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Assessing the Impact of Tax and Transfer Policies on Labour Supply: A Survey

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Assessing the Impact of Tax and Transfer Policies on Labour Supply: A Survey^{*}

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Abstract

Changes in parameters of tax and transfer programs can induce individuals to alter their behaviour in a wide variety of ways, including changes in labour supply, in the nature of employee compensation, in the choice of working in the underground economy, in savings decisions, in human capital investments and in fertility decisions. The magnitude of these responses is of critical importance in the formulation of adequate tax and transfer policies. Thus the behavioural effects of income taxes and those implicit in means-tested transfer programs may strongly influence the impact of these policies on income, tax receipts, budgetary costs and welfare. In this paper, we abide with the tradition of evaluating the impact of tax and transfer programs on labour supply at both the extensive (the decision to work or not) and the intensive margins (the number of hours worked). We provide both a theoretical and empirical survey of the labour supply impact of tax and transfer programs. An important part of the empirical results discussed in this paper focuses on the labour supply impact of tax and transfer reforms that occurred in the US, in the UK and in Canada.

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1 Introduction

Changes in parameters of tax and transfer programs can induce individuals to alter their behaviour in a wide variety of ways, including changes in labour supply, in the nature of employee compensation, in the choice of working in the underground economy, in savings decisions, in human capital investments and in fertility decisions. The magnitude of these responses is of critical importance in the formulation of adequate tax and transfer policies. Thus the behavioural effects of income taxes and those implicit in means-tested transfer programs may strongly influence the impact of these policies on income, tax receipts, budgetary costs and welfare.

In principle, a proper evaluation of tax and transfer programs would require a full interactive analysis of their numerous effects on individual behaviour. However, given the complexity of such an undertaking, almost all studies focus on a single effect. In particular, much of the literature has dealt with the impact of these policies on labour supply. There are at least three reasons that explain why labour supply has been the major focus of most analyses. First, recent reforms in tax and transfer programs often aim at stimulating employment and hours work of targeted groups. For instance, the potentially large disincentive effects induced by the high implicit tax rates of many social programs have come under severe criticism in recent years. Second, labour resources represent the most important input into the production of goods and services in the economy. Small variations in total labour supply may therefore have a significant impact on the level of aggregate output. Third, hours of work and labour force participation are easily measured and well understood concepts thus easing estimation and interpretation of relevant elasticities. This is probably why very few studies have attempted to estimate the impact of tax and transfer parameters on “work effort”. The quality of labour offered on the job is much more difficult to conceptualize and thus to measure.

In this paper, we abide with the tradition of evaluating the impact of tax and transfer programs on labour supply at both at the extensive (the decision to work or not) and the intensive margins (the number of hours worked).¹ We provide both a theoretical and empirical survey of the labour supply impact of tax and transfer programs. An important part of the empirical results discussed in this paper focuses on the labour supply impact of tax and transfer reforms that occurred in the US, in the UK and in Canada.

Section 2 provides the theoretical framework used to analyze the effect of tax and transfer programs on the decision to work and on hours of work. We start with the standard labour supply model and we extend it to take into account taxation and social transfers. This framework

¹We acknowledge that potentially important behavioural effects are excluded from our analysis. A simple way of providing a more comprehensive analysis of the various behavioural effects of an income tax reform is to investigate the sensitivity of taxable income. Our empirical survey discusses the findings of the few papers that have attempted such an analysis.

is then generalized to allow for factors such as social welfare stigma, fixed costs of participation to working, interactions between household members, rationing in the labour market, the life-cycle context, and the demand side of the labour market. We also provide a short discussion of micro-simulation models which are often used to evaluate the impact of tax and transfer reforms. Section 3 discusses the two basic econometric approaches that are used to estimate the parameters of labour supply functions: the *Natural Experiment Approach* and the *Structural Approach*. Section 4 provides an analysis of the econometric results. We focus in particular on two important tax reforms: the US Earned Income Tax Credit (EITC) and the UK Working Families Tax Credit (WFTC). These reforms have been extensively studied by economists in recent years. We also discuss a paper on the impact of the 1988 tax flattening in Canada on taxable income. A survey of results from the structural approach is finally presented. Section 5 presents some concluding remarks.

2 Theoretical framework

An assessment of the impact of public policies on labour supply requires economic models to provide a context for comparison. Indeed, the manner in which the empirical analyses are conducted is intimately linked to theoretical considerations. It is therefore important to present a unifying framework in which the various empirical studies discussed in Section 4 can be compared.

2.1 The Basic Labour Supply Model

The most simple labour supply model is based on the static consumer theory. It assumes that the individual has preferences over leisure (more accurately, nonmarket activities), l , and over consumption, x . These preferences can be affected by a set X of individual attributes such as age, education and number of children. This set of characteristics allows the model to take preference heterogeneity into account. Preferences can be represented by a standard utility function. The individual's exogenous hourly wage rate is w and his exogenous nonwage income is y . The individual has a time endowment, T , and can freely choose his hours of work, $h \equiv T - l$, and his level of consumption. Note that this does not mean that he can choose his hours of work with a single employer. The model can be thought of as characterizing a situation where the individual chooses his hours of work by selecting across employers offering different hours packages. The individual's budget constraint requires that his expenditures cannot exceed the sum of his wage and nonwage income. Assuming no (positive or negative) savings and normalizing the price of consumption to one, the budget constraint can be written as: $x \geq wh + y$. Finally, it is assumed that the individual chooses his hours of work and his

consumption so as to maximize his utility subject to the budget constraint. Under standard assumptions and assuming first that the individual has strictly positive hours of work, his labour supply function will be given by:

$$h = h(w, y; X) \tag{1}$$

Moreover, the individual's decision of working or not is obtained from a comparison between his reservation wage, w_r , and his actual wage rate, w . His reservation wage is the wage at which he is indifferent between working and not working. It is implicitly given by replacing h with 0 and w with w_r in equation (1): $0 = h(w_r, y; X)$. The individual will decide to work if his wage rate is larger than his reservation wage; otherwise, he will not work.

What does this model predict about the impact of a change in nonwage income, y , and wage rate, w , on his desired hours of work? If leisure is a normal good, the model predicts that an increase in y will reduce his labor supply (assuming the individual is a worker). Moreover, an increase in w produces two opposite effects on his labour supply: a substitution effect and an income effect. The substitution effect occurs because the wage rate is the opportunity cost of leisure. Therefore, for a given real income, an increase in the wage rate will reduce the demand for leisure, thereby increasing work incentives. The substitution effect thus has a *positive* impact on labour supply. In contrast, the income effect is the result of the worker's enhanced real income after the wage increase. For a given level of hours of work, the individual has a greater command over resources than before. As a result, he will normally increase his demand for leisure. The income effect of a wage increase thus *reduces* the worker's labour supply.

Because the actual labour supply response is the *sum* of the income and the substitution effects, we cannot tell what the net impact of a wage increase will be; economic theory simply does not tell us which effect is stronger. The answer depends on individual preferences. If the *income* effect is dominant, the individual will respond to a wage increase by decreasing his labour supply. However, when the *substitution* effect dominates, the actual response to a wage increase will be to increase labour supply. Only an empirical analysis can ascertain the final outcome.

2.2 Taxation, Social Transfers and Labour Supply

Even though the basic model discussed above is the outcome of a wage increase, it can nevertheless provide useful insights into the impact of tax and transfer policies.

We first turn to tax policies. A change in the rate at which income is taxed can easily be modeled within the framework discussed so far, at least in the most simple cases. Suppose

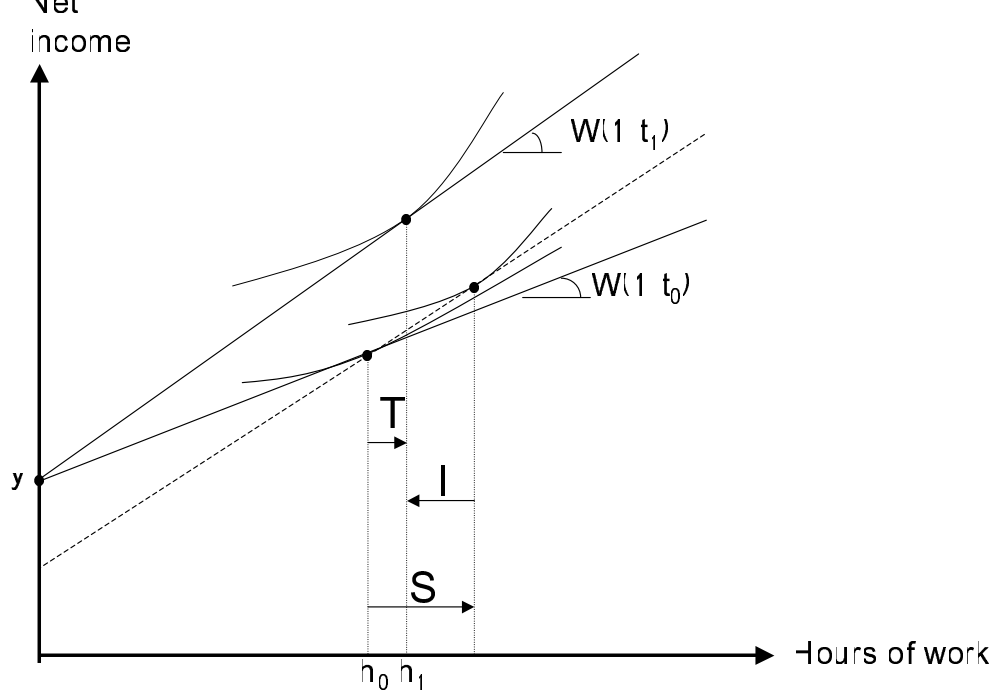


Figure 1: Impact of a tax cut on hours of work in a proportional tax system (case of substitution effect larger than income effect)

