	3,514	84.26	15.74
Manitoba	1,582	160	89.89	10.11
Saskatchewan	987	93	90.58	9.42
British Columbia	8,301	300	96.39	3.61
Alberta	2,119	201	90.51	9.49

Table 9-4

The Long-Run Net Employment Effect of the ETCP (under the assumption of $f_1=0$)

Province	Jobs Created in the Temporary Sector by the ETCP during the period April, 1978 to March, 1980 dN_2 Column 1	Job Loss in the Permanent Sector due to Job Creation in the Temporary Sector $(dL_1/dN_2) \cdot dN_2$ Column 2	Long-Run Net Employment Creation, dE $[(col.1-col.2)/col.1] \cdot 100$ Column 3	Displacement Effect $[(col.2)/(col.1)] \cdot 100$ Column 4
Newfoundland	873	1,711	-95.99	195.99
Nova Scotia	1,521	2,920	-91.98	191.98
New Brunswick	1,975	3,135	-58.73	158.73
Prince Edward Island	463			
Quebec	25,429	39,669	-56.00	156.00
Ontario	22,323	31,475	-41.00	141.00
Manitoba	1,582	2,167	-36.98	136.98
Saskatchewan	987	1,316	-33.33	133.33
British Columbia	8,301	11,206	-35.00	135.00
Alberta	2,119	2,860	-35.00	135.00

Table 9-5

The Estimates of the Long-Run Elasticity of Demand for Labour (ϵ) That Would Constrain $dL_1/dN_2 = -1$ and $dE=0$ (Equation 9-4)

Province	$\epsilon \left \begin{smallmatrix} * \\ dE=0 \end{smallmatrix} \right.$
Newfoundland	3.2706
Nova Scotia	2.5886
New Brunswick	2.2199
Prince Edward Island	-
Quebec	2.2316
Ontario	2.4256
Manitoba	2.1191
Saskatchewan	2.3756
British Columbia	5.0801
Alberta	2.2072

* These estimated values of ϵ leave a negative sign.

Table 9-6

The Short-Run and Long-Run Implications of the Creation of 25,429 Jobs in the Temporary Sector in Quebec

	Initial long-run equilibrium situation	Period 1	
		b	c
1. Total labour force ($\bar{L}$)	2,878,000*	2,878,000	2,878,000**
2. Skilled labour force (jobs) (L_1)	2,129,720*	2,108,423	2,127,223**
3. Unskilled labour force (L_2)	748,280*	769,577	750,777**
4. Unskilled jobs (N_2)	478,900*	504,329	504,329**
5. π	.64*	.6553	.6717**
6. Unemployment rate in unskilled sector ($1-\pi$) (%)	.36*	34.47	32.83**
7. Total employment in the region	2,608,620*	2,612,752	2,631,552**
8. Unemployment rate in the region (%)	9.36*	9.22	8.56**
9. $E(U_2) = \pi W_2(1-t_2) + (1-\pi)(h+b.d(1-t_2))$ (\$)	152.24*	152.60	152.97**
10. W_1 (\$)	289.80*	297.57	290.71**
11. $U_1 = W_1(1-t_1)$ (\$)	231.84*	238.06	232.57**
12. $U_1 - E(U_2)$ (\$)	79.60*	85.46	79.60**
13. $U_1 - E(U_2) \geq C$ ($C = \$79.60$)	=C*	>C	=C**
14. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-*	-	18,800**

Notes * denotes initial long-run equilibrium values.

** denotes new long-run equilibrium values.

b stands for beginning of the period.

c stands for the end of the period.

Those calculations assume $\delta=1$ per cent. The value of U_1 or W_1 is derived on the basis that the long-run wage elasticity of employment (or elasticity of demand for labour) is -.373 and that one per cent reduction in L_1 increases W_1 by 2.681 per cent.

Table 9-7

The Short-Run and Long-Run Implications of the Creation of 22,323 Jobs in the Temporary Sector in Ontario

	Initial long-run equilibrium situation	Period 1	
		b	c
1. Total labour force ($\bar{L}$)	4,289,000*	4,289,000	4,289,000**
2. Skilled labour force (jobs) (L_1)	3,345,420*	3,311,966	3,342,426**
3. Unskilled labour force (L_2)	943,580*	977,034	946,574**
4. Unskilled jobs (N_2)	669,940*	692,263	692,263**
5. Π	.71*	.7085	.7313**
6. Unemployment rate in unskilled sector ($1-\Pi$)	.29*	.2915	.2687**
7. Total employment in the region	4,015,360*	4,004,229	4,034,689**
8. Unemployment rate in the region (%)	6.38*	6.64	5.93**
9. $E(U_2) = \Pi [W_2(1-t_2) + (1-\Pi)(h+b \cdot d(1-t_2))]$ (\$) 10. W_1 (\$)	148.12*	148.08	148.65**
11. $U_1 = W_1(1-t_1)$ (\$)	303.62*	311.76	304.35**
12. $U_1 - E(U_2)$ (\$)	227.72*	233.82	228.26**
13. $U_1 - E(U_2) \frac{1}{C}$ (C=\$79.60)	79.60*	85.74	79.60**
14. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-C*	>C	-C**
	-*	-	30,460**

Notes: * denotes initial long-run equilibrium values.

** denotes new long-run equilibrium values.

b stands for beginning of the period.

c stands for the end of the period.

These calculations assume $\delta=1$ per cent. The value of U_1 or W_1 is derived on the basis that the long-run wage elasticity of employment (or elasticity of demand for labour) is -0.373 and that one per cent reduction in L_1 increases W_1 by 2.681 per cent.

Table 9-8

The Short-Run and Long-Run Implications of the Creation of 873 Jobs in the Temporary Sector in Newfoundland

	Initial long-run equilibrium situation	Period 1	
		b	e
1. Total labour force ($\bar{L}$)	207,000*	207,000	207,000**
2. Skilled labour force (jobs) (L_1)	105,570*	104,514	105,482**
3. Unskilled labour force (L_2)	101,430*	102,486	101,518**
4. Unskilled jobs (N_2)	51,730*	52,603	52,603**
5. π	.51*	.5132	.5181**
6. Unemployment rate in unskilled sector ($1-\pi$)	.49*	.4868	.4819**
7. Total employment in the region	157,300*	157,117	156,149**
8. Unemployment rate in the region (%)	24.01*	24.10	23.63**
9. $E(U_2) = \pi W_2(1-t_2) + (1-\pi)(h+b.d(1-t_2))$ (\$)	108.69*	108.86	109.12**
10. W_1 (\$)	235.37*	241.68	235.90**
11. $U_1 = W_1(1-t_1)$ (\$)	188.30*	193.34	188.72**
12. $U_1 - E(U_2)$ (\$)	79.60*	84.48	79.60**
13. $U_1 - E(U_2) \frac{2}{C} C$ ($C = \$79.60$)	=C*	>C	=C**
14. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-*	-	968**

Notes * denotes initial long-run equilibrium values.

** denotes new long-run equilibrium values.

b stands for beginning of the period.

e stands for the end of the period.

Those calculations assume $\delta=1$ per cent. The value of U_1 or W_1 is derived on the basis that the long-run wage elasticity of employment (or elasticity of demand for labour) is $-.373$ and that one per cent reduction in L_1 increases W_1 by 2.681 per cent.

Table 9-9

The Short-Run and Long-Run Implications of the Creation of 2,119 Jobs in the Temporary Sector in Alberta

	Initial long-run equilibrium situation	Period 1	
		b	c
1. Total labour force ($\bar{L}$)	1,015,000*	1,015,000	1,015,000**
2. Skilled labour force (jobs) (L_1)	842,450*	837,025	842,205**
3. Unskilled labour force (L_2)	172,550*	180,975	172,795**
4. Unskilled jobs (N_2)	127,690*	129,809	129,809**
5. n	.74*	.7172	.7512**
6. Unemployment rate in unskilled sector ($1-n$)	.26*	.2828	.2488**
7. Total employment in the region	970,140	963,834	955,654
8. Unemployment rate in the region (θ)	4.42	5.04	4.24
9. $E(U_2) = n \theta_2(1-t_2) + (1-n)(h+b.d(1-t_2))$ (\$)	170.98*	170.75	171.19**
10. W_1 (\$)	341.10*	350.24	341.37**
11. $U_1 = W_1(1-t_1)$ (\$)	255.82*	262.68	256.03**
12. $U_1 - E(U_2)$ (\$)	84.84*	91.93	84.84**
13. $U_1 - E(U_2) \geq C$ ($C = \$84.84$)	=C*	>C	=C**
14. Number of workers who will move from unskilled to skilled sector during the period to maintain $U_1 - E(U_2) = C$	-	-	8,180**

Notes * denotes initial long-run equilibrium values.

** denotes new long-run equilibrium values.

b stands for beginning of the period.

c stands for the end of the period.

Those calculations assume $\theta = 1$ per cent. The value of U_1 or W_1 is derived on the basis that the long-run wage elasticity of employment (or elasticity of demand for labour) is -.373 and that one per cent reduction in L_1 increases W_1 by 2.681 per cent.

Table 9-10

Mean Estimated Probability of Employment of ETCP Workers
by Province: ETCP Years, 1978 and 1979

Province	Probability of Employment (mean Π)*	Mean Estimated Incremental Employment Effect (1- Π)
Newfoundland	.49	.51
Nova Scotia	.61	.39
New Brunswick	.51	.49
Prince Edward Island	-	-
Quebec	.63	.37
Ontario	.70	.30
Manitoba	.73	.27
Saskatchewan	.74	.26
British Columbia	.73	.27
Alberta	.72	.28
Canada	.67	.33

* Based on the estimated coefficients from the WLS regression reported in Table 8-2 and the mean values of independent variables for those individuals who joined the Employment Tax Credit Program (ETCP) during the years 1978 and 1979.

Table 9-11

Cost per Incremental Work-Year Created by the ETCP by Province

Province	Gross Number of Work-Years Created*	Total Budgetary Cost of Work- Years Created (dollars)	Number of Net or Incremental Work-Years Created	Cost Per Unit of Net or Incremental Work-Years (dollars)
Newfoundland	433.5	1,688,049	221.09	7,635.12
Nova Scotia	720.0	2,803,680	280.80	9,984.62
New Brunswick	221.0	860,574	108.29	7,946.94
Prince Edward Island	925.5	3,603,897	370.20	9,735.00
Quebec	13,502.5	43,506,488	4,995.93	8,708.39
Ontario	10,611.5	31,647,340	3,183.45	9,941.21
Manitoba	847.5	2,893,365	228.83	12,644.17
Saskatchewan	474.5	1,619,943	123.37	13,130.77
British Columbia	1,064.0	3,184,312	287.28	11,084.35
Alberta	4,267.5	12,708,494	1,194.90	10,645.61
Canada	33,146.5	104,516,142	10,938.35	9,555.01

* Represents the gross number of work-years created during the first two years of the program (April 1978 through March 1980).

Source: Based on data from CEIC and our estimates.

CHAPTER 10

SUMMARY AND CONCLUSIONS

During the 1970s, federal direct job-creation programs were used as a major instrument of Canadian manpower policy. Concerns have been raised whether these programs pass the economic-efficiency criterion. Doubts have also been expressed about their employment impact. This study addresses questions concerning the efficiency basis of these programs and their net employment effects. The major objective of the study is twofold: (1) to examine whether there is an efficiency basis for subsidizing job creation in regions; and (2) to investigate the displacement effects and the net employment impact of such a policy. As a secondary objective, the study also examines the question whether direct job creation programs have any supply-side effect in the sense of improving the skills of the participants and, consequently, enhancing their future employability.

These objectives are evaluated within the context of Canada's recent Employment Tax Credit Program. The program, begun in 1978 and discontinued in 1981, was a temporary wage-subsidy scheme, offering tax credits of up to \$2.00 an hour to stimulate "incremental" employment in the private

sector. The rates of subsidy were linked with area unemployment rates.

To accomplish the objectives of the study, we set up a basic model that is both relatively easy to manipulate analytically and broadly in accord with the realities of the Canadian labour market.¹ The model developed in Chapter 2 attempts to avoid being too complex, so as to yield empirically testable implications. The model has its roots in the earlier work on human capital and the work of Harris and Todaro (1970). The basic model is a two-sector model with unemployment in the temporary sector; the other sector is termed "permanent." The temporary sector contains unskilled workers who are either unemployed or employed in jobs that are not expected to provide continuous employment. The presence of the minimum wage causes unemployment in this sector. Temporary-sector employment offers a package that consists of net of tax wages for the proportion of time employed; net of tax UI benefits for the proportion of time unemployed; and the value of leisure time when unemployed. The permanent sector employs skilled workers; for simplicity, it is assumed that full employment exists there. The wages in that sector are determined by competitive labour market forces. Workers in the temporary sector can acquire skills at their own cost and move to the permanent sector in

response to wage (or utility) differentials. Movement between the sectors is assumed to be an equilibrating phenomenon; that is, movement occurs until an equilibrium is achieved in the two markets. Within the context of this model, the long-run and short-run implications of a direct job creation policy in the temporary sector are analyzed in Chapters 3 and 4.

Chapter 5 evaluates theoretically the long-run efficiency basis of a job creation policy in the temporary sector. Can such a policy generate net social benefits and raise the level of welfare? We evaluate the efficiency effects in standard fashion (see, for example, Harberger, 1971a). We derive the social opportunity cost of a job in the temporary sector and compare it with the market wage in that sector, in order to establish whether a prima facie case can be made for subsidizing job creation in the temporary sector. In the absence of taxes and UI benefits in the system, it is shown that efficiency can be increased if:

-
- (a) the demand curve for skilled labour slopes downward in the permanent sector; that is, when there are diminishing returns to labour; or

(b) the demand curve for skilled labour is perfectly inelastic in the permanent sector.

