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Chapter Author: Thomas Aronsson, James R. Walker

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5 The Effects of Sweden's Welfare State on Labor Supply Incentives

Thomas Aronsson and James R. Walker

Sweden's extensive social insurance programs that care for Swedes "from cradle to grave" necessitate a tax burden that is among the highest in the world. This paper contributes to the discussion by summarizing the incentive effects of the principal tax and transfer programs that affect the Swedish labor supply. We adopt a broad definition of *labor supply* to cover a wide array of potential incentive effects. First, we describe the institutional details of how Sweden's cash transfer programs and tax system affect incentives and for whom. Second, we review the voluminous labor supply literature and recent empirical evidence obtained from Swedish data to measure the most important behavioral effects and to assess probable consequences of legislative reforms.

5.1 Dimensions of Labor Supply

It is common to think of labor supply as a homogeneous quantity, such as the number of hours worked or the number of people employed. Yet one important insight to be gleaned from the labor supply research conducted over the last three decades has been the recognition of the many distinct dimensions of labor supply. We consider three dimensions: (1) participation (whether an individual works); (2) the number of hours supplied in a period; and (3) quality or skill of the worker (also called *human capital,* where the worker's skill is to

Thomas Aronsson is associate professor of economics at the University of Umeå, Sweden. James R. Walker is professor of economics at the University of Wisconsin and a faculty research fellow of the National Bureau of Economic Research.

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some extent a choice variable). We also make the distinction between short- and long-run measures of labor supply.[1]

5.2 Theory of Labor Supply Response

We begin with a description of the individual's choice of hours of work in a static framework, which will be referred to as the *canonical model.* Its simple structure is useful for discussing the basic effects of taxes and transfer programs on labor force participation and hours of work.

5.2.1 The Canonical Model

We represent the individual's preferences over consumption goods and leisure by the utility function $u = u(c, L)$, where c is a composite consumption good, $L = T - h$ is leisure, T is total time available (i.e., the time endowment), and h is hours of work. The utility function is assumed to be increasing and strictly quasi concave in its arguments. The budget constraint is written

$$wh + y - \Gamma + B = c, \tag{1}$$

where w is the hourly gross wage rate, y is nonlabor income, Γ is the total tax payment, and B is a transfer payment received by the individual. To illustrate the outcome of utility maximization subject to equation (1), let us start by assuming that $B = 0$ (i.e., that the individual receives no transfer payment) and that the income tax is proportional in the sense that $\Gamma = \tau wh$, where τ is the marginal tax rate.

In figure 5.1, consumption of goods is measured along the vertical axis, while leisure and hours of work are measured along the horizontal axis, where we make use of the fact that $h = T - L$. The budget constraint is represented by the line E-E with slope $-w(1 - \tau)$ and intercept y. I_0, I_1 and I_2 are indifference curves; that is, each such curve represents combinations of c and L such that the utility is constant along the curve. The farther away from the origin an indifference curve is located, the higher the utility level corresponding to the curve. To reach the highest possible utility level without violating the budget constraint, the individual will choose the combination of goods and leisure consumption where an indifference curve becomes tangent to the budget constraint. This occurs at point A in the figure, where we also find that h_0 represents the optimal hours of work. A key insight provided by the theory of consumer choice is that the response in the hours of work to a change in the budget constraint can be decomposed into a substitution effect and an income effect. This is important in order to understand how to interpret the influence of economic policy such as taxes and transfer payments on hours of work. To illus-

1. The "longest" long run would consider the effect of taxes and transfer programs on the size and age composition of the population. The effects of Sweden's public policies on fertility and immigration are active topics of public discussion. For a discussion of the literature, see Walker (1995) and Gustafsson and Klevmarken (1993).