that taxation is a *linear* function of wage income. The tax revenue is therefore given by twh , where t is the tax rate. The net wage rate faced by the individual is thus $w(1 - t)$. A reduction (increase) in t is equivalent to an increase (reduction) in the net wage rate and its effect on the individual's labour supply will depend on the relative strengths of substitution and income effects, as discussed above. Figure 1 illustrates the case of the effect of a reduction in the tax rate (from t_0 to t_1) on the individual's hours of work. The straight lines correspond to the budget constraints while the individual's preferences are represented by the indifference curves. Also the individual's optimum choice is given by the tangency point between the relevant budget line and the indifference curve. In Figure 1, it is assumed that the substitution effect (S) is larger than the income effect (I). In that case, the net result (T) will be an increase in hours of work from h_0 to h_1 . Note however that if the individual does not work, a reduction in the tax rate might induce him to enter the labour market if his net wage rate becomes larger than his reservation wage. Otherwise, the reduction will have no effect on the individual's decision to work.

This simple model can be seriously misleading since individuals seldom face a linear (proportional) tax schedule. Rather, they are usually confronted to a progressive tax schedule. Thus in Canada, the tax schedule is defined by a limited number of linear segments relating the income tax to the taxable income, and whose slopes are increasing with taxable income. In turn, the individual's budget constraint is defined by a piecewise convex function which relates his net-of-tax income to his hours of work.²

²In fact, the tax system is not truly convex because of the effect of vanishing tax credits and the existence of

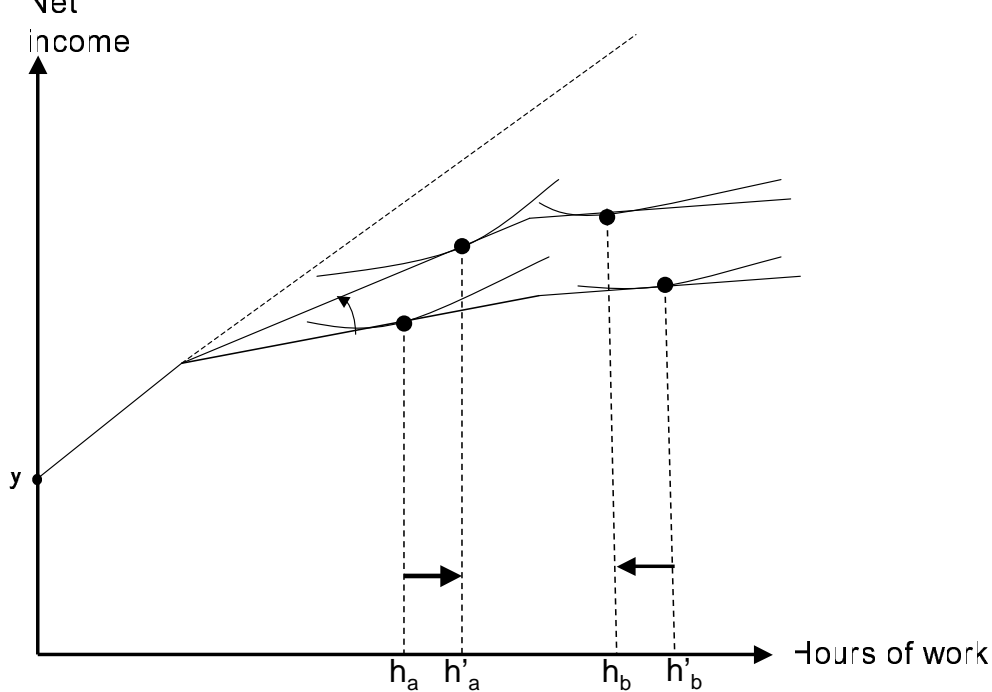


Figure 2: Impact of a reduction in the lowest tax rate of a progressive system (case of substitution effect larger than income effect)

With such a tax system, the individual's desired hours of work will generally be a function of all parameters of the tax schedule (including deductions, tax credits, marginal tax rates and critical taxable income associated with changes in tax brackets). To illustrate, consider the impact of a reduction in the lowest marginal tax rate, t_m , in a progressive (convex) two-rate tax system (see Figure 2). Now assume that an individual has taxable income such that his marginal tax rate is at the upper end of the tax schedule. For this individual, the reduction in t_m will simply reduce the level of income tax he has to pay without having any effect on his marginal wage rate (given by $w(1 - t_i)$, where t_i is his marginal tax rate). The change will therefore generate a pure income effect that will *decrease* his hours of work from h'_b to h_b . Note that this analysis supposes that the individual does not shift from one segment to another of his budget constraint (no change in his marginal tax rate through a change in his hours of work). On the other hand, consider a worker who faces the lowest marginal tax rate before and after the policy. In his case, the reduction in t_m , will produce a substitution and an income effect that will affect his labour supply in opposite directions. (In Figure 2, it is assumed that the former effect dominates the latter. Therefore the individual's hours of work *increase* from h_a to h'_a .) This analysis shows that the impact of a change in a parameter of the income tax system on aggregate labour supply will depend, among other things, on how individuals are distributed in the income scale.

The analysis is more complex when the individual shifts from one segment of his budget constraint to another, after the change in the marginal tax. In this case, few general propositions on the payroll taxes paid by the worker.

tions can be deduced about the effect of taxes on labour supply. We need “global” information on the individual’s preferences, since local income and substitution effects are not sufficient to analyze the impact of the change. More precisely, the piecewise linear system must be defined by a sequence of budget segments $B_j = (w(1 - t_j), y_j)$ of marginal wage rates and (virtual) nonwage income for the individual over a set of critical hours (H_j, H_{j+1}) corresponding to changes in the tax brackets. Then, an optimization algorithm must be implemented to obtain the individual’s desired hours of work (before and after the policy) that maximizes his utility function subject to this segmented budget constraint (see Hausman (1985)). When the budget constraint is convex (progressivity of the tax system), this algorithm is quite easy to implement since any local optimum corresponds to a global optimum. At the empirical level, knowledge of individual preferences (or the utility function) arises in the process of estimating the labour supply function. Therefore, numerical computations of the effect of taxation on hours of work can be carried out once the parameters of this function are estimated.

We also need to consider the impact of social transfers on the budget constraint. Many transfers provided by governments are means-tested or income-related. This means that they are targeted at poorer households. Also, some transfers play the role of work subsidies, that is, their amount increases with the level of wage income (*e.g.*, APPORT program in Québec). Clearly then, the individual’s overall budget constraint must also take into account these transfers. These will depend, among other things, on the individual’s characteristics (*e.g.*, his age, the number of children and their age), on his wage rate and on the number of hours he works on the labour market. In computing the tax schedule faced by a given individual, we must take into account not only the marginal tax rates associated with the tax system but also those related to the transfer programs. The latter indicate how benefits change with each additional dollar of earnings on the labour market. It is usually assumed that it is the cumulative (effective) marginal tax rates of all tax and transfer programs that affect labour supply behaviour and not only those associated with the income tax system.

In the most simple cases, economic theory can shed some light on the impact of transfers on labour supply. Assume for instance that a transfer program is defined by two parameters: a guaranteed level of income G and a benefit reduction rate, $r \leq 1$. The latter defines the rate at which transfers are reduced as total income increases up until the break-even point of the program, P , is reached. This parameter defines the minimum level of income at which no benefits are provided. Any additional hours worked beyond that point are paid at the wage rate (net of the usual taxes, which, for simplicity, are assumed to be proportional to income). Ignoring nonwage income, the individual’s budget constraint can therefore be written as : $x = G + w(1 - r)h$ for $G - rwh \geq 0$ and $x = w(1 - t)h$ for $G - rwh < 0$. Note that the break-even point is given by solving the equation $G - rP = 0$ for P , which yields: $P = G/r$. For instance, if G is \$7,000 and r is 0.5, the break-even point will be \$14,000. This means that the individual will receive a positive transfer from the government as long as his income is below this level.

the individual's budget constraint associated with the tax and transfer programs and to use an optimization algorithm to find the individual's optimal hours of work. Unfortunately, the budget constraint is no longer convex when the transfer programs and vanishing tax credits are considered. This is because the marginal tax rates are usually highest for low-income individuals. In this case multiple local optima are possible. Therefore, we need to compare the levels of utility associated with each local optima to determine the global optimum. It can also be shown that nonconvex budget constraint generate discontinuous labour supply functions (Hausman (1985)).

2.3 Extensions to the Theoretical Framework

2.3.1 Social Welfare Stigma

Up to now, we have implicitly assumed away social stigma associated with the participation in a transfer program. However, it may be the case that receipt of social assistance is negatively perceived. Social stigma is likely to reduce the individual's welfare. For the recipient, a dollar received from a social program may therefore be less desirable than a dollar received from other sources (Moffitt (1983), Hoynes (1996)). Moreover, social stigma may induce the individual not to apply for benefits even eligible. This may explain why the take-up rate of programs such as Employment Insurance or Social Assistance are much lower than 100% (a lack of information on the functioning of these programs may also be responsible). Finally, the requirements to have access to social benefits may vary from one program to another. Thus, to receive disability insurance benefits, a person must incur medical examinations, followed by a positive recommendation from a doctor (Gruber (2000)). Moreover, this recommendation must also be approved by the authorities of the program. Since the costs an individual must bear to have access to benefits may strongly vary across programs, their impact on individual labour supply decisions may differ substantially.