The efficiency cannot be increased (that is, the social opportunity cost of a job will be equal to the value of output) if:

(c) the demand curve for skilled labour is perfectly elastic in the permanent sector.

In the presence of taxes and UI benefits, however, the above statements cannot be made unambiguously.

• To estimate the social opportunity cost of an ETCP job, a week-by-week labour force activity profile was established for a sample of 2,359 ETCP participants, who joined the program during the first two years, showing their employment, unemployment and out-of-labour force status over the period from 1975 to the ETCP joining date. The administrative records relating to the unemployment insurance benefits and the records of employment were also used. The detailed data are presented in Chapter 7.

Estimates of the weekly social-opportunity cost of an ETCP job (SOCL) during the year 1979 are presented in Chapter 8. The determination of the SOCL essentially involved:

- (i) estimating the probability of finding alternative employment for ETCP workers in the year 1979;
- (ii) estimating the proportion of time ETCP workers would expect to receive UI benefits while unemployed;
- (iii) calculating the value of non-market or leisure time for ETCP workers while unemployed;
- (iv) calculating C , the weekly cost of acquiring skills; W_1 , the competitive wage in the skilled sector; $\bar{W}_2$, the ETCP wage for the year 1979; t_2 and t_1 , the average income tax rate in the unskilled and skilled sectors, respectively, applicable to ETCP and skilled workers; b , the UI benefit rate; L_2 , the size of the temporary sector labour force; N_2 , employment in the temporary sector; and f_1' , the slope of the marginal-product-of-labour curve in the permanent sector.

The preceding four steps were undertaken for all of the provinces except Prince Edward Island, for which data on the competitive wage in the non-unionized skilled sector were not available. The main findings are the following:

First, the proportion of time that ETCP workers would have spent unemployed in the absence of ETCP is consistent with observed provincial unemployment rates.

Second, the proportion of time ETCP workers would expect to receive UI benefits while unemployed is not that different inter-provincially, despite the fact that unemployment rates vary widely from province to province.

Third, the marginal value of non-market or leisure that a worker enjoys is not independent of the amount of time that he spends working. We estimate that the weekly value of leisure time for an unskilled worker is on the order of 4 to 39 per cent of the weekly wage rate in the temporary sector. The marginal value of leisure time for an

ETCP worker varies between provinces and is inversely related to the provincial unemployment rate. The weekly value of leisure as a percentage of the weekly wage is relatively lower for workers residing in New Brunswick (4 per cent) and Newfoundland (8 per cent) and higher for those in the western provinces (39 per cent in British Columbia and Alberta, 38 per cent in Saskatchewan and Manitoba). This value is 31 per cent in Quebec and Ontario. The low value of leisure in high-unemployment provinces is used as an important argument for taking jobs to the depressed regions.

Fourth, in the presence of taxes and UI benefits in the system, and under the assumption of a diminishing marginal product of labour in the permanent sector, the estimated weekly SOCL for creating an ETCP job is less than the weekly ETCP wage for each of the provinces studied. We estimate that the social cost of creating a job for a week is on the order of 18 to 47 per cent of the weekly wage bill. Thus, ETCP passes the

efficiency test and on efficiency grounds a case can be made for subsidizing job creation in the temporary sector in all the provinces. The ETCP can be considered a socially efficient program. The social opportunity cost of an ETCP job is inversely related to the provincial unemployment rate. In high-unemployment provinces -- Newfoundland (with a SOCL equal to 18 per cent of the weekly wage bill), New Brunswick (24 per cent), and Nova Scotia (39 per cent) -- the SOCL of creating a job is lower relative to the low-unemployment provinces -- Ontario and Manitoba (46 per cent), Saskatchewan (45 per cent), British Columbia (43 per cent), and Alberta (47 per cent).

According to our model, efficiency gains result into increased unskilled labour supply, lower skilled labour supply, and increased skilled labour wages. The efficiency gains exist because a wage subsidy policy reduces the efficiency cost of the existing distortions in the temporary sector, created by the presence of minimum wages and UI benefits. Since distortions exist only in the low-wage

sector, the usual equity case for shifting demand towards unskilled workers is now reinforced by an efficiency argument.

Fifth, our analysis indicates that the net social benefit resulting from the creation of an ETCP job is very significant. We estimate that the weekly net social benefit of creating a job under the Employment Tax Credit Program (ETCP) is on the order of 53 to 83 per cent of the weekly wage bill. The difference between the ETCP wage and the SOCL is positively related to the provincial unemployment rate. This suggests that net gains (i.e., benefits minus costs) from creating a job are higher in the high-unemployment provinces. The net social benefits as a percentage of the wage bill are relatively higher in the Atlantic provinces (Newfoundland, 83 per cent; Nova Scotia, 62 per cent; and New Brunswick, 76 per cent) and lower in the other provinces (Alberta, 53 per cent; British Columbia, 57 per cent; Saskatchewan, Manitoba and Ontario, 54 per cent; and Quebec, 58 per cent). Thus, on

efficiency grounds a justification can be made for higher rates of subsidy for high-unemployment provinces.

Sixth, our estimates indicate that the gains to the economy from job creation are maximized under the assumption of a perfectly inelastic demand curve for labour in the permanent sector of the economy, because the SOCL is given by the value of leisure time while unemployed.

Finally, we estimate that, under the assumption of a constant marginal product of labour in the permanent sector, the SOCL is greater than the ETCP wage for each of the provinces studied. In this case, large net social costs ensue from attempts to create employment in the temporary sector. In these circumstances, no intervention in the labour markets is warranted on efficiency grounds.

A major problem associated with direct job-creation programs involves "displacement effects" - the reduction of jobs elsewhere as an offset to the employment creation

effects of the programs. Because the primary objective is employment creation, its evaluation must be in terms of its net job-creation impact, defined as the difference between the employment level in the economy with the policy and the level without it. In terms of our theoretical analysis in Chapter 6, the net impact of a wage subsidy on employment depends on the extent to which the creation of job opportunities for unskilled workers is associated with a reduction in the employment of skilled workers. The possible displacements in other sectors of the economy are, therefore, considered explicitly. The analysis takes into consideration the direct and indirect effects over time in investigating the overall employment effects of a wage subsidy to the temporary sector.

Chapter 9 presents the net employment effect of the Employment Tax Credit Program (ETCP). The major findings are as follows:

- (i) Under the assumption of a diminishing marginal product of labour and the estimated slope of the labour demand curve in the permanent sector, the long-run loss in employment in the permanent sector of job creation in the temporary sector is very

small. The estimated values of the displacement effect, defined as total job loss in the permanent sector as a proportion of gross jobs created in the temporary sector, range between 3.61 per cent for British Columbia and 17.26 per cent for New Brunswick. Since the displacement effect is much lower, the long-run net employment effect of the ETCP is above 90 per cent for all of the provinces (except New Brunswick where the value is 82.74 per cent). We conclude, therefore, that the employment effects attributed to the ETCP appear to be substantial. These estimates are based on the assumption that all of the jobs created under the ETCP were incremental. That is, that no jobs were subsidized in the temporary sector that would already be produced without the subsidy.

(ii) Under the assumption of a constant marginal product of labour in the permanent sector, the long-run displacement effect is estimated to be above 100 per cent. The displacement effect is highest in the high-unemployment provinces and lowest in the

low-unemployment provinces. The job loss in the permanent sector is greater than one for every job created in the temporary sector. The job loss in the permanent sector per unit of job creation in the temporary sector is at its maximum in the high-unemployment provinces, ranging from 1.59 in New Brunswick to 1.96 in Newfoundland. The values for the low-unemployment provinces (Ontario and the West) are in the range of 1.30 to 1.40. The value for Quebec is 1.56. The implication of this finding is that if the provinces have a perfectly elastic demand curve for labour in the permanent sector, then job creation in the temporary sector will lead to a significant reduction in the employment of skilled labour sometime in the future. Therefore, the long-run net job-creation effect of the ETCP is negative, indicating that job creation in the temporary sector would, in the long run, reduce the overall level of employment in the economy.

(iii) Our analysis indicates that if the elasticity of the demand for skilled labour

with respect to real wage ranges from -2 to -5, the net employment effect of the job creation program will be zero.

(iv) Based on the long-run real wage elasticity of employment for the whole economy (estimated at $-.373$), our analysis suggests that a 1 per cent reduction in the skilled labour force would increase wages in the permanent sector by 2.68 per cent. Based on these estimates, we attempted to find out how long it takes for the regional labour markets to reach the new long-run equilibrium when jobs are created in the temporary sector. For all four provinces - Quebec, Ontario, Newfoundland, and Alberta - considered in the analysis, it was found that all of the adjustments are complete by the end of the first period. However, the length of calendar time defined as a period in the model is arbitrary. The speed of adjustment is not significantly affected by the rate of attrition of the skilled labour force. The main determinant of the speed of adjustment

is found to be the slope of the demand curve for labour in the permanent sector.

(v) In the empirical literature on job creation, some attempts have been made to evaluate the net employment effect of these programs. While these studies measured net increases in employment, they failed to consider the possible displacements in other sectors of the economy. The estimates of the incremental employment effect of the program were based on the assumption that there is some financial displacement in the sector in which the jobs have been created. Typically, these studies asked the question: Is the apparent increase in employment "real" or does part of it represent additional hiring — that would have occurred anyway? According to these studies, then, the definition of the displacement effect of the ETCP would refer to the job subsidized in the temporary sector that would have been created without the subsidy. When we estimate the net employment effect of the ETCP in this manner, only 33 per cent of the jobs attributed to the

ETCP during the first two years of its operation represent an incremental gain in employment. In other words, the displacement effect is 67 per cent. This gain was relatively higher in Newfoundland, New Brunswick, Nova Scotia, and Quebec (51, 49, 39, and 37 per cent, respectively) and lower in the western provinces (Alberta, 17 per cent; Saskatchewan, 28 per cent; Manitoba and British Columbia, 27 per cent) and Ontario (30 per cent). The provinces with relatively high-unemployment (Atlantic provinces and Quebec) had a higher net job-creation rate. The average cost per incremental work-year created by the ETCP is estimated to be \$9,555. This cost was comparatively higher in the western provinces -the highest being Saskatchewan, where it was over \$13,000 per incremental work-year.

A secondary objective of the Employment Tax Credit Program was "to improve the future employability of participants above that which would have occurred in its absence." In this regard we have analysed the labour market impact of the

ETCP on those individuals who participated in the program with a view to answering the following questions:

- Does the program increase the future probability of employment for those who participated in it?
- Does the program increase the length of employment per spell for participants?
- Does the program increase the weekly wages of participants at their future job(s)?

The results are reported in Appendix I.

Our analysis provides no strong evidence to suggest that the ETCP increased the future probability of employment of participants. Nor do the results suggest that the program increased the weekly wages of the participants at their next job(s). There is some evidence to suggest that the program had a positive impact on the length of employment spells. It is our general impression, however, that the program did not meet its objective of improving the future

employability of participants. This is not surprising, since the participants were not just from the lower end of the wage distribution but they were also workers who had had substantial labour market difficulties in the years prior to joining the program. Our findings, however, should be regarded as highly tentative, since the data were not available for long time periods and the estimate of long-run effects had to be made on the basis of an estimate of initial program impacts.

On the basis of these findings we are led towards the conclusion that (i) the Employment Tax Credit Program had only a demand effect, and (ii) that the program had no supply-side effect in the sense of improving the quality of unskilled labour. Our theoretical framework assumes (i) above and largely neglects (ii). Evidence here confirms that ignoring (ii) appears to be reasonable.

Within the framework of our model then, the foregoing discussion leaves us with four major considerations relevant for policy purposes.

First, temporary job-creation policies such as the Employment Tax Credit Program, can be justified on efficiency grounds under the assumption of a diminishing marginal product of skilled labour, since the net social benefit from the use of such a policy is very significant. We estimate that the average net social benefit of "creating" a job in this way is on the order of 60 per cent of the wage bill.

The assumption of a diminishing marginal product of labour is generally supported in the literature. Estimated elasticities of employment with respect to the real wage tend to be small; in a survey of U.S. results, Hamermesh (1976) settles on a medium estimate of -0.15 for the effect on employment after four quarters of a 1 per cent change in the real wage rate, holding the cost of capital constant. Clark and Freeman (1980) put the real-wage elasticity of demand for labour at -.496 after two to three quarters. For Canada, Woodland (1972) found "low elasticities of demand for labour with respect to all factor rewards." Our own estimates indicate a four-quarter, real-wage elasticity of demand for labour of -.17.

Second, on efficiency grounds a justification can be made for relatively higher rates of subsidy for high-unemployment provinces. The greatest net social benefits come from the creation of jobs in labour markets characterized by high-unemployment rates. This would tend to indicate that employment policy-makers should develop differential subsidy rates and move away from policies which apply uniformly across provinces.

Third, the results presented in Chapter 8 indicate that youth of either sex and female workers have a lower probability of employment. Recently a study by the Economic Council of Canada (1982), while determining the probability of extended unemployment, indicated that "relative to the reference category of prime-age males, all other age-sex groups exhibit greater probability of being in the 'at risk' category. Thus youths of either sex are more likely to experience long spells of unemployment than prime-age males. Women, especially those in the 20-and-over age group, are at a

relatively greater disadvantage" (p. 58). We conclude, therefore, that targeting job creation programs at young workers and at female workers might enhance their employment prospects.² Through such a policy, the usual equity case for shifting demand towards unskilled workers is reinforced by an efficiency argument. Such a program may also alter the equilibrium unemployment rate.³

Fourth, the displacement effect of the program in other sectors of the economy is very small; consequently, its net employment effects are very substantial. This conclusion is based on the assumption that all of the jobs created by the program are incremental and that no jobs are subsidized which would already be produced without the subsidy. When this assumption is dropped, however, analysis of the net employment effects of the program indicates that only 33 per cent of the jobs attributed to the program represent net job creation and that the cost per incremental work-year is \$9,555.