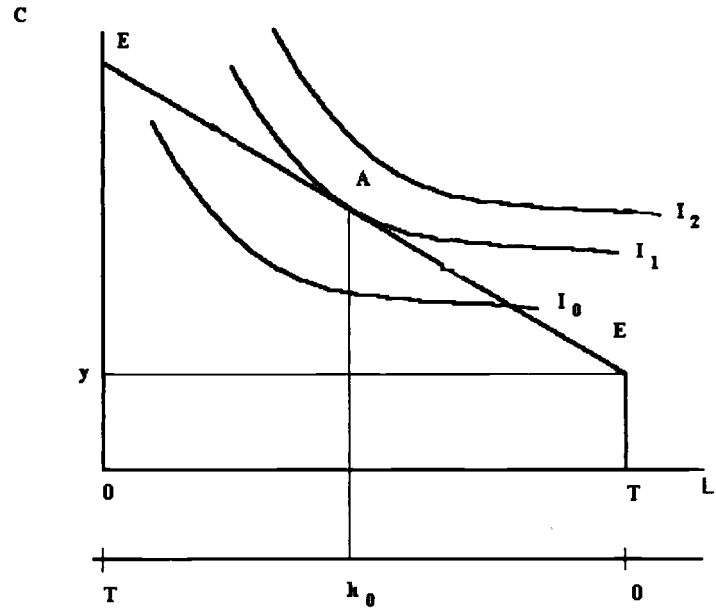

Fig. 5.1 Labor-leisure choice

trate, suppose that the marginal tax rate increases from τ to τ', and consider figure 5.2.

Prior to the change in the marginal tax rate, figure 5.2 coincides with figure 5.1, meaning that the initial optimal hours of work are h_0. An increase in the marginal tax rate will change the slope of the budget constraint, and the new budget constraint is represented by the line E-E' with slope $-w(1 - \tau')$. The new solution is given by the point D, where the optimal hours of work are h_1. To decompose the movement from h_0 to h_1 into a substitution effect and an income effect, suppose that following the policy change individuals were compensated with a lump-sum subsidy for the utility loss from increased marginal taxation. This would shift the new budget constraint (E-E') outward to E''-E'', which is tangent to the old indifference curve at point F. The movement from A to D can now be decomposed into a substitution effect, A-F, and an income effect, F-D. The substitution effect of increased marginal taxation (a decrease in the marginal wage rate) is always nonpositive, which has to do with the fact that increased marginal taxation makes leisure cheaper relative to consumption goods. On the other hand, if leisure is a normal good (i.e., if leisure is positively related to real income), the income effect will increase the hours of work. Since most empirical studies of the labor supply have found that leisure is a normal good, the qualitative response in the hours of work from increased marginal taxation depends on whether the substitution effect dominates the income effect. The distinction between the substitution effect and the income effect is

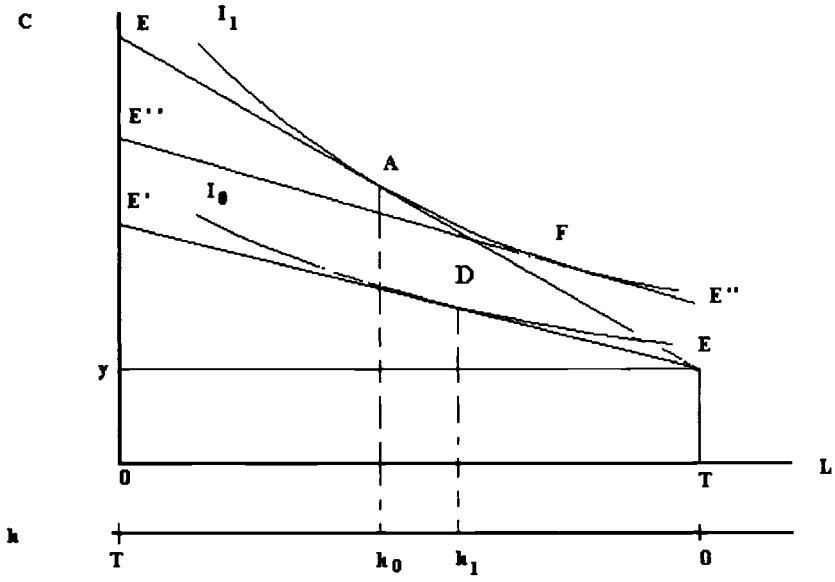

Fig. 5.2 Proportional income tax

important for two reasons. First, following an increase in the marginal wage, economic theory requires that the substitution effect (i.e., the compensated wage effect) be nonnegative. The latter is usually referred to as the Slutsky condition. Second, the social loss of taxation is related to the substitution effect (but not to the income effect). The latter implies, for example, that lump-sum taxes, which do not affect the slope of the budget constraint, cause no social loss because there is no substitution effect involved. We will return to this issue in the next subsection, where the welfare effects of taxes and transfer programs are discussed.