2.3.2 Fixed Costs of Participation

Another consideration which may have an important impact on the budget constraint, especially for women's labour force participation, is the presence of fixed costs to working. Transportation costs, child care fees, *etc.* all involve a fixed cost element in the labour supply decisions. A direct consequence of these is to increase the individual's reservation wage (Cogan (1981)). Moreover, when entering the labor market, the individual will only consider working at least a given minimum of hours of work so as to make-up for these fixed costs. This may explain why only a very small fraction of individuals are observed working less than fifteen hours per week. In turn, programs that provide child care subsidies have the effect of

encouraging the labor force participation of wives and single parents with young children by reducing their reservation wage. Note, however, that for those who worked in the labor market before the introduction of the program, child care subsidies are equivalent to an income effect that may reduce desired hours of work (Heckman (1974)).

2.3.3 Family Labour Supply

So far we have considered only *individual* labour supply. In fact many people live in households where there are more than one adult. Many people cohabit and it is quite likely that their economic decision making is interdependent. For example, a husband and a wife may make joint decisions concerning their labour supply, their domestic production and their consumption of goods and services. Moreover the basic unit for many transfer programs is not the individual but the household. This also complicates the analysis considerably. In that case, the benefit reduction rate faced by a wife who considers entering the labour market is the same as the one faced by her husband if the household receives benefit from the program.

Various approaches have recently been developed to allow for interactions between individuals within the household. The approach used in most empirical studies on labour supply is based on a so-called *recursive* model. It is first assumed that the husband is the “primary decision maker”. He makes his labour supply decisions independently of his wife’s work decisions. In particular, the wife’s individual income has no effect on his labour supply. On the other hand, the wife is assumed to be a “secondary decision maker”. Her husband’s individual income is therefore assumed to be a component of her nonwage income. In this approach, an increase in the husband’s wage income reduces his wife’s labour supply through a negative income effect. The main advantage of this *traditional family* approach lies in its simplicity. In particular, it makes the estimation of the labour supply function for two-person households almost as simple as for singles. Of course, one limitation of this model is that it does not take into account the possibility of substitutability or complementarity between nonmarket time of household members. Another approach, which allows for this possibility, is based on the so-called *unitary* model. It assumes that the household behaves as if its members maximized a standard household utility function subject to an household budget constraint. However, most implications of this approach have received little empirical support. In particular, the pooling restrictions – according to which only total nonwage income, and not its distribution across household members, matters for labour supply decisions – have been strongly rejected in many recent studies (Fortin and Lacroix (1997)). In contrast, a recent approach, referred to as the *collective* model, only imposes that the outcomes of decisions within the household are efficient (Chiappori, Fortin and Lacroix (2002)). However, to our knowledge, this model has never been used to estimate the impact of tax and transfer programs on household labour supply behaviour.

2.3.4 Rationing in the Labour Market

The framework discussed so far supposes that individuals can choose their desired number of hours of work with no restrictions. This is clearly an unrealistic assumption. The observed distribution of hours of work is the result of the interaction between the labour supplied by workers and the labour demanded by firms. While an individual may want to work 33 hours per week, there may be no job that offers this number of hours, at the given individual's wage rate. This type of constraints may however be introduced in the analysis by assuming that the choice set faced by the individual is defined by a discrete number of hours of work. The individual's wage rate may also vary with the level of these hours of work (Van Soest (1995)). Thus, everything being equal, full-time work often provides a higher hourly wage rate than part-time work. Rationing in the labour market can also be taken into account by modeling unemployment as a different state from non-participation.

2.3.5 Budget Constraint of the Public Sector

At the aggregate level, a complete model of the impact of tax and transfers programs must take into account the budget constraint of the public sector and how policy instruments are adjusted to satisfy this constraint. The model must also consider the impact of these adjustments on individual labour supplies. Assume that the government decides to increase the guaranteed income of a means-tested transfer program. The effect of this policy will crucially depend on how this policy is funded. For instance, it could be funded by an increase in the benefit reduction rate of the program, by an increase in the marginal income taxes and/or by a reduction in other government expenditures (*e.g.*, health, education). It is clear that the effect of the policy on aggregate labour supply will vary according to which instrument is used to finance the policy. When the marginal tax rates are increased, the *negative* income effect on the labour supply of low-income persons who receive higher benefits will be accompanied by a *positive* income effect on the labour supply of high-income persons who pay higher taxes to fund the policy. Therefore, the net income effect of the policy (and its funding) on aggregate labour supply is ambiguous and is again an empirical issue. Furthermore, the model must take into account the substitution effects associated with the increase in the marginal tax rates.

2.3.6 Multiperiod Models of Labour Supply

The approach we have presented until now is essentially static. However, many individuals make their labour supply choices on the basis of a long term horizon. For instance, when they are young, they might want to substitute education for labour supply; women might substitute fertility for hours of work and some individuals might prefer to retire from the labour market

early in their life cycle. Expectations of future wage changes or future tax and transfer policies may also influence current labour supply decisions. Individual labour supply responses to public policies may vary depending on whether the latter are expected to be permanent or temporary.

Recent theoretical and empirical developments have attempted to replace the static view of labour supply choices with a more dynamic approach. One basic idea is to analyze hours of work decisions based on a dynamic optimization model rather than on a one-period approach. Under standard assumptions, individual choices can be analyzed using a two-stage budgeting decomposition which is consistent with a life-cycle approach. In the first stage, the individual determines his allocation of wealth across periods. Second, within each period, his optimization behaviour is solved using a standard static maximization problem. However, the within-period individual's nonwage income is now defined as the difference between his consumption expenditures and his wage income (Blundell and Walker (1986)).

2.3.7 The Demand Side of the Labour Market

Another limitation of our analysis thus far is that gross wage rates are assumed to be exogenous. In other words, they are not allowed to vary when the government introduces a new transfer program or decides to make tax cuts. This issue is very important especially when one wants to assess the effect of a major tax or transfer policy that is likely to induce a substantial change in labour supply at the aggregate level. For instance, assume that the government introduces an “in-work” transfer program to encourage low-income individuals to enter the labour market. As long as the aggregate demand for these workers is highly inelastic with respect to the wage rate, the effect of this policy may be to reduce the wage rate of low-skilled workers without stimulating the creation of new jobs for these workers. In short, one will observe a *crowding-out* effect in the labour market: those low-skilled individuals who find a job will simply replace other workers.

2.4 Microsimulation Models

The above discussion suggests the use of a “microsimulation” approach in order to examine the impact of tax and transfer programs on labour supply. The essence of this approach is to use survey evidence and consider various disaggregated groups of households (*e.g.*, prime-age males, wives with children, wives with no children, lone mothers). For each group, the budget constraint is constructed based on existing tax and transfer programs. Also, the budget constraint of the public sector is incorporated into the model. The latter can then be used to simulate the impact of any tax and transfer policy on individual labour supplies and welfare

(*e.g.*, Blundell, Duncan and Meghir (1998)). In more complete models, one also specifies which government instruments adjust to satisfy the government budget constraint. The model requires a certain number of iterations to converge since changes in labour supply at each iteration influence the level of tax receipts and transfer benefits and therefore the value of the instruments that must be chosen to satisfy the government budget constraint. This approach has been used by Fortin, Truchon and Beauséjour (1993) to analyze various reforms of the welfare system in Quebec. Finally, one could also extend this approach to take the demand side of the labour market into account within an applied general equilibrium model. This would allow to consider the changes in the wage rates induced by tax and transfer policies as well as the substitutions made by firms between various groups of workers.

3 Methodological Issues

The previous section has underlined the potential (theoretical) impacts associated with changes in marginal tax rates and government transfers on labour supply. As mentioned there, because the income and substitution effects usually have opposite impacts and given the intricateness of the tax and transfer programs, one can seldom determine the net impact of a policy initiative on labour supply, let alone the magnitude of the impact. Economists have thus spent considerable efforts over the past twenty years to measure precisely the impact of policy changes on labour supply. Given the complexity of the tax and transfer regimes and the nature of individual decision-making, economists have devised different strategies to ascertain the impact of policy changes on behaviour. In what follows, we will briefly discuss the two main strategies used in empirical studies. We will then discuss the results from the most relevant studies.

3.1 The Natural Experiment Approach

In recent years the so-called Natural Experiment (NE) approach has been widely used in studies attempting to assess the impact of various government tax and transfer policies on individual behaviour. The policies that have been analyzed using this approach are varied and more or less complex.

Traditionally, analysts have relied on “Before-After” comparisons of labour market outcomes when assessing the impact of a particular policy change on a given group of individuals. As its name indicates, this estimator compares the outcomes of a given group at two separate points in time.³ The validity of this estimator relies on relatively stringent assumptions. One

³Ideally, the contrast should be computed for the same individuals in both time periods. Yet it can be shown that under mild conditions repeated cross sectional data that sample the same population are sufficient to construct

of them states that the only significant change that has occurred is the policy change under consideration. Changes in other policies or in the economic environment that affect the outcomes are thus assumed away. In the event that such changes have occurred the before-after estimate will be biased, and in some cases severely so. Given that behavioural adjustments to new policies may take some time, this assumption is very unlikely to hold.