Note that the above conclusions are based on the model which is kept simple for expositional purposes. In order to give quantification to the model, the labour force is classified between skilled permanent workers and unskilled temporary workers. The findings are based on the empirical observations that the elasticity of demand for labour in the permanent sector is low. Moreover, the data on training costs used in the analysis are sketchy. A more intensive quantification would require (a) a proper measure of training costs for those sectors to which the temporary labour force would move when employed in permanent jobs, and (b) a disaggregated estimate of the elasticity of demand for labour in the permanent sector.

Finally, the federal government pursues a variety of policies to affect the structure of demand for labour. A policy of wage subsidy and public-sector employment is designed to affect the regional, demographic, and skill composition of demand. Tariffs and quotas affect the industrial composition of demand. Incentives to firms affect both the regional and industrial composition. It is beyond the scope of this study to compare the magnitude of the efficiency gains or losses resulting from each of these policies. While an evaluation of job creation programs in

this broader context must await further study, the results of our research lend support to those who view these programs as important elements within the government's arsenal of weapons to combat unemployment.

APPENDIX

APPENDIX I

DIRECT JOB CREATION IN THE TEMPORARY SECTOR: IMPLICATIONS FOR POST-PROGRAM PARTICIPANTS' PRODUCTIVITY

In Chapter 5 our analysis of the change in social welfare resulting from job creation in the temporary sector does not include any additional future output that program participants may provide because of any increase in their productivity arising from work-experience or on-the-job training. The objective of this chapter is to extend the previous analysis by incorporating this additional feature into our model.

One possible component of social benefit is the increased productivity of the participants in the job creation program. That is, the program participants may be able to provide increased future output because work experience or on-the-job training increase their productivity. This increase in worker productivity has characteristics of an investment -- once the increase in productivity is attained, it persists at some level into the future. This future gain must also be reflected in the calculation of output produced by a new job.¹ The way to accomplish this, at least in concept, is to add up the future values of increased productivity and attribute the present discounted value to the program.

If an increase in productivity occurs, then equation (5-3) in Chapter 5 will understate the change in social welfare as a result of job creation. The more complete expression will include an extra term (g) which would reflect the present value of the increase in output resulting from increased post-program productivity as shown by equation (A-1) below:

$$(A-1) \quad \left. \frac{dz}{dN_2} \right| = \frac{dx_1}{dN_2} + \frac{dx_2}{dN_2} + h \left(\frac{dL_2}{dN_2} - 1 \right) + C \frac{dL_2}{dN_2} + g$$

Equation (5-4) of Chapter 5 will then become:

$$(A-2) \quad \left. \frac{dz}{dN_2} \right| = (f'_2 + g) - \left\{ h + (f'_1 - h - C) \frac{dL_2}{dN_2} \right\}$$

Thus in the presence of this post-program productivity effect the true value of the output produced by the new job will be $(f'_2 + g)$ and the social cost of achieving this would be,

$$SOCL = h + (f'_1 - h - C) \frac{dL_2}{dN_2}$$

where the expression for dL_2/dN_2 is given by equation (5-9) in the text.

In Chapter 4 we have seen that the economy gets back to initial equilibrium position after the job creation program is withdrawn. An interesting question is: In the presence of g , would the economy get back to initial long-run equilibrium condition after the program is withdrawn? The answer is no. If the g effect is permanent and irreversible, then the long-run equilibrium condition, after the program is withdrawn, will have different values of Π and W_1 relative to those in the initial equilibrium (i.e., Π^* and W_1^*). This is simple to explain. The effect of g would be to increase the marginal product of labour in the temporary sector. If wages ($\bar{W}_2$) are assumed to be fixed then the effect of increased marginal product would be reflected in the increased probability of employment (Π). This can be illustrated with the help of figure (A-1). In the absence of g , if the program is withdrawn the new long-run equilibrium is identical to the initial equilibrium situation where the employment of unskilled labour is back to $0_2 N_2^0$ from $0_2 N_2^1$. In the presence of g , because of the increased post-program productivity of the program participants, the marginal product of labour curve MPL_2^d in the temporary sector may shift upward to $MPL_2^{d'}$. If this happens, employment in the temporary sector will increase to $0_2 N_2^*$ and the probability of employment (Π) will increase. The increased

Figure A-1
Effects of Improved Productivity of Program Participants

Π will raise the expected utility of workers in that sector relative to those in the permanent sector. This will induce more workers in the temporary sector to stay in that sector resulting in lower $L_1(0, L_2')$, higher W_1 and higher Π in the new equilibrium. Rectangle $ab'N_2^0N_2^0$ is the increased output generated by program participants after the program is withdrawn.²

Thus, the model indicates that if the program participants produce increased future output because of work experience or on-the-job training, then (i) the probability of employment (Π) of the program participants will increase; and (ii) the wage rate in the permanent sector will be higher in the new equilibrium. The rest of the chapter is devoted to the discussion of the methodology, procedures and empirical results for finding empirical support for the statements (i) and (ii), made just above.

(A) Post Program Increase in the Probability of Employment of Participants

One of the important goals of the Employment Tax Credit Program (ETCP) was to improve the future employability of program participants. If the program was successful in achieving this objective then the probability of employment of the ETCP participant would have increased. In order to

test this, we need to carry out an investigation of the probability of employment of the ETCP participants before and after the program. Even if we do find that the probability of employment for participants increased after the program the question is: How do we know that the increased probability of employment is a result of the presence of the program and not due to changes within the economy (e.g., generally improved economic conditions)? With an adequate control group this problem does not arise. By comparing the probability of employment for program participants and for members of a control group who did not participate in the program general changes in the probability of employment can be distinguished from the effects of the ETCP. This comparison should be made over a number of time periods. Since data are not available over long time periods, an estimate of long run effects must be made on the basis of an estimate of initial program impact.

A sample of 2,359 program participants who joined the program sometime during the period April 1978 to December 1979 and who had at least one episode of employment or unemployment during the period 1975 to the ETCP joining date, was drawn from the Longitudinal Labour force Data Base (LFDB). Using the information on employment, unemployment, and out-of-labour-force spells, we are able to calculate the

pre- and post-ETCP probability of employment of individuals in the sample.

The United States literature on the evaluation of manpower training programs addresses the issue of how to select an appropriate control group.³ According to Kiefer (1976), the best way to select a control group is to choose a sample of individuals from the target population and then randomly assign them to serve as controls or trainees.⁴ This experimental procedure is of course not always feasible.⁵

Kiefer (1976) suggested that a control group could probably be constructed inexpensively from an existing longitudinal data set. Individuals from the data set could be matched with trainees on the basis of demographic characteristics and "pre-training" labour market experiences.⁶ Following this suggestion, we construct a control group from our longitudinal Labour Force Data Base (LFDB). Individuals from the data set are matched with ETCP participants on the basis of demographic characteristics and "pre-ETCP" labour market experiences. On the basis of matching age, sex, region, and the employment starting date we draw a sample of 811 individuals from the LFDB to serve as a control group. It is obvious that the comparison and ETCP participant groups are not drawn from the same population. The best

that can be done in these circumstances is to statistically control for observable differences between the two groups using measurable variables.

Summary Statistics

Table A-1 illustrates the demographic composition of the ETCP sample and the control group. In the ETCP sample, males outnumbered females by a ratio of two to one whereas the ratio is about four to one for the control group. There are no significant differences by age distribution between the ETCP sample and the control group. The provincial representation of the ETCP sample and the control group is almost identical, except that Alberta is a little over-represented and Quebec is slightly under-represented in the control group..

Table A-2 illustrates the labour market experience of each group during the years from 1975 to the ETCP joining date.

The observed employment-unemployment experience of the ETCP participants in our sample indicates that the mean probability of employment and unemployment, and the mean proportion of unemployed time in receipt of unemployment insurance (UI) benefits (d), were almost identical for males and females. The average duration of unemployment (ADU)

and average number of spells of unemployment (n) are higher, and the average length of unemployment per spell (ALU_s) is lower, for males than for females.⁷ The employment-unemployment experience of the control group is marginally different from that of the ETCP sample. For example, the control group's probability of employment is typically above the probability of employment of the ETCP sample. The ADU and ALU_s are lower for the control group than for the ETCP sample. As a result it is important to adjust for differences between the ETCP and the control group.

Determinants of the Change in the Probability of Employment

Changes in the probability of employment of the ETCP participants, relative to changes in the probability of employment of members of the control group can be examined in the following manner. The difference between the change in the probability of employment of the program participants relative to non-participants, adjusted for the effects of differences in age, occupation, industry, and previous employment experience, will be the program effect. The dependent variable is

$$\Delta PE = (\pi_{ap} - \pi_{bp})$$

where

Π_{bp} = (Total number of weeks individual employed one year prior to the program joining date)/(Total number of weeks in labour force during that one year period).

Π_{ap} = (Total number of weeks individual employed one year after the program joining date)/(Total number of weeks in labour force during that one year period).

The calculation of Π_{bp} and Π_{ap} is restricted to one year before, and after, the program because of the restriction imposed by the available ROE file which contained information until August, 1980 at the time of estimation. The variable $(\Pi_{ap} - \Pi_{bp})$ is interpreted as the change in the probability of being employed.

Following Kiefer (1976), each individual's expected change in probability of employment, ΔPE_e , can be captured by a vector, X_1 , denoting his productivity characteristics and the labour market conditions, and his ETCP status. The ΔPE_e function then can be given as:

$$(A-3) \quad \Delta PE_e = b_1 X_1 + a_1 ETCP + a_2 ETCP WKS$$

An individual's market productivity characteristics are captured by variables such as education, training, and age. From the data available to us, we do not have measures of education or training. The variable proportion of time employed before the estimation period, PEMP, is used as a measure of work experience which reflects the productivity characteristics of individuals. The changing labour market indicator is identified by the average national unemployment rate, Urate, and by the province. The occupation and industry variables are used as control variables.

In the regressions, Age is the age of the person at the beginning of 1975; PEMP is the proportion of the labour force time spent in employment before the estimation period; Urate is the average national unemployment rate during the period; Occupation (OCC), Industry (IND), Province (PROV) and ETCP variables are dummies. OCC takes on a value of one, where it coincides with the worker's last occupation prior to joining the ETCP and zero otherwise. IND takes the value of one, if the worker's last industry of employment belonged to that category, and zero otherwise. Similarly, PROV takes the value of one, if the individual lived in that province, and zero otherwise. The description of the variable mnemonics (for example, OCC, IND, PROV etc.) can be seen in Table 8-7 in Chapter 8. ETCP takes on the value of

one, if the individual was a ETCP participant, and is zero otherwise (control group). ETCP WKS is the number of weeks the individual was in the program.

The conditional distribution of an ETCP participant's probability of employment for a given number of weeks of program participation in this framework differs from the conditional distribution of the control group probability of employment only in location, and the difference in location is

(A-4) $a_1 + a_2 \text{ ETCP WKS}$

There is no economic model that would enable us to judge in advance, the signs of the coefficients on the independent variables. Our focus is on the coefficient for the variable ETCP, the participation in the program. If participation in the program increases the post-program probability of employment, then one would expect $(\partial \Delta PE / \partial \text{ETCP}) > 0$. The coefficient a_2 of ETCP WKS may be interpreted as an additional impact on the change in probability of employment if the participant stays in the program an additional week. Hence, we would expect that $(\partial \Delta PE / \partial \text{ETCP WKS}) > 0$.⁸

Equation (A-3) is estimated by means of an ordinary least squares (OLS) regression, since the data were not handed over to us by the Canada Employment and Immigration Commission (CEIC) in order to ensure compliance with confidentiality requirements. Consequently, some flexibility was lost. The loglikelihood function may be compared with that underlying OLS estimation, which is

$$(A-11) \quad L^* = -\frac{N}{2} \ln \sigma^2 - \frac{1}{2\sigma^2} \sum_{i=1}^N (y_i - x_i \beta)^2 + \text{constant}$$

Observations at $y_i = -1$ and $y_i = 1$ are treated in equation (A-11) in the same way as other observations instead of as discrete probabilities. It should be noted, however, that the OLS estimation may not cause much bias, because none of the individuals in our sample were fully employed or fully unemployed one year prior to, and after, the ETCP.

Equation (A-3) is estimated by OLS separately for males and females. The rationale for estimating separately by sex is that the probability of employment is affected by differences between the occupational and industrial distributions of male and female workers. In our sample, male participants were mostly employed in goods-producing

industries, such as manufacturing, construction, and transportation while a majority of female participants were employed in community business, personal services, finance and trade. In order to isolate the influence of the industrial and occupational differentials on the change in the probability of employment, the equation is estimated separately for males and females.

Once the parameters are estimated, the average effect of ETCP may be obtained by evaluating equation (A-4) at the mean number of weeks the participant spent in the program. The coefficients of ETCP and weeks in ETCP (ETCP WKS) are presented in Table A-3. The estimation results of equation (A-3) in entirety, are presented in Table A-4.