There is one special case where a change in the after-tax wage has an unambiguous effect on labor supply. For individuals not participating in the labor market (i.e., those consuming full leisure and consumption y of market goods), if it has any effect at all, an increase in the wage can only increase labor supply. An increase in the market wage will then induce some nonparticipants to enter the labor market since for nonparticipants an increase in the market wage has only a substitution effect.

Let us now complicate the analysis by assuming that taxes are progressive, but, for the time being, we will continue to assume that $B = 0$. In a progressive tax system, the marginal tax rate is positively related to income, although it is usually constant within given income intervals. To simplify the analysis, suppose that only labor income is taxed and that the marginal tax rate, $\tau(wh)$, is determined according to the tax schedule $\tau(wh) = 0$ if $wh < X_1$, $\tau(wh) = \tau_1$ if $X_1 \leq wh < X_2$, and $\tau(wh) = \tau_2$ if $wh \geq X_2$, where $\tau_2 > \tau_1$, while X_1 and X_2 are

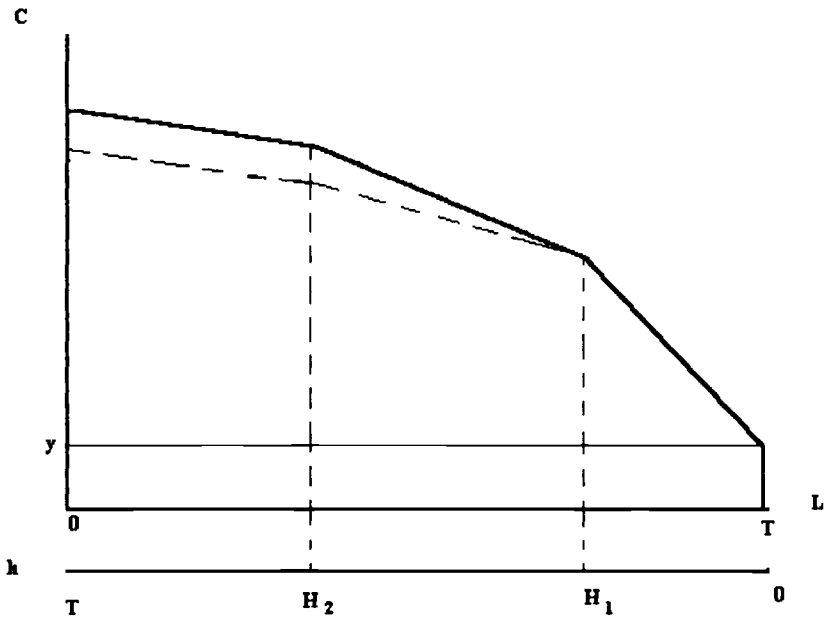

Fig. 5.3 Kinked and piecewise linear budget set

lower and upper limits of the second tax bracket measured in terms of income. This means that the budget constraint will contain three segments, as illustrated in figure 5.3.

In figure 5.3, H_1 and H_2 are the limits of the tax brackets expressed in terms of hours of work; that is, $H_1 = X_1/w$, and $H_2 = X_2/w$. The budget constraint is represented by the heavily drawn kinked line. By starting at the point on the budget constraint where $h = 0$ and then moving leftward along the budget constraint, we see that the marginal wage, $w[1 - \tau(wh)]$ is reduced each time the individual enters a new tax bracket. Since both substitution and income effects are involved, it is generally not possible to predict the influence of piecewise linear taxation on the labor supply. However, some predictions can be made, as illustrated by the following example (borrowed from Blomquist 1989). Suppose that the marginal tax rate on the second segment, that is, for $h \in (H_1, H_2)$, is increased while it remains constant at the other segments. This means that for $h > H_1$ the budget constraint is now replaced by the dotted line in figure 5.3. To be specific, we see that the first segment of the budget constraint is the same as prior to the change. The second segment has a smaller slope than previously because of the increase in the marginal tax rate τ_1. Finally, the third segment is subject only to a parallel shift inward because individuals on the third segment now pay more taxes on the part of their income that falls short of X_2SKr. What predictions are possible? If the initial hours of