The NE approach – also known as the Difference-in-Difference approach – circumvents the main caveat of the before-after approach by comparing the changes in the outcomes of a group that was specifically targeted by the policy change with that of a group that was not targeted or affected by the policy change. The former group is often referred to as the “treatment group” in the literature, while the latter is often referred to as the “control group”. Changes in observed outcomes of the control group may be attributed to fluctuations in the business cycle or to changes in policies not being investigated. By factoring out the measured changes in the control group from the measured changes for the treatment group, one can reasonably assume that the residual truly reflects the net impact of the policy change.

The fundamental assumption of the NE approach is that both the control and the treatment groups are similarly affected by factors not considered explicitly in the analysis. This assumption, while subject to criticism, probably is not as severe as those imposed by the traditional before-after estimator. Yet, the main challenge of the NE approach is finding an acceptable comparison group.

This comparison strategy is based on longitudinal data. It exploits the idea that a person can be in both states at different times, and that outcomes measured in one state at one time are good proxies for outcomes in the same states at other times. In other words, the outcomes before the policy change are good proxies for outcomes that would have occurred had the policy not been implemented.

3.2 The Microeconomic (Structural) Approach

One of the advantages of the NE approach is that, under plausible assumptions, it allows to “locally” estimate some structural parameters of the labour supply function without having to explicitly parameterize either the complex nonlinear budget constraint faced by the individual or his utility function. The main drawback of this approach is its inability to infer potential impacts of policy changes other than those considered in any given analysis. This drawback arises because little formal structure is relied upon in deriving estimates of the impacts of policy changes.

In contrast, the so-called “structural approach” purports to estimate all the preference pa-

a consistent before-after estimate.

rameters and therefore provides global information which can be used to simulate the effect of any reform on labour supply. In essence, the structural approach uses all the restrictions imposed by economic theory to estimate the parameters of the model. A particular model of labour supply behaviour is first assumed based on an optimization program that considers both individual preferences and budget constraints. Statistical assumptions are then made regarding the way in which the stochastic terms are introduced into the model. For example the latter may reflect measurement errors, preference heterogeneity, or optimization errors. Assumptions are also made regarding the distribution of these stochastic terms (*e.g.*, normality, absence of correlation between regressors and these random terms). Of course, the complexity of the estimation method (*e.g.*, maximum likelihood methods, GMM, instrumental variables (IV), non-parametric or semi-parametric approaches) depends on the complexity of the economic model considered, on the functional form of the utility function, on the nature of the budget constraint (*e.g.*, piecewise linear constraint with fixed costs of participation and with hours rationing) and on the numerous assumptions concerning the distribution of the stochastic terms. Blundell and MaCurdy (1999) provide step-by-step examples of econometric labour supply models derived under various assumptions based on economic and statistical theories.

The structural methods used to estimate models of labour supply with tax and transfer programs have been criticized on various grounds. First, some approaches assume that the individual has a perfect knowledge of the parameters of all the tax and transfer programs that influence his budget constraint. Of course, this requires a very high degree of information on the part of the individual. Second, the approach requires that some variables such as education be assumed to affect wage rates but not preferences, which is a rather strong assumption that is not based upon economic theory. Third, given the complexity of the estimating methods used, the functional form used to represent preferences often lacks flexibility (*e.g.*, linear labour supply function), which may induce biases in the estimates. Finally, labour supply parameters are often not very robust to the choice of the economic and statistical assumptions made to estimate the model.

4 Empirical Results

4.1 Results from the Natural Experiment Approach

As mentioned earlier, many recent studies rely on the NE approach to assess the impact of tax reforms. We begin by reviewing evidence from two foreign tax programs, the US Earned Income Tax Credit and the UK Working Families Tax Credit (WFTC), for three reasons. First, both these programs exhibit similar features to the Canadian Earned Income Supplement (EIS) and the Quebec APPORT program. Second, both the EITC and the WFTC have been exten-

Table 1: Earned Income Tax Credit Parameters (1996)

	Phase-In Rate	Phase-In Range	Max Credit	Phase-Out Rate	Phase-Out Range
One child	34.0%	\$0-\$6330	\$2,152	15.98%	\$11,650-\$25,078
Two children or more	40.0%	\$0-\$8,890	\$3,556	21.06%	\$11,650-\$28,495
No children	7.65%	\$0-\$4,220	\$323	7.65%	\$5,280-\$9,500

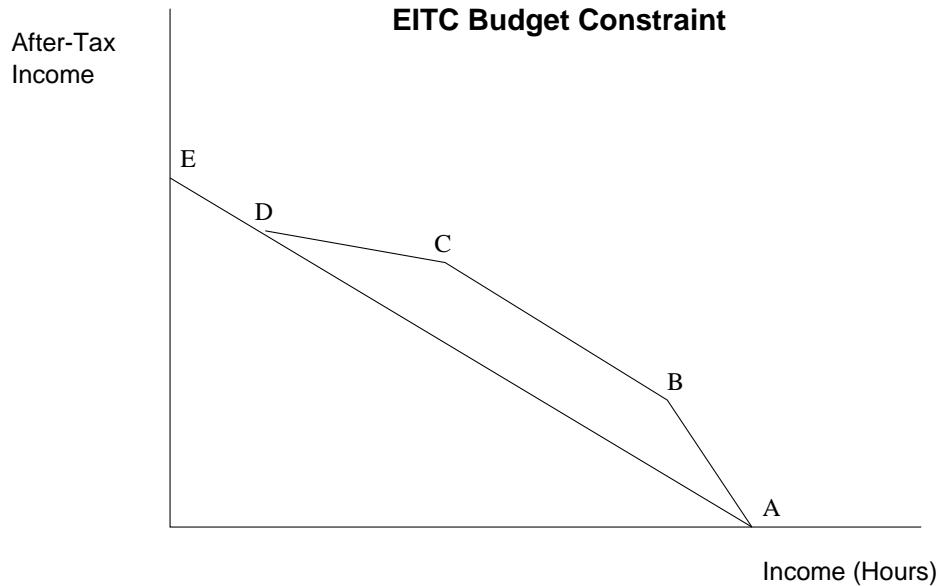
sively studied by economists in recent years. Third, most studies rely on the NE approach. Following the discussion about the EITC and the WFTC, we will discuss other studies that have looked at general tax reforms using the NE approach.

4.1.1 The US Earned Income Tax Credit (EITC)

The EITC was begun in 1975 as a modest program aimed at offsetting the social security payroll tax for low-income families with children. The program was expanded in 1986, 1990 and 1993. Taxpayer's eligibility for the EITC depends on earned income (or in some cases adjusted gross income), and the number of qualifying children who meet certain age, relationship and residency tests. It is also required that the taxpayer have positive earned income that is below a certain threshold (\$28,495 in 1996). The credit is refundable so that a taxpayer with no federal tax liability could receive a refund from the government for the full amount of the credit. The parameters of the EITC are reported in Table 1 below.

The program includes three separate regions. The phase-in region transfers an amount equal to the subsidy rate times earnings. In the flat region, the family receives the maximum credit. Finally, in the phase-out region the credit is clawed back at a given phase-out rate. For example, a family with a single child and earnings between \$6,330 and \$11,650 will receive the maximum credit of \$2,152. Earnings beyond \$11,650 are taxed back at the rate of 15.98%. Once earnings reach \$25,078 the family no longer receives any benefit. The EITC program is depicted in Figure 4 for an unmarried taxpayer. The figure shows how the introduction of the EITC shifts the budget set of an otherwise untaxed individual from ADE to ABCDE.

From a policy perspective, the issue of interest is determining how such a shift may change work incentives. As discussed in Section (2.2), the effect of such a program likely to be ambiguous since it depends on the individual's preferences and his/her wage rate. Notice first that the well-being of an individual that chooses not to work is unaffected by the EITC since receipt is conditional on positive earnings (A). On the other hand, some may find the additional income accruing from the EITC worth entering the labour market. This will be the case if their wage rate gross of the phase-in subsidy exceeds their reservation wage. The phase-in region



of the EITC thus has an unambiguous positive impact on labour force participation (segment AB). Individuals in the flat-range region (segment BC) have no incentives to increase their hours of work. Quite to the contrary, for a given number of weekly hours of work, the EITC has increased their income. If leisure is a normal good, they will be induced to consume more of it, thereby decreasing their hours of work. Over the phase-out region, individuals face relatively high implicit tax rates. Those that were already located between the C and D hours thresholds may choose to reduce their hours of work. Finally, those that were located between D and E may also choose to reduce their hours of work in order to benefit from the tax credit.

All in all, the EITC has unambiguous positive work incentives only for individuals that are out of the labour force. The incentive effects are more complicated for married couples. Even the labour force participation effect is ambiguous. This occurs because the EITC is based on family earnings. Indeed, to the extent that the husband is the primary decision maker (see Section 2.3.3), the impact of the EITC on his decision to work is as described above. The wife's decision to work will be conditional on her husband's income. Suppose that the husband earns \$11,650 placing him at the beginning of the phase-out region. If the wife remains out of the labour force, the family will receive the maximum benefit. For each dollar she earns, the family's credit will be reduced by 21 cents (for a family with two children). She will also have to pay social security taxes, state taxes, etc. Only if her husband earns very little income will there be strong incentives for her to join the labour market.