The effect of the Employment Tax Credit program on the change in the probability of employment was not found to be statistically significant. This implies that the program did not succeed in increasing the future probability of employment of the participants. It is generally argued that wage subsidy programs in the private sector not only ensure that the produced output meets the conventional tests of consumer demand but also create jobs directly in regular employment, so workers are not making a transition from special temporary programs.⁹ Our results suggest that the

probability of employment after the program does not change and that the dynamics of the employment-unemployment transition continue as in the pre-program period.

This is not a surprising finding because the ETCP participants were not average members of the labour force but rather members who had substantial labour market difficulties in the years prior to entering the program. For example, their average duration of unemployment per completed spell (ALU_s) during the period 1975 to the program joining date was 24.2 weeks for males and 27.7 weeks for females, versus 16.6 weeks for males and 19.6 weeks for females during 1975-79 for the average labour force.¹⁰ Workers with special difficulties are more likely to enter a job creation program and, of course, it was just such long-term unemployed workers for whom the Canada Employment and Immigration Commission (CEIC) had targetted the ETCP in the first place. Similarly, the average duration of employment per completed spell (ALE_s) for the ETCP participants during the same time period was 17.8 weeks for males and 22 weeks for females, versus about 35 weeks for males and 46 weeks for females for the average labour force.¹¹

Before concluding the discussion of changes in the probability of employment, a number of ancillary results

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emerging from Table A-4 may be noted parenthetically. First, the proportion of time employed one year prior to the program joining date, PEMP, is used as a measure of experience. We expected a positive sign on the coefficient of this variable. As it turns out, this variable has a significant negative impact for males and for the total sample. Second, the national Urate was expected to have a negative effect on the change in the probability of employment. The result is puzzling as the coefficient of Urate is found to be positive and statistically significant in all cases. Finally, the coefficients of other control variables like Province, Occupation, and Industry are statistically significant in most cases.

The overall explanatory power of the equation in all the cases is very weak (R^2 is equal to .06 for males and for the total sample, F statistics, 3.11 for males and 3.93 for the total sample) except for the female sample ($R^2=.15$ and $F=2.42$). This leads us to conclude that for the ETCF participants most of the socio-economic characteristics, even when taken together, have a very low predictive power in explaining the change in the probability of employment.

Given the procedure employed for calculating the probability of employment (PE), part of the change in PE may

come about as a result of a change in weeks of employment; and part as a change in labour-force participation. With our data we can also conduct an analysis of the effect of ETCP on the total weeks of employment per spell. The framework used is similar to that used in the analysis of probability of employment changes; the independent variables are the same, except for the additional variable, W_t , the weekly wages of an individual at time t . The dependent variable is total weeks of employment per spell, $EWKS_t$. The equation to be estimated is given by

$$(A-12) \quad EWKS_t = b_0 + b_1 Age + b_2 EWKS_{t-1} + b_3 Urate + b_4 W_t \\ + b_5 OCC + b_6 IND + b_7 Province + b_8 ETCP \\ + b_9 ETCP \text{ WKS} + e_t$$

where e_t is the error term and the total effect of the ETCP on weeks of employment per spell is given by

$$(A-13) \quad b_8 + b_9 \text{ ETCP WKS}$$

Equation (A-13) is evaluated at the mean number of weeks the participant spent in the ETCP. The coefficient of ETCP WKS may be interpreted as the number of additional employment weeks (per spell) which a program participant will gain if he stays in the program an additional week.

One would expect younger people to engage in more job search and to spend less time on the job that they ultimately find. Hence, we expect $(\partial \text{EWKS}_t / \partial \text{Age}) > 0$. Employment weeks in the previous spell, EWKS_{t-1} , is used as a measure of experience. This variable can also be viewed as measuring stability in employment; that is, the ability to stay at one job for a period of time, a quality which is valued by prospective employers. As such, one would expect $(\partial \text{EWKS}_t / \partial \text{EWKS}_{t-1}) > 0$. The sign of the coefficient of Urate is ambiguous, i.e., $(\partial \text{EWKS}_t / \partial \text{Urate}) \geq 0$. The reason is that if aggregate economic conditions worsen, individuals will be less inclined to quit their job and employers may be forced to resort to lay-offs. The net result would be uncertain. If, however, the latter effect dominates one would expect a negative coefficient on this variable. The sign on the wage rate variable is indeterminate, $(\partial \text{EWKS}_t / \partial W_t) \geq 0$, for two reasons. First, if the wage rate is higher, workers will tend to increase their employment length. Second, usually higher wage rates tend to be related to the level of skill required by the job. As higher-skilled jobs tend to be more stable, this would tend to increase the employment length as well. However, for ETCP this may not be true as participants are generally unskilled or low-skilled workers. The high wage rates in that case may force employers to lay-off high wage individuals first, which may tend to reduce their

employment length. The other variables used in equation (A-12), Province, Occupation, and Industry, are control variables.

OLS estimates of the coefficients of ETCP (b_8) and ETCP WKS (b_9) and t -statistics are presented in Table A-5 along with their estimated average effects on the employment length per spell.

For all cases the coefficient on ETCP is negative and statistically significant, whereas the coefficient on ETCP WKS is positive and statistically significant suggesting that the participants who stayed in the program longer had a longer employment length (per spell) after the program. Strong positive average employment effects of ETCP are found both for males and females. The effect is larger for females than for males. The effects of ETCP on labour force participation were not estimated. As a result, we can not draw any firm conclusions regarding its effect on changes in the probability of employment since the latter may come through a change in employment, in labour force participation, or both.

The complete estimation results of equation (A-12) are presented in Table A-6. The most surprising result is that.

age does not appear to have a significant impact on total weeks of employment per spell. The variable job tenure in the previous spell, $EWKS_{t-1}$, is used as a measure of work experience. It was hypothesized that longer tenure will improve the expected future employment length. As expected, the coefficient on $EWKS_{t-1}$ is positive and statistically significant for males, females, and both. The coefficient on $Urate$ is positive and statistically significant. The wage a person earns has a significant negative impact on the person's employment length.

(B) Post Program Increase in Wage Differentials Between Sectors

Our model predicts that job creation through a wage subsidy in the temporary sector will increase the skilled-labour wage in the permanent sector in the new long-run equilibrium. That is

$$(A-14) \quad \frac{W_1}{\bar{W}_2}^* < \frac{W_1}{\bar{W}_2}^{**}$$

where $(W_1/\bar{W}_2)^*$ is the relative wage in the initial equilibrium situation and $(W_1/\bar{W}_2)^{**}$ is the relative wage in the new equilibrium situation after the job creation program has been introduced. To empirically test equation (A-14), we

need data on the pre-program wage in the skilled sector (W_1^*), the post-program wage in the skilled sector (W_1^{**}) and the wage in the unskilled sector, $\bar{W}_2$. No distinction is made between pre- and post-program $\bar{W}_2$ because it does not change by assumption. Unfortunately we do not have sufficient data to test the hypothesis, as stated.¹²

The major objective of wage subsidy programs is to stimulate employment and reduce the level of unemployment in the economy. The concern for reducing unemployment is derived from a concern for the decreased earnings of unemployed workers; and if program participants subsequently suffer less unemployment, their earnings should be higher.¹³ In the literature on job creation, the question is also frequently raised as to whether these programs increase the post-program earnings of the individuals. To our knowledge, there is no empirical evidence on this issue. Our data permit us to estimate the effect of ETCP on participants' earnings. Part of a change in earnings may come about as a result of a change in employment, and part due to a change in the weekly wage rate. Since earlier in this chapter we examined the impact of ETCP on the change in employment, we can now concentrate on the effect of the program on the weekly wages of participants. This quantitative assessment of the effect of the program on participant wages will

provide a measure of the success of the ETCP. By performing this exercise, we are in fact testing for the assumption of the model, that wages in the unskilled sector remain fixed and do not change even after the introduction of the program.

On the basis of our earlier discussion, it is clear that information on participant wages is not in itself sufficient for the analysis of the effect of the program on wages in a changing economy. It is also necessary to have an adequate control group of individuals against whom to compare the wages of program participants, so that general changes in wages are not taken to be the effect of the program. The present data include only those program participants and control group members who were included in the earlier study of the change in probability of employment. The differences between the changes in weekly wages of the ETCP participants and the control group, adjusted for the effects of differences in age, previous employment experience etc., will be the ETCP effects. The dependent variable is

$$\Delta W = W_{ap} - W_{bp}$$

where ΔW = change in average weekly wages one year after the program from one year before

W_{ap} = average weekly wages one year after the program

W_{bp} = average weekly wage one year before the program.

Each individual's expected change in wages, ΔW_e , conditional on his age, previous employment experience, previous occupation, industry, province, and ETCP status is assumed to be given by

$$(A-15) \quad \Delta W_e = b_1 X_1 + C_1 \text{ ETCP} + C_2 \text{ ETCP WKS}$$

where vector X_1 is represented by a set of the same independent variables which were included in equation (A-3). As in equation (A-3), the conditional distribution of ETCP participant weekly wages for a given number of weeks in the ETCP differs from the conditional distribution of control group weekly wages only in location. The difference in location is

$$(A-16) \quad C_1 + C_2 \text{ ETCP WKS}$$

The weekly wages in this data base are obtained from UI data on insurable earnings and premiums paid. As there is a "cut-off" point for UI premiums above which the premium rate

remains the same - a maximum of \$264 per week earnings in 1979 - data on wages below this maximum reflect actual wages, while those above understate the actual amount.

Consequently, in our data set the dependent variable is truncated for those observations where the values are at or above the truncation level. Clearly a technique which accounts for the truncation in the dependent variable would be more appropriate.¹⁴ A suggested technique would be the maximum likelihood procedure.

The observations can be split into two groups. The first group contains those observations with continuous value of the dependent variable, say y_i (where $i=1...n_1$). The probability of falling in this group is given by a normal distribution function, $f(y_i)$, given the explanatory variables X_i and some true linear model with a normally distributed random error with zero mean and constant variance σ^2 . The second group contains those observations j (where $j=1...n_2$) with dependent variable values greater than or equal to some truncation level L_j . The probability of an observation falling in this group (conditional on L_j and X_j) is given by the cumulative probability of Y_i being greater than or equal to L_j given X_j ; or $(1-\Phi(d_j))$ where d_j equals $(L_j - X_j\beta)/\sigma$ and Φ is the cumulative probability of a standard normal distribution. Hence, the likelihood

function, L , is the joint probability of this sample of observations, assuming the linear model is the true relationship between y_i and x_i ; or

$$(A-17) \quad L = \prod_{i=1}^{n_1} f(y_i) \prod_{j=1}^{n_2} (1 - \Phi(d_j))$$

We estimate equation (A-15) by means of ordinary least squares (OLS). For reasons stated earlier, we could not apply the maximum likelihood procedure here. The problem in using OLS is that it results in estimated coefficients that are systematically biased. The degree of bias increases with the severity of the truncation of the sample. In our case, the truncation problem may not be a source of serious bias since only 9 per cent of the sample had actually earned at least the maximum insured earnings.

The coefficient C_2 of ETCP.WKS may be interpreted as the number of additional dollars which a participant earns by staying in the program an additional week. Once the parameters are estimated, the average effect of the ETCP may be obtained by evaluating equation (A-16) at the mean number of weeks the participant spent in the program. If the ETCP did increase the post-program weekly wages of the participants, we would expect the average effect of the program to

be positive. The coefficients of ETCP and ETCP WKS and their t-ratios are presented in Table A-7 along with the average effects.

The coefficient of the average ETCP effect is positive but not statistically significant in any of the cases estimated above. This indicates that ETCP participation did not increase the weekly wages of the participants relative to those of members of the control group. This is not a surprising finding in view of the fact that (i) ETCP individuals had substantial labour market difficulties before entering the program, as argued earlier, in this chapter. For these long-term unemployed individuals, on average, 19.6 weeks of program participation does not seem to be sufficient to leave any significant post-program wage impacts; (ii) ETCP participants were workers from the lower end of the wage distribution (as shown in Table A-8) for whom very limited or virtually no wage advancement opportunities exist in the market in which they are participating.

The detailed estimation results of equation (A-15) are presented in Table A-9. Age of the workers had no significant effect on the change in weekly wages. Previous employment experience (PEMP) is positively related to wages. High PEMP is expected to indicate the higher relative value

of a worker to any employer, and hence, the possibility of earning high wages. The variable is statistically significant for males but not for females. The coefficient on Urate is negative for all the cases and is statistically significant only for the female sample. The negative sign on the coefficient of PROVINCES is not unexpected. In general the coefficient is significant and negative suggesting, lower change in wages in other provinces relative to Alberta - the missing category in regressions.

The overall explanatory power of the equation is quite low (a not unusual phenomenon in cross-section regressions).

The R^2 's are very low (.05 for the males, .09 for females, and .04 for the total sample), and while the F-statistic is significant, it is not very high.

Table A-1

Demographic Characteristics of the ETCP Participants
and Control Group: 1975-1978/79

	<u>ETCP Participants</u>	<u>Control Group</u>
<u>Sex</u>		
Male	69.6	78.3
Female	30.4	21.7
<u>Age (in 1975)</u>		
< 19	44.4	41.7
20-24	22.4	22.7
25-44	27.1	29.6
45-64	6.1	5.9
<u>Provinces</u>		
Newfoundland	1.9	2.8
Prince Edward Island	0.8	0.7
Nova Scotia	2.2	3.3
New Brunswick	4.7	3.6
Quebec	42.1	35.6
Ontario	28.0	30.1
Manitoba	2.7	1.7
Saskatchewan	1.9	1.8
Alberta	2.7	6.0
British Columbia	12.9	12.9

Source: CEIC, Sample ETCP file linked with the LFDB, 1975-78/79.