The impact of EITC on hours of work and participation

Several studies have attempted to measure the impact of the EITC on hours of work. Using standard elasticity estimates from the literature, Browning (1995) conducted simulations that predicted that approximately half of the taxpayers in the phase-out region would reduce their hours of work (see Section 2.4). Other studies have measured the impact of the EITC directly [Dickert and Houser (1998), Scholtz (1996), Eissa and Liebman (1995) and Attanasio and MaCurdy (1997)]. Eissa and Liebman (1995) examine the impact of recent EITC expansions on female household heads using natural experiment methods that compare changes in the labor force participation rates and hours worked of eligible (with children) and ineligible (without children) women. They find an increase in the rate of labour force participation, but no evidence of a decline in hours worked by taxpayers in the phase-out region. Meyer and Rosenbaum (2002) confirm the participation result and further conclude that the EITC explains over half of the substantial increases in the labor force participation of single women with children over the past decade.

Attanasio and MaCurdy (1997) use the policy driven EITC changes over the past decade to estimate a life-cycle consistent model of household labor supply (see our discussion in Section 2.3.6). They estimate the EITC effects on couples in the labour market. Their results suggest substantial effects of the credit expansion on hours worked. Unfortunately, their analysis does not consider the participation decision.

More recently, Eissa and Hoynes (1999) have studied the response of married couples to several EITC expansions over the period 1984-1996. Their results suggest that the EITC expansions have caused married men's labour force participation to increase only slightly but have contributed to reduce women's labour force participation by over a full percentage point. This modest effect masks sizeable heterogeneity across individuals. Hence, women in the phase-out region are more than 5% less likely to work, and if in the labour force, work as much as 276 hours (20%) fewer hours per year.

The parameter estimates show that the elasticity with respect to the net-of-tax wage is about 0.3 for women's participation, and between 0.1 and 0.5 for their hours of work. The authors also present evidence that hours of work elasticities for men and women are larger for lower-earning individuals. Their overall assessment indicates that the EITC expansions have led to reduced family labour supply and pre-tax family earnings. They are thus led to conclude that the EITC is effectively subsidizing married mothers to stay home. In order to offset the negative incentive effects of secondary earners, they suggest that the EITC be based on individual rather than family earnings, although this would entail sizeable costs.

In a recent paper, Meyer and Rosenbaum (2002) have investigated the impact of the welfare and tax policy changes that were enacted between 1984 and 1996. Their analysis allows them to measure the contribution of several distinct policy changes to the observed unprecedented increase in single mothers' employment and hours of work. The empirical analysis reveals that both the participation in paid work as well as hours of work are highly sensitive to expansions

in the EITC. In both cases the estimated elasticity with respect to the marginal tax rate is approximately equal to 0.7. Likewise, the analysis also reveals that the increase in work by single mothers also responded to welfare benefit reductions, welfare waivers and child care expansions, but to a lesser degree. The authors conclude that financial incentives through the tax and welfare systems have substantial effects on single mothers' labour supply decisions.

4.1.2 The UK Working Families Tax Credit (WFTC)

An important component of the British tax and welfare system is the “in-work” benefit program called Family Credit (FC). Introduced in 1988 as an extension to Family Income Supplement, it has many features in common with the EITC program in the US. However, eligibility is based on a minimum weekly working hours requirement. The new Working Families Tax Credit, which replaced FC in October 1999, has exactly the same minimum weekly hours requirement. In this respect, the British in-work benefit system has similarities to the Canadian Self-Sufficiency Program.⁴ The FC system was designed to encourage part-time work and to support the income of part-time working parents. It has subsequently been extended with a small supplement for full-time work.

The basic FC scheme is generous but has a high benefit reduction rate. Family Credit becomes payable to individuals in families with children if their working hours exceed 16 per week and their overall income falls below some specified level, which varies with the number and age of children. The credit is then progressively withdrawn at a reduction rate of 70% as income rises (lowered to 55% in the WFTC reform). This rate is considerably higher than that for the EITC in the US (see Section 4.1.1).

Since the introduction of FC in 1988, the structure of the in-work benefit system has witnessed three major reforms: a reduction in the hours rule from 24 to 16 in 1992, the introduction of childcare disregards to help recipients with child-care costs in 1994, and the introduction of an additional credit at 30 hours. During this period, the number of recipients doubled to well over 500,000. The Working Families Tax Credit reform only marginally changes the structure with a more generous level of payment and a lower benefit reduction rate of 55%. Consequently, more individuals in work who would not have received FC will now receive WFTC.

For most low-income individuals working less than 16 hours per week, the income support and housing benefit system renders the budget constraint virtually flat, so that FC can act as an important jump in the in-work income for low-wage working parents. The high benefit reduction rate, however, implies a reasonably flat constraint above 16 hours, providing a potentially

⁴However, it should be pointed out that the SSP, which is only currently operating on an experimental basis, is time-limited and only available to parents with long durations of welfare receipt and unemployment.

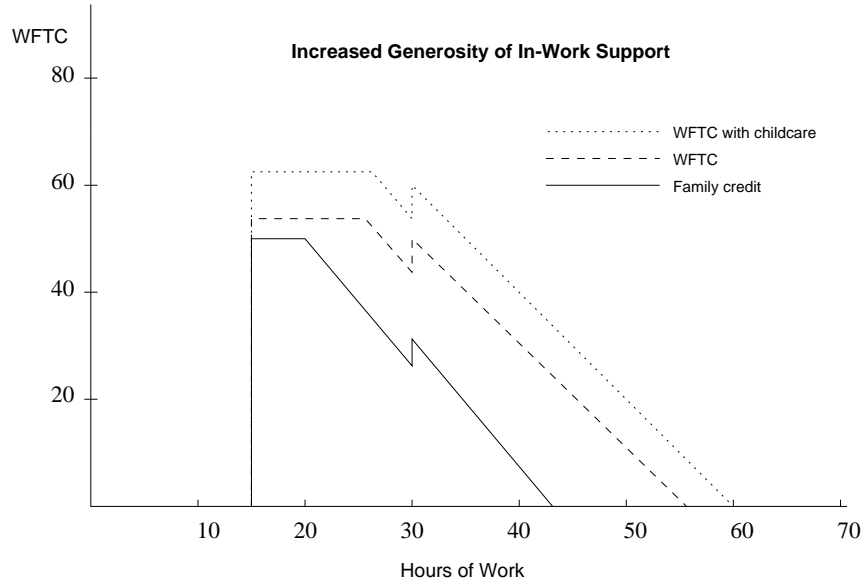


Figure 5: WFTC Schedule

strong incentive for those working more to reduce their hours. Consequently, questions similar to those of the EITC arise as to the effectiveness of the system.

The impact of the WFTC on hours of work and participation

Several research projects have been conducted recently at the Institute for Fiscal Studies (IFS) to assess the likely impacts of the WFTC on the participation and hours of work of target groups. The papers by Gregg, Johnson and Reed (1999), Blundell, Duncan, McCrae and Meghir (2000) and Gillian, Walker and Zhu (1999) all use simulation techniques operating on microeconomic data (see our discussion in Section 2.4). They differ both in terms of methodology and in data sources. Yet, as shown in Table 2 below, all three studies yield essentially the same results.

Indeed, the results show an unambiguous positive impact on the participation of single mothers. There is also a sizeable positive impact on participation for married women with unemployed partners. As would be expected, there is a moderate negative impact on married women with employed partners. This partially offsets the positive impact on single women, but if the aim is to reduce the number of families with no earners then this may be less important. To this end, the impact on non-working married men with spouses who do not work is equally interesting. Here again, there is a fairly large positive impact on employment. Finally, for men with partners who do work, there is more disagreement across models - in fact, this

Table 2: Predicted Impact of the WFTC

Group	Gregg <i>et al.</i>		Blundell <i>et al.</i>		Gillian <i>et al.</i>	
	Number	%	Number	%	Number	%
Single parents	28,600	1.85	34,000	2.20	24,700	1.60
Married women, partner not working	14,610	1.75	11,000	1.32		
Married women, partner working	- 29,050	-0.83	-20,000	-0.57		
Married men, partner not working	16,820	0.48	13,000	0.37		
Married men, partner working	1,790	0.05	-10,500	-0.30		
Total employment effect	32,770		27,500			

is essentially the main reason why the totals differ. For this group, the effect of an increase in the wife's income leads to a negative impact on participation in the study by Blundell *et al.* (2000). The study by Gregg *et al.* (1999) does not find a negative effect; however, this may be because it only looks at entry into work and does not directly model exit from work. Hence, it does not pick up the effect of previously employed men moving out of work in response to the WFTC.

4.1.3 Evaluating Tax Reforms using the NE Approach

The previous subsections have focussed on the evaluation of particular provisions of the tax system in the US and the UK. Here we will summarize the results of the empirical literature that concentrates on the impact of various tax reforms on labour supply.

Tables 3–5 report the results of the main studies that have investigated various tax reforms in the United States, the United Kingdom and Canada. Table 3 focuses on the US. All the papers listed in the table investigate the impact of the Tax Reform Act of 1986 (TRA). The TRA reduced the top marginal tax rates significantly. Some papers incorporate EITC expansions in the analysis, others do not. Those that do not, manage to isolate the TRA from EITC effects by choosing appropriate control and treatment groups, *i.e.* groups that were not affected by EITC expansions.

The first four papers look at the impact of the TRA on labour supply. It is found that the labour supply of women reacted positively to the reduction in the marginal tax rates. This is true for high-income married women [Eissa (1995)] and for female headed households [Eissa and Liebman (1995) and Meyer and Rosenbaum (2002)]. Men, on the other hand, are found

to be less responsive to the tax changes. Indeed, Eissa (1996) find only weak evidence that men increased their labour supply following changes in the marginal tax rates. Moffitt and Wilhelm (1998), on the other hand, investigate the behaviour of wealthy men. They find that high-income men have not responded to the reduction in top marginal tax rates. They conjecture that since these men already work many hours, they may have little scope to adjust their behaviour.

Recall from our discussion in the Introduction that hours of work is only one margin against which to adjust behaviour in the face of changing fiscal provisions. Indeed, rising tax rates may induce individuals to work in the underground sector or to modify their savings or portfolio decisions.⁵ The last three papers in Table 3 investigate how taxable income changes as a result of changing marginal tax rates. Saez (1999), Feldstein (1995) and Gruber and Saez (2000) all find that individuals significantly increase their taxable income when tax rates are reduced. According to Saez (1999), both low-income and middle-income tax payers increase their taxable income. The author suggests that these workers have little scope for adjustment outside the labour market and is thus led to conclude that increased hours of work are the main driving factor behind increasing revenues. Feldstein (1995), on the other hand, finds taxable income to be extremely sensitive to variations in marginal tax rates. The reported elasticities range between 0 and 3. It is clear that such variations in taxable income cannot be explained by variations in hours of work alone. Other adjustments are taking place. Feldstein further warns that his results represent short-run adjustments to variations in marginal tax rates. The long-run response is likely greater. Thus when interpreted in light of Moffitt and Wilhelm (1998)'s results, Feldstein's results imply that increasing the top marginal tax rates will yield few if any additional tax revenues for the government. The results reported in Gruber and Saez (2000) are consistent with those of Feldstein (1995) but the elasticities are somewhat smaller.

Table 4 reports the results of two studies that were conducted using UK data. In the first of these, Blundell et al. (1998) investigate the impact of the various tax reforms that were carried out through the 1980s and early 1990s on married women's labour supply. The elasticities reported in this study do not distinguish between participation *per se* and annual hours of work. All the net wage elasticities are found to be positive and to vary according to the age of the youngest child. Interestingly, it is found that the elasticities are highest when the youngest child is a preschooler.

The other study listed in the table focuses on lone mothers. In their paper, Blundell, Duncan and Meghir (1992) report labour supply elasticities according to hours of work and schooling levels. As in their 1998 paper, they find that women with preschoolers are more sensitive than others to variations in net wage rates. Likewise, women working few hours are more responsive to increases in their net wage than those working more hours. In fact, women

⁵Veal (2001) has recently investigated the impact of the 1988 tax flattening in Canada on RRSP contributions.

working many hours are found to have a backward-bending labour supply curve. In other words, increases in the net wage rate translates into fewer hours of work. This is an indication that the income effect is greater than the substitution effect.

Finally, Table 5 reports the results of a study by Sillamaa and Veall (2000) that uses Canadian data. This study is similar to those conducted by Moffitt and Wilhelm (1998) and Feldstein (1995). The authors use tax records from the Longitudinal Administrative Database (LAD) for the years 1986–1989 to study the impact of the 1988 tax flattening in Canada. As stressed by the authors, we know fairly little about the impact of tax reforms in Canada. Yet, the responsiveness to tax changes is important in determining the social marginal cost per dollar revenue raised through the tax system.⁶

Unfortunately, the LAD contains no information on hours of work. The authors therefore seek to investigate the response of taxable income to the 1988 tax flattening. The authors report the impact of the tax flattening on various measures of income. The first row of the table show that a 1% reduction in the marginal tax rate increase gross income by 0.25%. Income accruing from regular employment and self-employment is much more sensitive, with an elasticity nearly equal to 1. When reported separately, income from regular employment has an elasticity of about 0.22 and the elasticity of income from self-employment is as high as 1.23. The elasticity of income from regular employment is similar to elasticities usually reported for annual hours of work.

The second row of the table reports elasticities of individuals that were at least 64 years of age in 1986. The senior population is singled out because the option of retiring or reducing hours of work significantly is presumably more likely. The estimate for regular income (1.764) suggests indeed that when faced with higher marginal tax rates, seniors will respond by decreasing considerably their labour supply. The response of self-employment income, though sizeable at 0.637, is less than that found for the total population.

Finally, the authors investigate the responsiveness of high-income individuals to tax changes. Unfortunately, only the response of gross income is reported in the paper. Nevertheless, the elasticities indicate that increases in the marginal tax rates will be more than compensated for by reductions in gross income, except perhaps for married women. These elasticities are of the same order of magnitude as those reported using US data.

⁶Fortin and Lacroix (1994) estimate the marginal social cost of an additional tax dollar to be approximately equal to \$1.55 in Québec when labour supply in both the regular and the underground sectors are taken into account.

4.2 Results from the Microeconomic (Structural) Approach

4.2.1 Standard Labour Supply Studies

As mentioned in Section 3.2, the so-called structural approach exploits the institutional details of the tax regimes to model individual behaviour. The main benefit of this approach is its ability to simulate precisely the response to changes in tax regimes on an individual basis. Given the complexity of the tax regimes and the ensuing methodological challenges, all studies most rely on simplifying assumptions. These can relate to the details of the tax regimes *per se* and/or to statistical assumptions. Microeconomic studies could thus be categorized according to the postulated assumptions. Instead, we have chosen to categorize them according to the country under investigation. The technical details are thus willingly omitted from the discussion. Given the robustness of the results observed in the literature, we feel there is no need to spend much time on this issue.

Tables 6 and 7 report results for men and married women separately. Fewer studies are devoted to studying men's behaviour. Indeed, men's labour supply is usually thought not to be very responsive to changes in tax rates. In fact, most results presented in Table 6 are consistent with this presumption. The net wage elasticity of hours of work ranges between 0 and 0.25. The only noteworthy exception in the table is the study by Lacroix and Fortin (1992) using Canadian data. In their 1992 paper, they study the impact of marginal tax rates on hours of work in the regular and irregular (underground) labour markets. The fact that their elasticities are higher than those of other studies is the consequence of allowing for an additional margin of adjustment (irregular labour) in the analysis. No other study allows for such adjustment due to the lack of appropriate data. The elasticity of regular hours for individuals working in the regular market only, 0.249, is close to those found in other studies. On the other hand, individuals working in both sectors are much more sensitive to variations either in the regular wage (RW) and the irregular wage (IW). In a study that used Census data, and in which irregular hours are not allowed for, Fortin and Lacroix (1997) find elasticities very much in line with those found in other countries. It is safe to conclude that men's hours of work respond little to changes in net wage rates. On the other hand, they are relatively sensitive to changes in nonwage income. The reported elasticities are negative as expected, and relatively high in some cases.

Women's elasticities are reported in Table 7. A quick glance through the table shows that women's elasticities are much higher than those of men, irrespective of the country considered. In nearly all cases, the elasticities are positive. The only noteworthy exceptions are the studies by Robinson and Tomes (1985) and Nakamura and Nakamura (1981), both using Canadian data. It is not clear why these two studies yield different results. On the other hand, the studies by Stelcner and Breslaw (1985), Smith and Stelcner (1985), Lacroix and Fr chet te (1994) and

Fortin and Lacroix (1997) all use samples of women from Québec for different years. Yet, they all yield very similar results.

4.2.2 Labour Supply and Child Care

Recall from Section 2.3.2 that fixed costs of work increase an individual's reservation wage. A consequence of fixed costs is also to induce individuals to work a minimum number of hours so as to absorb these additional costs. Research into the impact of child care cost on women's labour supply has been very active in recent years. Table 8 reports results for Canada and the US. Both Canadian studies use data from the Canadian National Child Care Survey to investigate the sensitivity of women's hours of work with respect to child care costs. Both studies find negative and relatively high elasticities of participation and hours of work with respect to child care costs. Interestingly, Cleveland, Gunderson and Hyatt (1996)'s paper shows that an increase in father's wage translates into additional expenditures on market care.

The US studies yield very similar results to those found in Canada. The study by the Government Accounting Office (1994) reports results based on broad income groups. The results show that poor households are much more responsive to increase in child care cost than non-poor households. Hence, a 10% increase in child care costs will induce 5% of poor households to leave the labour market. The study by Anderson and Levine (1999) offers very interesting insights into the sensitivity of women's labour supply decision with respect to child care costs. Their results are classified first according to schooling levels, then by income and schooling levels. Their results show that those who are poorly educated are much more responsive to variations in wage rates and child care costs when deciding to participate in the labour market. Likewise, poor and near-poor households react much more strongly to increases in child-care costs. These results suggest that policies that provide support for child care costs will benefit poor, low-educated households most.

5 Conclusion

The influence of governmental tax and transfer programs on individual behaviour is often a critical consideration in the design of policies. Changes in any single policy parameter can potentially affect a whole array of decisions including, but not restricted to, labour supply, work in the underground economy, savings, human capital investments, *etc.*

This report has focused exclusively on labour supply responses to policy changes for three reasons. First, recent reforms of tax and transfer programs often aim at increasing employment and hours work of targeted groups. Second, labour resources represent the most important

input into the production of goods and services in the economy. Third, hours of work and labour force participation are easily measured and are well understood concepts.