Table A-2

Labour Market Experience of the ETCP Participants and
Control Group, 1975-1978/79

Labour Market Characteristics*	ETCP Participants			Control Group		
	Male	Female	Total	Male	Female	Total
Mean probability of employment (Π)	.67	.66	.67	.73	.77	.74
Mean probability of unemployment ($1-\Pi$)	.33	.34	.33	.27	.23	.26
Average duration of unemployment in weeks (ADU) per person	37.4	32.0	35.8	30.2	26.1	28.1
Average length of unemployment per spell in weeks (ALU_s)	24.2	27.7	25.0	21.9	22.3	22.0
Average number of spells of unemployment per person (n)	1.7	1.4	1.6	1.5	1.3	1.4
Average length of employment per spell in weeks (ALE_s)	17.8	22.0	18.7	18.1	21.2	18.6
Average number of spells of employment per person (m)	4.3	2.8	3.9	4.4	3.2	4.2
Mean proportion of unemployed time in receipt of unemployment insurance benefits (d)	.88	.88	.88	.86	.85	.86

* For calculation of these variables, see Table A-10.

Source: CEIC, Sample ETCP file linked with the LFDB, 1975-78/79.

Table A-3

Estimated Coefficients of ETCP and ETCP WKS and Average ETCP Effects on the Change in Probability of Employment (ΔPE) by Sex

Coefficients of	Male Sample	Female Sample	Total Sample
	(t-statistics)		
ETCP	.011 (0.32)	-.086 (1.22)	-.016 (0.52)
ETCP WKS	.001 (0.57)	.006 (1.75)	.002 (1.26)
Total ETCP effect	.030* (0.44)**	.042 (0.30)	.023 (0.38)
Mean of ETCP WKS (in weeks)	18.82	21.36	19.6

* This value is derived as $(a_7 + a_8 \cdot \text{ETCP WKS})$

** These t-statistics are based on the standard errors derived according to the relation $\text{var}(a_7 + a_8 \text{ ETCP WKS}) = \text{var}(a_7) + \text{ETCP WKS}^2 \text{var}(a_8) + 2 \text{ ETCP WKS cov}(a_7, a_8)$.

Table A-4

Determinants of the Change in the Proportion of Time Employed
Between ETCP Participants and Control Group:
One Year Before the ETCP and One Year After
OLS Estimates: Dependent Variable, ΔPE

Coefficients of	Male Sample (t-Statistics)	Female Sample	Total Sample
Intercept	-1.054 (4.19)	-1.584 (3.78)	-1.189 (5.43)
Age	.001 (0.96)	-7.842 (0.03)	.0007 (0.58)
PEMP	-.167 (4.26)	.007 (0.10)	-.107 (3.23)
Urate ^a	.078 (2.50)	.108 (1.91)	.083 (3.04)
ETCP	.011 (0.32)	-.086 (1.22)	-.016 (0.52)
ETCP WKS	.001 (0.57)	.006 (1.75)	.002 (1.26)
<u>OCCUPATION^b</u>			
OCC 1	.216 (2.37)	.145 (1.14)	.206 (2.83)
OCC 2	.134 (1.67)	.134 (1.77)	.153 (3.11)
OCC 3	.018 (0.23)	.143 (1.06)	.058 (0.88)
OCC 4	-.012 (0.17)	.062 (0.63)	.024 (0.43)
OCC 5	.006 (0.09)	.191 (1.71)	.076 (1.37)
OCC 6	.024 (0.40)	-.150 (0.41)	.046 (0.78)
OCC 7	.121 (2.52)	.137 (1.62)	.117 (2.87)
OCC 8	.133 (3.07)	-.092 (0.47)	.129 (3.15)
OCC 9	.025 (0.38)	.214 (0.48)	.037 (0.58)
OCC 10	.165 (3.14)	.081 (0.66)	.171 (3.59)
OCC 11	.315 (1.85)	.271 (0.75)	.299 (1.93)

PROVINCES^b

NFLD	.292 (2.88)	.571 (2.58)	.401 (4.40)
NS	.314 (3.31)	.315 (1.65)	.355 (4.21)
NB	.085 (1.06)	.653 (4.27)	.248 (3.55)
PEI	.222 (1.53)	1.016 (1.98)	.322 (2.33)
QUEBEC	.141 (2.51)	.299 (3.19)	.206 (4.31)
ONT	.118 (2.06)	.313 (3.31)	.187 (3.85)
MAN	.186 (1.89)	.596 (3.31)	.308 (3.59)
SASK	.207 (2.12)	.136 (0.77)	.220 (2.59)
BC	.169 (2.73)	.455 (4.15)	.262 (4.93)

INDUSTRY^b

IND 1	.009 (0.08)	.000 (0.00)	.025 (0.23)
IND 2	-.01 (0.22)	-.023 (0.23)	-.020 (0.45)
IND 3	-.053 (0.94)	-.262 (1.19)	-.040 (0.76)
IND 4	-.208 (2.47)	.345 (1.26)	-.130 (1.64)
IND 5	-.093 (1.60)	-.068 (0.60)	-.087 (1.69)
IND 6	-.0146 (1.33)	-.005 (0.04)	-.124 (1.56)
IND 7	-.060 (0.96)	-.062 (0.57)	-.075 (1.44)
IND 8	-.107 (1.51)	.044 (0.35)	-.074 (1.21)

R ²	.06	.15	.06
F Ratio	3.11	2.42	3.93
No. of Observations	1513	476	1989
Mean of the Dependent Variable	-0.32	-0.36	-0.33

a denotes Average National Unrate for the period under consideration.
b denotes Occupation, Provinces, and Industry of the employment spell prior to the ETCP.

Table A-5

Estimated Coefficients of ETCP and ETCP WKS and Average ETCP
Effects on Employment Weeks Per Spell by Sex

<u>Coefficients of</u>	<u>Male Sample</u>	<u>Female Sample</u>	<u>Total Sample</u>
	(t-statistics)		
ETCP	-12.62 (16.57)	-13.810 (8.48)	-11.314 (16.42)
ETCP WKS	.926 (21.53)	.961 (11.01)	.922 (24.21)
Total ETCP effect	4.801* (3.06)*	6.716 (2.93)	6.727 (4.65)
Mean of ETCP WKS (in weeks)	18.82	21.36	19.6

* For calculation procedures, see notes to Table A-3.

Table A-6

Determinants of Total Weeks of Employment Per Spell:
ETCP Participants and Control Group, 1975-1980
OLS Estimates: Dependent Variable, $EWKS_t$

Coefficients of	Male Sample (t-Statistics)	Female Sample	Total Sample
Intercept	5.983 (4.47)	5.186 (1.74)	6.741 (3.89)
Age	.001 (0.08)	.029 (0.93)	.010 (0.86)
$EWKS_{t-1}$	.098 (13.37)	.036 (2.55)	.081 (12.71)
Urate ^a	.803 (5.58)	.693 (2.17)	1.416 (9.27)
W_t	-.003 (10.40)	-.003 (4.50)	-.003 (12.77)
ETCP	-12.626 (16.57)	-13.810 (8.48)	-11.344 (16.42)
ETCP WKS	.926 (21.53)	.961 (11.01)	.922 (24.21)
<u>OCCUPATION</u>			
OCC 1	2.085 (2.22)	2.321 (1.35)	2.038 (2.55)
OCC 2	.097 (0.11)	3.220 (3.15)	1.812 (3.23)
OCC 3	1.726 (2.06)	1.496 (0.89)	1.730 (2.36)
OCC 4	.524 (0.70)	-.068 (0.05)	.482 (0.79)
OCC 5	2.354 (3.40)	.306 (0.22)	1.588 (2.69)
OCC 6	1.211 (1.94)	-2.766 (0.63)	1.244 (2.02)
OCC 7	1.384 (2.84)	2.043 (1.85)	1.438 (3.37)
OCC 8	.387 (0.90)	.101 (0.04)	.266 (0.65)
OCC 9	1.316 (2.06)	7.229 (1.48)	1.206 (1.95)
OCC 10	-.952 (1.78)	.449 (0.31)	-.875 (1.78)
OCC 11	3.206 (1.72)	2.904 (0.52)	3.539 (2.02)

PROVINCES

NFLD	.119 (0.11)	-.805 (0.25)	-.403 (0.41)
NS	1.039 (0.69)	-5.353 (1.25)	-2.427 (2.85)
NB	-1.644 (1.78)	-1.031 (0.40)	-2.030 (2.69)
PEI	-.868 (1.05)	-5.032 (2.40)	-.331 (0.24)
QUEBEC	.885 (1.43)	-1.157 (0.85)	.250 (0.45)
ONT	1.196 (1.91)	1.169 (0.87)	.423 (0.76)
MAN	1.739 (1.55)	3.086 (1.18)	.648 (0.64)
SASK	-.176 (0.17)	4.934 (2.01)	.454 (0.48)
BC	.251 (0.38)	.001 (0.00)	-.358 (0.61)

INDUSTRY

IND 1	-1.428 (1.22)	0.00 (0.00)	-.978 (0.85)
IND 2	-1.430 (2.68)	2.181 (1.83)	-.749 (1.57)
IND 3	-1.611 (2.80)	7.898 (2.52)	-1.172 (2.21)
IND 4	-1.465 (1.69)	-4.212 (1.03)	-1.420 (1.76)
IND 5	-.449 (0.71)	1.896 (1.32)	.085 (0.15)
IND 6	-2.200 (1.64)	2.958 (1.66)	-.041 (0.04)
IND 7	-2.236 (3.35)	1.800 (1.38)	-1.145 (2.02)
IND 8	-1.464 (1.97)	1.827 (1.21)	-.668 (1.03)

R ²	.10	.10	.12
F Ratio	29.66	6.56	39.32
No. of Observations	9,595	2,119	11,714
Mean of the Dependent Variable (Weeks)	12.60	13.53	12.77

a denotes Average National Urate for the period under consideration.

Table A-7

Estimated Coefficients of ETCP and ETCP WKS and
Average ETCP Effects on Weekly Wages by Sex

<u>Coefficients of</u>	<u>Male Sample</u>	<u>Female Sample</u>	<u>Total Sample</u>
	(t-statistics)		
ETCP	-17.367 (2.45)	22.325 (1.91)	-8.741 (1.44)
ETCP WKS	1.112 (3.22)	.041 (0.07)	.907 (3.06)
Average ETCP effect	3.56* (0.26)	23.20 (0.97)	9.04 (0.76)
Mean of ETCP WKS (in weeks)	18.82	21.36	19.6

* For calculation procedures see notes to Table A-3.

Table A-8

Wage Distribution of ETCP Participants and Control Group in the
Sample One Year Before and One Year After the ETCP

Wages (\$)	<u>ETCP Participants</u>		<u>Control Group</u>	
	One Year Before ETCP (%)	One Year After (%)	One Year Before ETCP (%)	One Year After (%)
< 150 \$	33.33	43.72	32.13	37.69
151-200 \$	23.43	21.83	20.25	20.13
> 200 \$	43.23	34.45	47.62	42.15

Source CEIC, Sample ETCP file linked with the LPDB, 1975-78/79.

Table A-9

Determinants of Change in Average Weekly Wage Between ETCP Participants
and Control Group: One Year Before the ETCP and One Year After
OLS Estimates: Dependent Variable ΔW

Coefficients of	Male Sample (t-Statistics)	Female Sample	Total Sample
Intercept	131.708 (2.62)	226.234 (2.97)	147.724 (3.52)
Age	-.151 (0.57)	-.293 (0.69)	-.235 (1.05)
PEMP	18.398 (2.36)	.751 (0.07)	15.652 (2.47)
Urate ^a	-.875 (0.14)	-16.791 (1.77)	-3.560 (0.68)
ETCP	-17.367 (2.45)	22.325 (1.91)	-8.741 (1.44)
ETCP WKS	1.112 (3.22)	.041 (0.07)	.907 (3.06)
<u>OCCUPATION^b</u>			
OCC 1	12.570 (0.69)	6.542 (0.31)	-9.903 (0.71)
OCC 2	-19.409 (1.21)	-5.032 (0.40)	-20.693 (2.19)
OCC 3	16.198 (1.07)	-6.867 (0.30)	7.550 (0.60)
OCC 4	11.070 (0.80)	6.589 (0.40)	8.111 (0.76)
OCC 5	-25.244 (1.92)	-14.416 (0.77)	-28.615 (2.70)
OCC 6	-20.287 (1.67)	-76.738 (1.26)	-18.667 (1.66)
OCC 7	-9.780 (1.02)	6.873 (0.49)	-9.771 (1.25)
OCC 8	-23.016 (2.66)	31.885 (0.98)	-17.715 (2.27)
OCC 9	-3.136 (0.24)	-66.487 (0.89)	.586 (0.05)
OCC 10	-40.764 (3.89)	5.883 (0.29)	-34.534 (3.78)
OCC 11	6.892 (0.20)	-48.365 (0.80)	-.044 (0.00)

PROVINCES^b

NFLD	-15.724 (0.78)	-34.090 (0.92)	-20.142 (1.16)
NS	-51.830 (2.74)	-71.071 (2.23)	-54.020 (3.34)
NB	-34.658 (2.17)	-60.188 (2.36)	-39.442 (2.94)
PEI	-62.390 (2.16)	-112.820 (1.32)	-65.271 (2.46)
QUEBEC	-29.218 (2.61)	-48.130 (3.07)	-31.228 (3.42)
ONT	-33.042 (2.90)	-43.141 (2.73)	-35.342 (3.80)
MAN	-36.543 (1.86)	-42.230 (1.40)	-35.619 (2.17)
SASK	-22.231 (1.14)	-11.721 (0.40)	-21.412 (1.31)
BC	-35.252 (2.85)	-37.382 (2.04)	-33.377 (3.28)

INDUSTRY^b

IND 1	2.304 (0.10)	.000 (0.00)	9.483 (0.45)
IND 2	-11.825 (1.18)	1.740 (0.10)	-8.907 (1.04)
IND 3	-5.497 (0.49)	55.431 (1.51)	-8.003 (0.08)
IND 4	-14.282 (0.85)	12.187 (0.27)	-11.629 (0.77)
IND 5	-8.744 (0.76)	15.180 (0.80)	-3.573 (0.36)
IND 6	-2.942 (0.13)	14.374 (0.65)	-.829 (0.05)
IND 7	-32.870 (2.62)	-1.931 (0.11)	-28.833 (2.89)
IND 8	-11.393 (0.80)	9.605 (0.46)	10.617 (0.91)

R ²	.05	.09	.04
F Ratio	2.31	1.43	2.73
No. of Observations	1513	476	1989
Mean of the Dependent Variable (\$)	76.30	62.55	73.01

a denotes Average National U-rate corresponding to the period under consideration.
b denotes Occupation, Province, and Industry of the employment spell prior to ETCF.

Table A-10

Calculation of Variables Used in Table A-2

$$\Pi = \frac{1}{T} \left(\sum_{i=1}^T (\text{Total weeks of employment, from 1975 till ETCP joining date})_i / (\text{Total weeks in the labour force, from 1975 till ETCP joining date})_i \right)$$

$$(1-\Pi) = \frac{1}{T} \left(\sum_{i=1}^T (\text{Total weeks of unemployment, from 1975 till ETCP joining date})_i / (\text{Total weeks in the labour force, from 1975 till ETCP joining date})_i \right)$$

$$ADU = \frac{1}{T} \sum_{i=1}^T (\text{Total weeks of unemployment, from 1975 till ETCP joining date})_i$$

$$ALU_s = \frac{1}{\sum_{i=1}^T N} \sum_{i=1}^T (\text{Total weeks of unemployment from 1975 till ETCP joining date})_i$$

$$n = \frac{1}{T} \sum_{i=1}^T N$$

$$ALE_s = \frac{1}{\sum_{i=1}^T M} \sum_{i=1}^T (\text{Total weeks of employment from 1975 till ETCP joining date})_i$$

$$m = \frac{1}{T} \sum_{i=1}^T M$$

$$d = \frac{1}{T} \sum_{i=1}^T \left(\text{Total weeks UI benefits received, from 1975 till ETCP joining date} \right) / \left(\text{Total weeks of unemployment from 1975 till ETCP joining date} \right)$$

where,

N = total number of spells of unemployment per individual i

i = number of individuals ($i=1,2,\dots,T$)

M = total number of spells of employment per individual i

Notes to Chapter 1

1 See, CEIC Task Force Report (July 1981).

2 See Economic Council of Canada (1982). Evidence from the United States on the effectiveness of federally run training programs under the Comprehensive Employment and Training Act (CETA) confirms that these programs were not successful in increasing income and employment opportunities for those who participated in these programs. See, for example, Ashenfelter (1978).

3 Activity under AOTA includes both institutional and industrial training; the former is provided under the Canada Manpower Training Program (CMTP), while the latter operates through the Canada Manpower Industrial Training Program (CMITP) and Critical Trades Skill Training (CTST). In January 1982, a new proposal, known as the National Training Plan (NTP) was initiated by the federal government.

4 Haveman (1980).

5 According to Haveman (1980), the political rationale for direct job creation rests on two factors. First, some of the appeal of direct job creation stems from frustration over the apparent failures of early labour-market programs in the late 1960s, such as training and education for the unskilled, to correct supply-side deficiencies. Second, increasing public dissatisfaction with growth of the income support system and hints about linking welfare with some work requirement led policy-makers to place more emphasis on fitting individuals into a job slot and less on the value of their output.

6 Job creation programs have also been designed to provide summer employment for youths and students. In 1971, the Opportunities for Youth (OFY) program was established, with the principal objectives being to create short-term (10 weeks in duration) employment for students. The employment strategy also contained a number of proposals to reduce youth unemployment. The Young Canada Works (YCW) and Summer Job Corps (SJP) programs were introduced in 1977 as part of the Student Summer Employment and Activities Programs (SSEAP) which, the following year, became known as the Summer Youth Employment (SYE) program. During the summer of 1977, YCW created 30,517 summer jobs, with an overall expenditure of approximately \$43.6 million. In the summer of 1979, 33,037 jobs were created at a cost of about \$53.4 million. SYE created 45,335 short-term jobs in the summer

of 1980, at an expenditure of about \$53.4 million. For details see CEIC Task Force (July 1981) and Economic Council of Canada (1982).

7 Experimentation bearing on possibility of using unemployment insurance (UI) funds in support of job creation, as authorized under Section 38 of the Unemployment Insurance Act, is presently being conducted. The principal objective of such a measure would be to provide interim employment opportunities, particularly in major layoff situations, so as to retrain the work force for future permanent employment. UI benefits would be used to help defray wage costs. A pilot "work-sharing" program using UI funds to compensate workers for short-term work has also been established. By paying UI funds to employees of participating firms who are working on a short-term basis, the work-sharing program allows employers to maintain their work force intact.

8 See, for example, Haveman and Palmer (1982).

9 For goods and services exchanged in the market, the standard measure of value is the willingness to pay. Market prices indicate the willingness to pay based on the data from market transactions. For output produced by these program participants no such index of value exists. This is a problem not only for the outputs of the public-sector employment programs but also for the valuation of the output of the government sector generally. In reality, the maximum value of the output will be equal to what the community would have to pay for a particular output if it were to purchase the output on a contractual basis. This can clearly exceed the willingness to pay for that service.

10 Haveman (1978) also points to three additional "social psychological" benefits which are harder to estimate: (1) any improved well being of participants that is not reflected in increased economic productivity; (2) any reduction in social costs or increases in output that might occur as a result of the first benefit - such as lower medical expenses or improved productivity of a spouse; and (3) any improved satisfaction among the community at large because of the programs' results.

11 A recent OECD study (1980) reports, "no studies have been done on the Canadian programs, but the fact that they are performed on a fixed duration project basis, where average worker duration for CW is 15 weeks; and for YCW 11 weeks, plus the fact that normal market sector activities are not allowed, precludes many opportunities for displacement. In the LEAP program, which is highly targeted

- on the hard-to-employ and where projects are designed from the ground up, officials consider all jobs to be net."

12 While there seems to be little evidence regarding the displacement effects of PSE programs in the private sector, concern has been expressed about fiscal substitution effects. To the extent that sponsors increase their regular non-PSE employment as the number of PSE slots increase, PSE subsidies replace funds from normal sources, thus creating a "fiscal substitution effect." There are basically three ways in which this type of displacement can happen: (i) the funds can be used to retire debt (or to reduce borrowing); (ii) the administration (provincial and local authorities) can reduce taxes or postpone raising them; and (iii) funds can be used to increase expenditures on items other than direct employment. If the fiscal substitution effect is significant, it represents a serious limitation of the PSE approach as an employment-stimulating policy.

13 For a brief survey in this context, see Dodge (1978).

Notes to Chapter 2

1 Harberger (1980).

2 See, for example, Economic Council of Canada (1982); Labour Market Task Force (1981); and Glenday and Jenkins (June 1981).

3 The unemployment or non-employment in the temporary sector may arise because of various factors. The first is the level of aggregate demand in the economy; the second is the labour/leisure choice; the third is the job search; and the fourth is the existence of labour market imperfections such as the minimum wage, information externalities in the labour market, union monopoly power, firm monopsony power and collective bargaining. In our model, we assumed that the unemployment is caused by the minimum wage.

4 Throughout the subsequent analysis, we use the following terms interchangeably: (i) Sector I or the skilled sector or the permanent sector; and, (ii) Sector II or the unskilled sector or the temporary sector.

5 In making these Ricardian type production assumptions we are abstracting from capital as an input into production processes. We are implicitly assuming that capital is perfectly mobile between sectors and allocated with efficiency.

6 Throughout our analysis, the terms value of leisure and value of non-market time are used interchangeably.

Notes to Chapter 3

1 For our long-run analysis, we are ignoring the transition process between long-run equilibrium situations. That is, we are not interested in the question of how long it will take. Also, because equation (2-8) always holds, we can ignore the period beginning (b) and ending (e) distinction.

2 For an analysis of costs associated with subsidies, see D. Usher (1983).

3 Analytically, this result is identical to that obtained by Boadway and Flatters (1981).

4 By dividing the numerator and the denominator of equation (3-28) by f_2^* , we get

$$\frac{dL_1}{d\bar{w}_2} = \frac{\{N_2 + (\bar{w}_2 - h)/f_2^*\}}{\{f_1^* L_2 - \Pi(\bar{w}_2 - h)\}}$$

5 Equation (3-31) is arrived at by making the following manipulations.

$$\eta_2 = \frac{dN_2}{d\bar{w}_2} \cdot \frac{\bar{w}_2}{N_2}$$

solving for $(dN_2/d\bar{w}_2)$ from equation (3-30) and by substituting that into the above equation, we get equation (3-31):

$$\eta_2 = \frac{N_2}{-(\bar{w}_2 - h)} \cdot \frac{\bar{w}_2}{N_2}$$

6 The result in equation (3-32) is identical to that obtained by Boadway and Flatters (1981), despite the fact that in their model the change in initial endowment is viewed as taking place before the migration equilibrium is worked out. In our case, the labour endowments are changed after the long-run equilibrium has been achieved.

7 To examine the effect of a reduction in the labour endowment ($\bar{L}$) through the reduced supply of unskilled labour, let us rewrite equation (2-3) of our basic model as

$$L_1 + L_2 = \bar{L}_1 + \bar{L}_2 = \bar{L}$$

Similarly equation (3-14) can be replaced by equation (3-14)' below:

$$(3-14)' \quad dL_1 + dL_2 = d\bar{L}_1 + d\bar{L}_2 = 0$$

To examine the effect of a change in $\bar{L}_2$ on the long-run equilibrium value of the skilled labour supply, we solve for $(dL_1/d\bar{L}_2)$ from the system of equations (3-14)' and equations (3-12) to (3-17) excluding equation (3-14). We get

$$(3-32)' \quad \frac{dL_1}{d\bar{L}_2} = \frac{\Pi(\bar{w}_2 - h)}{\{\Pi(\bar{w}_2 - h) - f_1'' L_2\}}$$

One can similarly solve for $dL_1/d\bar{L}_1$. This is given by

$$\frac{dL_1}{d\bar{L}_1} = \frac{\Pi(\bar{w}_2 - h)}{\{\Pi(\bar{w}_2 - h) - f_1'' L_2\}}$$

These results suggest that

$$\frac{dL_1}{d\bar{L}} = \frac{dL_1}{d\bar{L}_2} = \frac{dL_1}{d\bar{L}_1}$$

Notes to Chapter 5

1 Some writers have focused more strongly on employment and output as objectives than on efficiency. See, for example, Baily and Tobin (1977).

2 Jackman and Layard (1980).

3 It is assumed that the solution of reducing (removing) minimum wages and unemployment insurance benefits is ruled out on equity and insurance grounds.

4 In the relevant literature, the expressions "social opportunity cost of labour" and "shadow price of labour" have been used inter-changeably. Throughout this discussion, however, I shall use the former term. Further the "social opportunity cost of labour" (SOCL) and "social opportunity cost of a job" are used interchangeably.

5 In the literature on development, it is generally assumed that migration flows in a more or less steady stream from rural to urban areas (Harris and Todaro [1970]). When new unskilled jobs are created in urban areas, they are filled by migrants from rural areas. For these unskilled urban jobs, the commonly held notion is that the relevant measure of the social opportunity cost is the marginal product of agricultural labour in rural areas. Harberger (1971) argues that this argument contains a basic flaw. The social opportunity cost of labour (SOCL) need not be determined by the marginal product of labour forgone in rural areas when the workers are employed in urban jobs. The reasoning is essentially that there are differences in working conditions and environmental characteristics across areas, so that a worker may require a different wage level in order to derive equal utility. Therefore, the competitive wage, for a given skill classification of labour and in a given labour market area, would be the best available measure of the social opportunity cost of that type of labour in that area. Harberger goes one step further and suggests that the concept of voluntary supply price which provides a far more technically rigorous and subtle basis for approaching the measurement of social opportunity cost than does the concept of forgone product. Underlying this argument is the idea that national accounts are not a good measure of welfare. He gives the frequently cited example of the man who marries his housekeeper, welfare has, we presume, improved, but national income (and product aggregates) has fallen, because the money that the man gives to his new wife does not appear as wages. Since it is difficult to measure the voluntary supply price of labour, the competitive wage can be used as a good proxy for supply price.

6 In standard methodology the expression for welfare change is derived from an underlying utility function. See, for example, Sen (1972), and Findlay and Wellisz (1976).

7 UI payments are a net receipt for the region, and thus a benefit to it. From the point of view of the country, this is just a transfer. Therefore, in principle there are two measures.