Section 2 has reviewed the main theoretical tools that are necessary to understand the bulk of published empirical studies in the economics literature. Section 3 presented the two main empirical strategies used when assessing the impact of policy reforms. Finally, Section 4 has surveyed the most recent empirical evidence on labour supply response to changes in policy parameters.

Our overall assessment of the vast literature on labour supply is threefold. First, from a methodological point of view, it seems quite clear that most recent empirical studies have favoured the so-called difference-in-differences or natural experiment approach. This approach has many virtues, one of them being its simplicity. Unfortunately, many analysts tend to overlook the stringent assumptions that are implicitly required to obtain consistent impact estimates. From a policy perspective, this approach is also of limited use since it does not provide sufficient information for extrapolation to, or simulation of, alternative policy changes. Microeconomic structural models are better equipped to simulate tax and welfare policy changes. On the other hand, estimation of a structural model that embodies complex tax and transfer programs can be daunting and require strong identifying restrictions.

Second, a careful reading of the empirical literature reveals that much of women’s response to policy initiatives occurs through the extensive (participation) margin. Two important studies (Eissa (1995), Eissa and Liebman (1995)) have thus established that both married women and single mothers are less responsive to policy changes at the extensive margin. The latter study has also found that the significant changes that had been made to the EITC with the passage of the 1986 Tax Reform Act had no impact on the hours of work of single mothers already in employment.⁷ This result has profound implications for the efficiency-equity trade-off under-

⁷In a recent paper, Meyer (2002) provides empirical evidence that the EITC unequivocally encouraged single parents to work, while having little or no effect on the hours of work patterns of those already in employment. In a relatively recent paper, Kimmel and Kniesner (1998) provide strong econometric evidence that the elasticities of labour supply differ substantially at the extensive and the intensive margins. We have not surveyed their study since the analysis does not account for income taxes. Nevertheless, their results are worth underlining. The table below reports the main elasticities from their paper.

Estimated Labour Supply Wage Elasticities				
	Single Men	Married Men	Single Women	Married Women
Employed	0.65	1.08	2.42	1.85
Hours	0.44	0.40	0.69	0.67

These results show that there are no differences by marital status in the elasticities of hours worked by the employed, but significant differences by marital status in the wage elasticities of employment as expected if fixed money costs of employment are important. The sex/marital status differences in employment elasticities are consistent with family fixed costs of employment falling largely on the wife in married families.

lying any policy reform. Models and simulations that do not acknowledge unresponsiveness of labour supply at the intensive (hours) margin are likely to overstate the labour supply disincentives effects of many transfer programs. On the other hand, many studies have found that taxable income is much more responsive to tax changes than hours of work. This is observed both in the U.S. (Moffitt and Wilhelm (1998), Saez (1999), Feldstein (1995), Gruber and Saez (2000)) and in Canada (Sillamaa and Veall (2000)). In particular, high income taxpayers are always found to be very sensitive to increases in marginal tax rates. These results raise a fundamental policy dilemma: policies or programs that favour labour market participation are costly from the government's point of view. In order to satisfy its budget constraint, additional taxes must be levied against some taxpayers. According to these studies, the government's ability to increase tax income accruing from high income taxpayers appears to be somewhat limited.

Thirdly, studies that use Canadian data to assess the impact of tax and transfers programs in a methodologically sound manner are despairingly few. Indeed, the main labour supply surveys that have been published over the past two decades include only two or three studies that use Canadian data. Discussions of policy reforms in Canada are thus based on evidence from other countries which may or may not be relevant given institutional and behavioural differences. Research efforts should thus be devoted to fill this important gap and to enlighten policy discussions.

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Table 3: Impact of Tax Reforms: US data

Study	Description	Results
Eissa (1995)	Impact of the 1986 Tax Reform Act on labour supply responsiveness of married women. TRA reduced top marginal tax rates from 50% to 28%	Labour supply of high-income married women increased. Elasticity of total hours = 0.8, elasticity of participation=0.4.
Eissa and Liebman (1995)	Impact of the 1986 Tax Reform Act and EITC expansion on the labour supply of single women with children, which were specifically targeted by the EITC expansion.	Increase in labour force participation among female household heads by 1.4 percentage points. Increase largest among low-educated and low-income women with children. No evidence that the EITC expansion decreased hours of work for those already in the labour force.
Eissa (1996)	Labour supply response to the sequence of tax reforms during the 1980s.	Only weak evidence of an increase in male labour supply.
Meyer and Rosenbaum (2002)	Labour supply response of single mothers to the 1986 TRA, and changes in EITC expansions, welfare benefit reductions and child care expansions.	Find evidence that a large share of the increase in work by single mothers can be attributed to the EITC. The elasticity of participation with respect to the marginal tax rate is estimated to be 0.69 and as much as 0.70 for weekly hours of work.
Moffitt and Wilhelm (1998)	The effect of the 1986 TRA on the labour supply of high-income men. The TRA reduced the top marginal tax rates substantially (see above). Analysis spans years 1983 to 1989.	No evidence of any response in annual hours of work. Authors speculate this is due to the fact that such men are already working long hours.
Saez (1999)	From 1979 to 1981, the income tax schedule was fixed in nominal terms while inflation was high (around 10%). Paper uses individual tax returns and the “bracket creep” to measure the sensitivity of income to changes in tax rates.	Elasticities of income with respect to marginal tax rates are higher than those typically found for hours of work. No evidence that high-income taxpayers adjust either their labour supply or other forms of compensation. Single low-income taxpayers increase substantially their taxable income. Elasticities are estimated to be between [1.082, 1.310]. Married middle-income taxpayers are found to have elasticities between [0.383, 0.521]. Author suggests most of the changes are driven hours changes.
Feldstein (1995)	Sensitivity of taxable income to changes in marginal tax rates (TRA 1986). Allows for changes in labour supply, other forms of compensation, investments in assets, extent of spending on tax-deductible activities.	Substantial response of taxable income, implying elasticities of at least 1, and as high as 3.05.
Gruber and Saez (2000)	Elasticity of taxable income to changes in marginal tax rates. Consider the entire set of state and federal tax reforms during the 1980s. Study uses NBER panel of tax returns 1979–1990 (known as Continuous Work History File).	The overall elasticity of taxable income is 0.4. Taxpayers with incomes above \$100,000 have a much higher elasticity than those with incomes below \$100,000 (0.57 vs 0.20). Moreover, high income taxpayers who itemize are particularly responsive to taxation.

Table 4: Impact of Tax Reforms: UK data

Study	Description	Results																				
Blundell et al. (1998)	Use the sequence of tax reforms in the 1980s and early 1990s to study the sensitivity of married women's hours of work.	<p>Net wage elasticities are found to be moderately sized.</p> <p>Elasticities of hours of work</p> <table border="1"> <thead> <tr> <th></th> <th>Net wage</th> <th>Other income</th> </tr> </thead> <tbody> <tr> <td>No Children</td> <td>0.140</td> <td>0.000</td> </tr> <tr> <td>Youngest child 0-2</td> <td>0.205</td> <td>-0.185</td> </tr> <tr> <td>Youngest child 3-4</td> <td>0.371</td> <td>-0.173</td> </tr> <tr> <td>Youngest child 5-10</td> <td>0.132</td> <td>-0.102</td> </tr> <tr> <td>Youngest child 11 +</td> <td>0.130</td> <td>-0.063</td> </tr> </tbody> </table>		Net wage	Other income	No Children	0.140	0.000	Youngest child 0-2	0.205	-0.185	Youngest child 3-4	0.371	-0.173	Youngest child 5-10	0.132	-0.102	Youngest child 11 +	0.130	-0.063		
	Net wage	Other income																				
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Youngest child 5-10	0.132	-0.102																				
Youngest child 11 +	0.130	-0.063																				
Blundell et al. (1992)	Study focuses on the labour supply behaviour of lone mothers. This group faces highly non-linear budget constraints.	<p>Labour supply is quite wage elastic at low hours and becomes flat and slightly backward bending at higher wage rates. Little evidence of hours constraints.</p> <p>Elasticities of hours of work</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Age of children</th> </tr> <tr> <th>Pre-school</th> <th>Primary school</th> </tr> </thead> <tbody> <tr> <td>e(min)</td> <td>-0.04</td> <td>-0.10</td> </tr> <tr> <td>e(25)</td> <td>0.07</td> <td>0.12</td> </tr> <tr> <td>e(50)</td> <td>0.17</td> <td>0.22</td> </tr> <tr> <td>e(75)</td> <td>0.45</td> <td>0.44</td> </tr> <tr> <td>e(mean)</td> <td>0.52</td> <td>0.38</td> </tr> </tbody> </table> <p><i>e(25), e(50), etc. refers to the 25th, 50th percentile, etc.</i></p>		Age of children		Pre-school	Primary school	e(min)	-0.04	-0.10	e(25)	0.07	0.12	e(50)	0.17	0.22	e(75)	0.45	0.44	e(mean)	0.52	0.38
	Age of children																					
	Pre-school	Primary school																				
e(min)	-0.04	-0.10																				
e(25)	0.07	0.12																				
e(50)	0.17	0.22																				
e(75)	0.45	0.44																				
e(mean)	0.52	0.38																				