8 The social opportunity cost of a particular size of a wage subsidy can be derived as follows: By multiplying both sides of equation (5-4) by dN_2/ds , we get

$$(5-4)' \quad \frac{dz}{dN_2} \cdot \frac{dN_2}{ds} \Big|_{\bar{L}} = \{f_2' - h - (f_1' - h - C) \frac{dL_2}{dN_2}\} \frac{dN_2}{ds}$$

By substituting the value of dN_2/ds from equation (3-21) into equation (5-4)', we get

$$\frac{dz}{ds} \Big|_{\bar{L}} = \{f_2' - h - (f_1' - h - C) \frac{dL_2}{dN_2}\} \left(-\frac{1}{f_2''} \right)$$

$$(5-6)' \quad = -\frac{f_2'}{f_2''} + \frac{1}{f_2''} \{h + (f_1' - h - C) \frac{dL_2}{dN_2}\}$$

or,

$$(5-7) \quad \frac{dz}{ds} \Big|_{\bar{L}} = -\frac{f_2'}{f_2''} + \frac{1}{f_2''} \{h - (f_1' - h - C) \frac{dL_1}{dN_2}\}$$

$$\left(\text{since } \frac{dL_2}{dN_2} = -\frac{dL_1}{dN_2} \right)$$

9 In case that $f_1''=0$, the SOCL from equation (5-16) will be given by

$$SOCL = h + \frac{(f_1' - h - C)}{\Pi}$$

Then using equilibrium condition (2-8), $f_1' - C = \Pi \bar{W}_2 + (1 - \Pi)h$,

$$SOCL = \frac{\Pi \bar{W}_2 + (1 - \Pi)h - (1 - \Pi)h}{\Pi} = \bar{W}_2$$

10 Note that, in our welfare analysis, for a small change in the number of jobs in the temporary sector, we consider $f_2^* = \bar{w}_2$ and therefore, the output gain in the temporary sector is counted as the area abcd instead of amcd. For a big sized job creation program, we shall move along the demand curve MPL_2^d and the net output will be shown by the area amcd.

11 As pointed out by Jenkins and Kuo (1978), this measurement of the welfare gains and losses from the externalities caused by market distortions is consistent with the formulation of the measure of welfare changes presented by Harberger (1971a):

12 As shown by Jenkins and Kuo, an alternative derivation for the SOC of retaining a migrant which gives the same final result is the sum of the following items:

- (i) the SOC of labour in the temporary sector if there is no migration: $[\Pi \bar{w}_2 + (1-\Pi)h]$
- (ii) the net increase in income tax collections to society from a relocation in a higher-income sector:

$$[\Pi_a \bar{w}_{2a} t_{2a} - \Pi \bar{w}_2 t_2]$$
- (iii) the saving in unemployment insurance payments to the society from the movement to the high-income sector:

$$[(1-\Pi)b.d(1-t_2) - (1-\Pi_a)b_a d_a (1-t_{2a})]$$

13 The SOCL associated with creating a permanent job in the slow-growth region is equal to the SOC of one migrant. It is clear, therefore, that the creation of jobs in the temporary sector results in a significantly higher social cost than the creation of jobs in the permanent sector. For a detailed discussion, see Jenkins and Kuo (1978).

14 Alternatively, SOCL can be derived as:

- (i) the SOC of labour in the temporary sector if there is no movement across sectors: $[\Pi \bar{w}_2 + (1-\Pi)h]$

(ii) the net increase in income tax collections to society from a relocation in the permanent sector:

$$[W_1 t_1 - \Pi \bar{W}_2 t_2]$$

(iii) the saving in unemployment insurance payments to society from the movement to the permanent sector:

$$[(1-\Pi)b.d(1-t_2)]$$

15 This will take place if $W_1 < \Pi' \bar{W}_2 + (1-\Pi')h$ where Π' is the new probability of employment caused due to job creation in the temporary sector. If physical reverse migration from the permanent to the temporary sector takes place, the expression for the change in social welfare will be:

$$dz = dx_1 + dx_2 + h(dL_2 - dN_2)$$

since C is a sunk cost.

16 This is derived in Boadway and Flatters (1978).

Notes to Chapter 6

1 Note that in the constant marginal product of case, in which $f_1'' = f_2'' = 0$, it can be seen from equation (6-4) that $dL_1/dN_2 = -1/\Pi$. If $f_1'' < 0$ and $f_2'' < 0$, then $-dL_1/dN_2 < 1/\Pi$ and the reduction in movement of labour to the permanent sector is less than the constant marginal product case.

2 The possibility that $dE > dN_2$ is ruled out in our model since the model does not allow for $dL_1/dN_2 > 0$.

Notes to Chapter 7

1 The rate of tax credit is linked to the geographic area's unemployment rate.

2 The initial response to the program was not encouraging, despite the fact that a nation-wide advertising campaign (at a cost of \$800,000) was launched by the Canada Employment and Immigration Commission (CEIC) in May 1978 to promote private-sector interest in the program. This reluctance on the part of employers to participate resulted in a very slow program take-off: for example, only 5,000 jobs had been approved by the beginning of August 1978. Concern over this situation led to a survey of employers during June 1978, in an attempt to ascertain those factors associated with the apparent lack of private-sector interest. The Survey revealed that while the majority of companies surveyed viewed the program favourably, some were reluctant to participate for various reasons:

- the "incentive" to participate (i.e., the size of the tax credit) was deemed insufficient;
- employers were deterred by the requirement to hire a person who had been unemployed for a period of at least 8 weeks prior to being hired;
- they were deterred by the possibility of an audit by Revenue and Taxation Canada;
- they were deterred by the requirement that the job must be incremental in nature and certified as such by the employer in the agreement to hire.

Specific program design changes were, therefore, initiated in the Fall of 1978, and a second advertising campaign to promote employer and general public awareness of the revised ETCF was implemented during October 1979, at a cost of \$490,000.

Potential modifications were constrained by the fact that while regulation-based changes were possible, it was not possible (at that point in time) to effect revisions that required a legislative change in the Employment Tax Credit Act. Thus, while it was clear from the Survey data that the largest marketing "pay-off" would result from an increase in the tax credit incentive itself, it was decided to focus attention on those "deterrent" factors that required only a regulation-based change. The modified program included, among others, provisions to extend the duration of the subsidy from 9 to 12 months, to increase its potential value by one third, and to reduce the 8-week "unemployment qualification" for eligible workers to two weeks.

3 For details, see Guide to the Employment Tax Credit Program, Canada Employment and Immigration Commission and Revenue Canada, 1978.

4 This period was chosen because employment information from the Record of Employment file in the longitudinal data file is available only from 1974. Longitudinal information on unemployment from UI records dates from 1972.

Notes to Chapter 8

1 The insured workers constitute approximately 90 per cent of the total work force in Canada.

2 If an individual was employed (unemployed) on 1st January 1975, the information on the employment (unemployment) episode in our sample began as of the date that spell started.

3 The concept of unemployment used here is somewhat different from that of the Labour Force Survey (LFS) carried out by Statistics Canada. According to the LFS, a person is unemployed if he, or she, is not working but looking for work during a reference week of a given month. This concept is rooted in job search activity, whereas our longitudinal measure of unemployment is tied to the unemployment insurance claim experience. A person is unemployed after a job during a given week if, after job separation, he, or she, is serving a waiting period, or receiving a full UI regular benefit, or serving a disqualification or a disentitlement period. In fact, the criterion of receiving regular benefit is the most frequent decision rule used in establishing whether or not a particular week is treated as unemployed for an individual. A person by interacting with the UI program reveals his, or her, unemployment status. Our concept of unemployment appears, on the surface, different from that of the LFS, but they are in fact conceptually related. A person who is receiving regular UI benefit is expected to search actively for a job. New entrants and some re-entrants, included in the LFS unemployment flow, are, however, not included in the insured population, and, therefore, excluded in the longitudinal file. They may be ineligible for unemployment insurance benefits.

Our criterion for determining when a person is out of the labour force is much more restrictive than the one used by Statistics Canada for its labour force survey. For the UIC-ROE data base, an individual is classified as being out of the labour force only if the person notified the UIC that for reasons such as sickness, schooling, maternity leave or retirement, they were not available for work. Alternatively, if in our examination of the person's labour force experience we find that he or she quit a job, did not find subsequent employment for an extended period, was eligible to collect UIC benefits but did not make a claim, then we classified this individual as being out of the labour force. This criterion has also been used by some of other users of the LFDB. See, for example, Glenday and Jenkins, July 1981.

4 Glenday and Jenkins (July, 1981) argue that because a large fraction of women in the labour force are the second earners in families and have a relatively high opportunity cost in terms of forgone household time, the probability of employment will be lower for females in alternative employment.

5 See, Goldberger (1964), p. 249; and Amemiya (1981).

6 See, Amemiya and Nold (1975); Berkson (1951, 1953); and Theil (1970).

7 During the sample period from 1975 until the program joining date, the number of weeks in the labour force (N) differs across individuals giving rise to heteroscedastic residuals.

8 In a recent paper Johnson (1983) has concluded that a large part of the observed sex differentials in unemployment rates may be attributed to the definition and methodology used in deriving unemployment statistics rather than to discrimination in productive opportunities.

9 Glenday and Jenkins (July, 1981) estimate the proportion of labour force time employed for the individuals in the labour force who had experienced some unemployment during 1974 through 1979. They utilize the same data base (LFDB). The equation is estimated directly by OLS. They found a relatively weak explanatory power of the equation. The adjusted R^2 was equal to .11, F Statistic= 54.7.

10 See, Unemployment Insurance in the 1980s, CEIC Task Force Report, July 1981, p. 56.

11 There are some provisions for special UI benefits for women. See, Unemployment Insurance in the 1980s (1981), p. 46.

12 See, Unemployment Insurance in the 1980s (1981), p. 60.

13 This is calculated according to the formula where uniform annual payments to be paid at the end of each year per \$1 borrowed now. For example, a debt of \$1 can be repaid, at 10 per cent interest, with \$1.10 in one year or 57.8 cents annually for two years, or 40.3 cents annually for three years or 13.2 cents annually for 15 years.

14 Even if we assume a uniform value of C for all the provinces, it does not make any significant difference to the calculations of the value of h.

15 In a Wall Street Journal article (Aug. 3, 1982, p. 1) on "Union Organizer Faces Harder Job....." the following observation is made: "Non-union employees are seeing unionized industries hit hardest by the economic slump". From the same source (July 30, 1982, p. 1), an article on United States (US) Wage negotiations with US Steel notes that lower wages are being demanded by management or more lay-offs will ensue: "Racked by the recession and unable to compete against lower-cost foreign producers steelmakers are warning the union that unless it complies there will be more lay-offs. Currently more than 100,000 steelworkers are out of work".

16 See, Unemployment Insurance in the 1980s, CEIC Task Force, July 1981, p. 58.

17 Notice that the values of leisure time when unemployed also include the value of hours spent in job search activity. The evidence suggests that the average unemployed individual spends only about 8.4 hours per week in search activity. See, for example, R.J. Gordon (1973); and A. Hasan and S. Gera (1982). For ETCP workers, the amount of time devoted to search activity is presumably very low. Those individuals who claim to have searched in the past four weeks and are thereby classified as unemployed may be distinguished from the subset classified as "not in labour force" more by their desire to retain UI benefits than by a significantly different pattern of daily activity.

18 A regression equation ($h = a_0 + a_1 \text{ Provincial Urate}$) is estimated by OLS. The result we get:

$$h = 96.99 - 5.50 \text{ Provincial Urate} \quad R^2 = .63$$
$$(6.82) \quad (3.46) \quad \text{No. of observations} = 9$$

The numbers in the parenthesis represent t-statistics.

19 Previously suggested imputations for the price of non-market activity have ranged from the market wage rate in studies of passenger transport to Tobin's suggestion that the time spent by laid-off employees awaiting recall is a "deadweight loss", perhaps influenced by remarks in Bakke's depression case studies - "My time has no value, and of course if I figured in my own time, that wood would cost me as much as if I bought it, but my time isn't worth anything when I don't have a job" quoted from Gordon (1973).

20 The detailed definition and construction procedure of the variables involved in the equation (8-22) may be found in the RDXF model of the Bank of Canada.

21 Although this estimate is comparable with some of the studies done elsewhere (Kopits, 1978), Clark and Freeman (1980) suggest that the time series studies of the determinants of employment have tended to find relatively low elasticities of response to wage changes. According to them, the low econometric estimates of elasticities of demand may result "from the particular type of model specified, with alternative models yielding different results; peculiar variation or lack of variation in the factor price variables, creating poor empirical "experiments"; inadequate measurement of variables; correlation between the wage and error terms due to simultaneity; or, in fact, highly inelastic demand for labour". Their estimates suggest the wage elasticity of demand for production workers in manufacturing lies between -0.15 and -0.20 in the short run (one quarter), and a value of -.496 over the longer term (after two to three quarters).

22 In calculating f_1 and subsequently using this estimate for the calculation of the social opportunity cost of an ETCP job, we make the following compromises: (i) the estimate of the long-run wage elasticity of employment or the elasticity of demand for labour in the permanent sector (ϵ) is obtained from the labour demand equation estimated for the private non-farm sector of the Canadian economy. Strictly speaking, the estimate of ϵ should have been based on the data for the private non-farm sector of the permanent sector. This would, however, not create any serious biases in our calculations unless the true estimate of ϵ is significantly different from -.373 (or the estimate of ϵ is equal to or greater than -2, as shown by our later analysis). In a similar type of exercise, simulating the effects of a marginal employment tax credit on total employment, Hamermesh (1978) estimated the elasticity of demand for labour based on the data for the private non-farm sector of the U.S. economy; and (ii) we further assume that the estimate of ϵ is the same across sectors and provinces.

23 A regression equation, $SOCL = b_0 + b_1 \text{ Provincial Urate}$ is estimated by OLS and the following results are obtained:

$$SOCL = 111.66 - 5.19 \text{ Provincial Urate} \quad R^2 = .76$$

(11.35) (4.72) No. of observations = 9

The numbers in parenthesis represent the t-statistics.

24 Program administration costs were calculated to average \$54 per job over the two-year period covered by the study. When this cost (on a weekly or annual basis) is added to the calculated SOCL, the resulting total cost is still lower than the market wage in all provinces so long as $f_1 < 0$.

25 Note that in this case, SOCL is not equal to the market wage. This result will hold only in the absence of taxes and transfers. Our findings suggest that $SOCL > \text{wage}$ in the presence of taxes and UI benefits. The CEIC Task Force (1981) examined the historical data from two slow-growth regions of Canada - the Sherbrook area of Quebec and the Cape Breton Island area of Nova Scotia. Their findings indicate that in long-run equilibrium, the social opportunity cost of labour in average temporary jobs was about 150 per cent of the wage bill. In the absence of the availability of the framework underlying their analysis, we presume that they must have assumed constant marginal product of labour in the permanent sector of the regions.

26 When a regression equation, $(ETCP \text{ WAGE} - SOCL) = c_0 + c_1 \text{ Provincial Urate}$ is estimated, the following results are obtained:

$$(ETCP \text{ WAGE} - SOCL) = 83.21 + 2.84 \text{ Provincial Urate} \\ (8.52) \quad (2.60)$$

$$R^2 = .49$$

No. of observations = 9

The numbers in parenthesis represent t-statistics.

Notes to Chapter 9

1 For details on this issue, see Treasury Board's Benefit-Cost Analysis Guide, 1976.

2 To confirm that long-run equilibrium has been achieved, we carry out the analysis one period further. At the beginning of the second period the ordained movement in labour endowment creates an expected utility difference of \$86.25 between the sectors. Because this differential exceeds the cost of training to the skilled worker, movement begins from the unskilled to the skilled sector. As skilled labour force starts increasing wages start decreasing in the skilled sector and $E(U_2)$ begins to increase in the unskilled sector. This process continues until $U_1 - E(U_2) = C$ holds again. By the end of this period, 21,272 workers migrate (which is equal to δL_1^*) that is just sufficient to keep the size of skilled labour force constant.

3 R.H. Haveman and G.B. Christainsen, "Public Employment and Wage Subsidies in Western Europe and the U.S.: What We're Doing and What We Know", Institute for Research on Poverty Discussion Paper No. 522-78, Nov. 1978.

4 To conduct a full analysis of net job creation in the economy, multisector general equilibrium models or fully specified macro-economic models have been developed. See, for example, P.R.G. Layard and S.S. Nickell, "The Case for Subsidizing Extra Jobs", London School of Economics, Discussion Paper No. 15, Feb. 1978.

5 Conceptually one could devise a more elaborate model which incorporates both financial and labour market displacements.

6 About three-fourths of these 62 per cent employers indicated that there was a good chance these additional jobs would survive over the longer term.

7 Hamermesh (1976), and Kopits (1978) simulate the short-run employment impact of a wage subsidy by estimating the short-run elasticity of demand for labour.

8 This approach has been utilized by Abt Associates of Canada in their study of the evaluation of Canada Works Program (Economic Growth Component). See, "Evaluation of the Economic Growth Component of Canada Works: Final Report", Program Evaluation Branch, Strategic Policy and Planning, Employment and Immigration Canada, April 1980.

9 See, In Short Supply Jobs and Skills in the 1980s,
Economic Council of Canada, 1982, p. 76.

Notes to Chapter 10

1 These have been documented thoroughly in a recent report of the Economic Council of Canada (1982) and in the CEIC Task Force Report (1981).

2 In a recent paper, Glenday and Jenkins (1981) estimated the proportion of labour force time employed for those individuals who had experienced some unemployment during 1974-79. They utilize the same data base (LFDB). The equation is estimated directly by OLS. On the basis of the relatively weak explanatory power of their equation (adjusted R^2 equals .11, F Statistic, 54.7), they conclude that targeting programs at individuals with specific socio-economic characteristics in order to reduce their unemployment might not be very successful.

3 See Watcher (1976) for a derivation of the equilibrium unemployment rate. The normalized unemployment rate is an approximation to the nonaccelerating inflation rate of unemployment and captures shifts in the demographic composition of the labour force and a change in relative unemployment rates.

Notes to Appendix I

1 In the literature it is pointed out that job creation programs can generate long-run externalities. One source of positive externality may be an increase in social and economic stability since individuals with good jobs are (supposedly) far less likely to commit crimes than are the chronically unemployed. Another source of positive externality due to increased future employability of the program participants may be a reduction in UI payments. The reduction in payments alone is not a benefit since UI payments are transfer payments. However, if the cost of administering the UI system is reduced, this reduction is an economic benefit. Another category of increased social benefit could be called the "social psychological" benefits to the participants in the program. Haveman (1978) points out various sub-categories of social psychological benefits. For example, any improved well-being of participants that is not reflected in increased economic productivity. This can arise from a number of sources -- the pleasure from contributing to an on-going productive process, the social interactions with other workers, etc.

2 We are aware of the fact that we have modelled this post-program productivity effect in a very simplistic fashion. For example, in Figure A-1, the shift in the MPL curve in the temporary sector will not be parallel since it is likely that ex ante or ex post the firm will hire the most skilled in the temporary sector first, sending the least skilled to the employment margin. Therefore, the employment probabilities facing workers in the temporary sector will not be uniform unless skills obtained in the program are too specific. A properly formulated model would have to take into consideration the fact that the probability of employment (Π) changes only for those workers who participate in the program. The workers in the temporary sector would no longer be identical. They will have different abilities and acquired skills. These factors could be introduced formally into our model though at a cost in terms of increasing complexity. Such a refinement could be important if job creation programs make a significant contribution to worker productivity. However, available empirical evidence does not support this conclusion.

3 For a recent survey of the manpower literature, see Perry, et. al., The Impact of Government Manpower Programs, Philadelphia: Industrial Relations Unit, The Wharton School, 1975. Another useful survey is by Earnst Stormsdorfer, "Review and Synthesis of Cost-Effectiveness

Studies of Vocational and Technical Education, Columbia:
ERIC, 1972.

4 For a variety of reasons actual training programs have not been operated in this way. See, for example, Ashenfelter (1974).

5 One frequently used control group consists of "no shows", individuals who were accepted into a training program but who did not show up, and early dropouts. Both of these groups have an obvious defect; their members are different from members of the trainee group or else they would have shown up for training (or stayed in the program). The use of "no-shows" as a control involves the implicit assumption that whether or not an individual shows up for training is uncorrelated with that individual's future earnings in the absence of training. This assumption seems unlikely to be true, though the direction of the bias introduced into the analysis is uncertain. An individual may not show up because he is offered a job, or because he is unreliable.

Another source of control comes from what is known as the "snowball" technique. Trainees are asked to name friends who were in the same situation in the labour market but who did not enter training. One of these individuals is then interviewed. If the trainee cannot name someone, or if the people named cannot be interviewed, then an interviewer canvasses the trainee's neighbourhood to find someone who was unemployed when the trainee was, but who did not enter a training program. This seems to be an effective way to construct a comparison group, although it is not as good as a random assignment scheme. Another, still more expensive, technique is simply to canvass the trainee's neighbourhood without asking the trainee for a name. This will eliminate any bias which is due to the trainee's selection of a running-mate.

6 This source of controls was not used in any of the studies surveyed in a recent survey of the manpower literature. See, for example, Perry, et. al. (1975); and Stormsdorfer (1972).

7 These averages mask real differences in unemployment experience by sex. When we compare the average unemployment experience of the male worker with that of the female one we are at the same time picking up the influence of the industrial or occupational differentials, in addition to the sex effect, on their experience in the labour market.

8 As suggested by Kiefer (1976), to estimate equation (A-3) the proper technique would be the following. The variation in the change in the probability of employment (ΔPE) around the conditional mean is represented by setting observed ΔPE equal to expected change in the probability of employment (ΔPE_e) plus an error ϵ . However, if $\Delta PE_e + \epsilon$ is greater than one then ΔPE is equal to one representing the fact that a change in probability of employment greater than one is not observed. Similarly, if $\Delta PE_e + \epsilon$ is less than minus one then ΔPE is equal to minus one since the change in probability of employment cannot be less than minus one (i.e., representing a case of fully employed where probability of employment (PE) equals one, to fully unemployed where PE equals zero).

The change in probability of employment model can be specified as

$$(A-5) \quad \Delta PE = \begin{cases} 1 & \text{if } \Delta PE_e + \epsilon \text{ is greater than one} \\ \Delta PE_e + \epsilon & \\ -1 & \text{if } \Delta PE_e + \epsilon \text{ is less than minus one} \end{cases}$$

where ϵ is a random term assumed normally distributed with a zero mean and variance σ^2 . Writing equation (A-5) as $y_i = x_i \beta + \epsilon$, the probability of observing y_i equal to one is

$$(A-6) \quad \begin{aligned} p(y_i=1) &= p(x_i \beta + \epsilon > 1) \\ &= p(\epsilon > 1 - x_i \beta) \\ &= 1 - p(\epsilon < 1 - x_i \beta) \\ &= 1 - \Phi(1 - x_i \beta / \sigma) \end{aligned}$$

where Φ is the cumulative standard normal distribution. Since the standard normal distribution will be symmetric around zero the probability of observing y_i equals minus one would be identical to that in equation (A-6). Hence

$$(A-7) \quad p(y_i=-1) = \Phi(1 - x_i \beta / \sigma)$$

The density of an observation not equal to one and minus one (i.e., the probability that $y_i \neq -1$ and $y_i \neq 1$) is

$$(A-8) \quad \frac{1}{\sqrt{2\pi}\sigma} \exp \left\{ -\frac{1}{2\sigma^2} (y_i - x_i \beta)^2 \right\}$$

Expressions (A-6) to (A-8) are functions of the unknown parameters; their product (over all observations) forms the likelihood function

$$(A-9) \quad L = \prod_{i|y_i=1}^{\eta_1} \{1-\Phi((1-x_i\beta)/\sigma^2)\} \prod_{i|y_i=-1}^{\eta_2} \{1-\Phi((1-x_i\beta)/\sigma^2)\} \\ \prod_{i|y_i \neq 1, y_i \neq -1}^{N-\eta_1-\eta_2} \frac{1}{\sqrt{2\pi\sigma^2}} \exp \left\{ -\frac{1}{2\sigma^2} (y_i - x_i\beta)^2 \right\}$$

where Φ , again is the cumulative standard normal distribution, η_1 is the number of observations at the lower end-point and η_2 is the number of observations at the upper end point (this problem was studied by Rosett and Nelson, (1975)) and N is the total number of observations. Applying the rule of exponentials and expressing (A-9) as a loglikelihood function,

$$\ln L = \sum_{i|y_i=1}^{\eta_1} \ln \{1-\Phi((1-x_i\beta)/\sigma^2)\} \\ + \sum_{i|y_i=-1}^{\eta_2} \ln \{1-\Phi((1-x_i\beta)/\sigma^2)\} \\ - \frac{N-\eta_1-\eta_2}{2} \ln \sigma^2 - \frac{N-\eta_1-\eta_2}{2} \ln 2\pi \\ - \frac{1}{2\sigma^2} \sum_{i|y_i \neq 1, y_i \neq -1}^{N-\eta_1-\eta_2} (y_i - x_i\beta)^2$$

where σ^2 is constant. Since $(N-\eta_1-\eta_2)/2 \ln 2\pi$ is constant, we can write

$$\begin{aligned}
 \ln L &= \sum_{i|y_i=1}^{\eta_1} \ln \{1 - \Phi((1-x_i)\beta)/\sigma^2\} \\
 &+ \sum_{i|y_i=-1}^{\eta_2} \ln \{1 - \Phi((1-x_i)\beta)/\sigma^2\} \\
 (A-10) \quad &= \frac{N-\eta_1-\eta_2}{2} \ln \sigma^2 \\
 &- \frac{1}{2\sigma^2} \sum_{i|y_i \neq 1}^{N-\eta_1-\eta_2} (y_i - x_i\beta)^2 + \text{constant}
 \end{aligned}$$

The likelihood function is somewhat different from the standard notion of a likelihood function, being the product of discrete probabilities and densities, but Amemiya (1973) has shown that estimators obtained by maximizing $\ln L$ are consistent, asymptotically efficient and asymptotically normally distributed. The likelihood function can be maximized over β and σ^2 using a Davidson-Fletcher-Powell (DFP) algorithm (see Goldfeld and Quandt (1972)).

9 Haveman (1980).

10 See, S. Magun, "Unemployment Experience in Canada: A Five-Year Longitudinal Analysis", Paper presented at the Canadian Economic Association Meetings, University of Ottawa, Ottawa, June 4-6, 1982. The author uses the LFDB file (same as ours) to analyze the unemployment experience of the labour force over almost the same time period which we cover in our present study.

11 Glenday and Jenkins (July 1981).

12 It is argued in the literature that during periods of high unemployment unskilled workers will tend to accept unpleasant low-skilled jobs without demanding a large premium for them. Thus the wages of the unskilled tend to fall, widening the skilled-unskilled wage differential (see, A. Rees, Economics of Work and Pay, New York, 1973, p. 175). Further, since employers invest in the hiring, screening,

and training process of skilled workers they tend to view this as a "sunk cost", which may be recovered only by retaining these workers. Unskilled workers, on the other hand, may be replaced at relatively low cost and so wage differentials widen during periods of unemployment (see, Walter Y. Oi, "Labour as a Quasi-Fixed Factor", Journal of Political Economy, December 1962). For some detailed discussion see, S. Ostry and M.A. Zaidi, Labour Economics, MacMillan of Canada, Toronto, third edition, 1979, pp. 316-344.

13 See Ashenfelter (1978).

14 See Tobin (1973).

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