Table 5: Impact of Tax Reforms: Canadian Data

Study	Description	Results					
		Tax-Price Elasticities of Income					
	Group	Gross Income	Taxable Income	Work (Regular + Self)	Regular Employment	Self - Employment	
Sillamaa and Veall (2000)	LAD 1986-1989, Personal income tax reform of 1988	Age 25-61 in 1986	0.2525	0.1353	0.9178	0.2166	1.1235
		64 + in 1986	0.2934	0.2748	2.4408	1.7638	0.6369
		Gross income > 75 000\$					
		24 ≤ Age in 1986 ≤ 62	1.2963				
		Age in 1986 ≥ 62	1.9305				
		Married Women (24 ≤ Age in 1986 ≤ 62)	0.9121				

Table 6: Non-linear budget constraints, cross-sectional data, Men

Study	Data	Results	
		Wage elasticity	Income elasticity
CANADA Lacroix and Fortin (1992) [†]	Enquête sur la fiscalité au Québec	<i>Regular Labour Market, only</i>	
		0.249	-0.054
		<i>Regular and Irregular Labour Markets</i>	
		Regular Hours [RW] 0.487 [IW] -0.126 Irregular Hours [RW] 0.788 [IW] 0.823	-0.019
		<i>Irregular Labour Market</i>	
Fortin and Lacroix (1997)	1986 census data	0.278	-0.046
		0.223	-0.054
UNITED STATES			
Hausman (n.d.)	US Panel Study of Income Dynamics, 1975	[0.00,0.03]	[-0.95, -1.03]
MaCurdy, Green and Paarsch (1990)	US Panel Study of Income Dynamics, 1975	0	-0.01
Triest (1990)	US Panel Study of Income Dynamics, 1983	0.05	0
SWEDEN			
Blomquist (1983)	Swedish Level of Living Survey, 1974	0.08	[-0.04, -0.03]
Blomquist and Hansson-Brusewitz (1990)	Swedish Level of Living Survey, 1981	[0.08, 0.13]	[-0.01,-0.008]
Flood and MaCurdy (1993)	Swedish Household Market and Non-market Survey, 1984	[0.04, 0.25]	[-0.1, -0.07]
NETHERLANDS			
Van Soest, Woittiez and Kapteyn (1990)	Dutch Strategic Labor Market Research Survey, 1985	0.12	-0.01
GERMANY			
Kaiser, van Essen and Spahn (1992)	German SocioEconomic Panel, 1983	-0.004	-0.28
FRANCE			
Bourguignon and Magnac (1990)	French Labour Force Survey, 1985	0.1	-0.07
UNITED KINGDOM			
Blundell and Walker (1986)	British Family Expenditure Survey, 1980	0.024	-0.287

[†] No distinction between men and women.

Table 7: Non-linear budget constraints, cross-sectional data, Married Women[†]

Study	Data	Results	
		Wage elasticity	Income elasticity
CANADA			
Robinson and Tomes (1985) Nakamura and Nakamura (1981)	Quality of Life Survey, 1979 1971 census data	[-0.23, -0.20] [Age Group]	0
		[25–29] -0.370	-0.220
		[30–34] -0.270	-0.495
		[35–39] -0.305	-0.188
		[40–44] -0.086	-0.269
		[45–49] -0.085	-0.207
		[50–54] 0.143	-0.271
		[55–59] -0.051	-0.076
Stelcner and Breslaw (1985)	1981 census data	0.40	-0.09
Smith and Stelcner (1985)	1981 census data	[Age Group]	
		[20–34] 0.149	-0.184
		[35–54] 0.028	-0.077
Christofides, Stengos and Swidinsky (1997)	LMAS 1988-1989, Lone mothers on welfare	[Hours] 0.074	0
		[Participation] 0.765	-0.404
Lacroix and Fréchette (1994)	Enquête sur la fiscalité au Québec	0.469	-0.170
Fortin and Lacroix (1997)	1986 census data	0.458	-0.015
UNITED STATES			
Hausman (n.d.)	US Panel Study of Income Dynamics, 1975	0.995	-0.121
Triest (1990)	US Panel Study of Income Dynamics, 1983	0.97	-0.33
SWEDEN			
Blomquist and Hansson-Brusewitz (1990)	Swedish Level of Living Survey, 1981	0.79	[-0.24, -0.06]
NETHERLANDS			
Van Soest et al. (1990)	Dutch Strategic Labor Market Research Survey, 1985	0.79	-0.23
GERMANY			
Kaiser et al. (1992)	German SocioEconomic Panel, 1983	1.04	-0.18
FRANCE			
Bourguignon and Magnac (1990)	French Labour Force Survey, 1985	[0.05, 1.0]	[-0.3,-0.2]
Dagsvik, Laisney, Strom and Oster-vold (1988)	Enquête INSEE Budget des familles, 1978-1979	[1.62,1.97]	[-0.41, -0.32]
UNITED KINGDOM			
Arellano and Meghir (1992)	British Family Expenditure Survey, 1983 and British Labour Force Survey, 1983	[0.29,0.71]	[-0.40, -0.13]
Arrufat and Zabalza (1986)	British General Household Survey, 1981	2.03	-0.2
Blundell, Meghir, Symons and Walker (1988)	British Family Expenditure Survey, 1980	0.09	-0.26
ITALY			
Colombino and Boca (1990)	Turin Survey of Couples, 1979	[0.66, 1.18]	0.52

Unless otherwise stated.

Table 8: The Impact of Child Costs on Labour Supply

Study	Data	Results			
		Variable	Participation	Hours	Market Care
CANADA Cleveland et al. (1996)	1988 Canadian National Child Care Survey	Wage	0.025		0.007
		Price of child care	-0.106	-0.265	
		Price of market care			
		Nonwage income	-0.009		0
Powell (1997)	1988 Canadian National Child Care Survey and 1988 LMAS	Father's wage	-0.026		0.141
		Father's nonwage income			0
		Wage	0.18	0.03	
		Child care cost	-0.38	-0.32	
Powell (2002)	1988 Canadian National Child Care Survey and 1988 LMAS	Wage	0.778		
		Day care price	-1.396		
		Baby sitter price	-3.600		
		Relative price	-0.803		
Simulation Results from Powell (2002)					
	Not Work	Work Center	Work Sitter	Work Relative	Work Husband
	0.568	0.066	0.172	0.100	0.094
	0.527	0.076	0.199	0.999	0.097
	0.561	0.078	0.169	0.099	0.093
	0.522	0.059	0.242	0.091	0.086
	0.563	0.065	0.170	0.108	0.094
	0.516	0.070	0.238	0.090	0.085
	0.512	0.069	0.236	0.098	0.084
	Base Case				
	Wage (+10%)				
	Center Price (-10%)				
	Sitter Price (-10%)				
	Relative Price (-10%)				
	Center-Sitter (-10%)				
	All Prices (-10%)				

Table 8: The Impact of Child Care on Labour Supply (Continued)

Study	Data	Results			
		Variable	Participation	Hours	Market Care
UNITED STATES Averett, Peters and Waldman (1997)	1986 wave of the NLSY	Wage		1.29	
		Income		-0.05	
		Child care cost		-0.78	
		Child care cost			
		Child care cost			
Connelly (1992) United States General Accounting Office (1994)	Wave 5 (1984) of the SIPP 1990 National Child Care Survey	Child care cost	-0.20		
		Child care cost	-0.50 (poor)		
		Child care cost	-0.34 (near poor)		
		Child care cost	-0.19 (non-poor)		
Michalopoulos, Robins and Garfinkel (1992) Ribar (1995) Blau and Robins (1988)	Wave 5 (1984) of the SIPP Wave 5 (1984) of the SIPP 1980 Baseline Household Survey of Employment and Opportunity	Child care tax credits		0	
		Child care cost	-0.74		
		Child care cost	-0.38		
Hotz and Kilburn (1991)	1986 National Longitudinal Survey of High School Class of 1972	Child care cost	0		
		Child care cost			
Gelbach (1997) Kimmel (1988)	1980 Census (5% sample) Wave 6 of the 1897 SIPP	Child care cost	[-0.13, -0.36]		
		Child care cost	-0.22 (singles)		
Han and Waldfogel (1998)	1991-1994 March CPS	Child care cost	-0.92 (married)		
		Child care cost	-0.31 (singles)		
		Child care cost	-0.21 (married)		

Table 8: The Impact of Child Care on Labour Supply (Continued)

Study	Data	Results			
		Variable	Participation	Hours	Market Care
Anderson and Levine (1999)	1990, 1991 1992 and 1993 waves of the SIPP	RESULTS BY SCHOOLING LEVELS			
		Less than High-School			
		Wage	0.881		
		Child care	-0.891		
		High school			
		Wage	0.436		
		Child care	-0.488		
		More than high school			
		Wage	0.341		
		Child care	-0.300		
		RESULTS BY SCHOOLING AND INCOME			
		Less than High-School, Non-Poor			
		Wage	0.818		
		Child care	0.115		
		High-School, Non-Poor			
		Wage	0.237		
		Child care	-0.160		
		More than High-School, Non-Poor			
		Wage	0.291		
		Child care	-0.192		
Less than High-School, Poor, Near-Poor					
Wage	0.422				
Child care	-0.649				
High-School, Poor, Near-Poor					
Wage	0.068				
Child care	-0.205				
More than High-School, Poor, Near-Poor					
Wage	0.053				
Child care	-0.227				