work are located on the first segment, the tax reform will have no effect on behavior since the first segment of the budget constraint is not affected by the reform. If the prereform hours of work are located on the second segment, it is not possible to give a qualitative prediction because there is both a substitution effect and an income effect involved when the slope of the budget constraint is altered. Finally, if the prereform hours of work are located on the third segment, there is only an income effect involved. The reason is that, although the consumption possibility is reduced when taxes are increased, the marginal tax rate remains constant. In this case, if leisure is a normal good, the hours of work will increase.

What are the conclusions from this example? If we decrease the marginal tax rates corresponding to low-income tax brackets, a low-income individual would increase his or her labor supply if the substitution effect dominates the income effect. However, given that the marginal tax rates corresponding to high levels of income remain unaltered, an individual with high income would be subject only to an income effect, meaning that he or she would decrease hours of work if leisure is a normal good. Similarly, if we decrease the marginal tax rates corresponding only to high levels of income, high-income individuals may either increase or decrease their labor supply, depending on whether the substitution effect dominates the income effect, while the behavior of individuals with low income would not be affected by the latter reform.

Income-dependent transfer programs introduce nonlinearities in the budget constraint in a way similar to progressive taxes. To see this, suppose that the transfer B in equation (1) decreases when income increases. This means that, if an individual has a sufficiently low level of income to qualify for the benefit, his or her effective marginal tax rate will be $\tau(wh) + B'$, where B' is the marginal reduction of benefits when income increases. As income continues to increase, the benefit will continue to decrease and will eventually be zero. When that happens, the effective marginal tax rate becomes equal to the marginal income tax rate, $\tau(wh)$. An important effect of income-dependent transfer programs is that they may introduce nonconvexities in the budget set in the sense that the effective marginal tax rate decreases when income increases. When this occurs, we can no longer rule out the existence of multiple solutions to the utility-maximization problem. As in the convex case, the concepts of substitution and income effects are still useful in analyzing labor market intervention. However, elasticities and other local measures of comparative statics are less meaningful here because a small change in the budget constraint may cause a large change in behavior.

5.2.2 Welfare

By introducing taxes and transfers, the government creates a wedge between the price a consumer pays and the price a producer receives. These wedges create distortions for the allocation of goods and services (see also Norrman

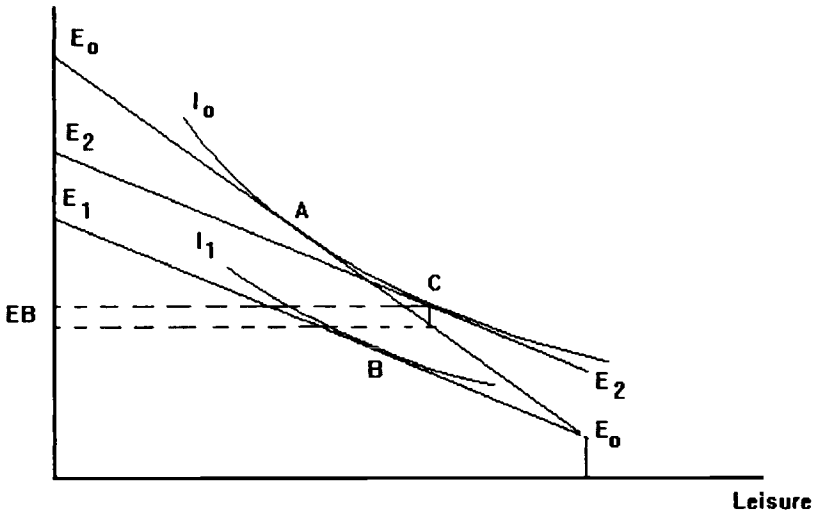

Fig. 5.4 Excess burden based on the compensated variation

and McLure, chap. 3 in this volume; and Rosen, chap. 2 in this volume). Distortions are commonly measured by the excess burden (or deadweight loss), which is the cost of a tax system beyond the revenue it collects. As explained by King (1987) and Auerbach (1985), measures of the excess burden suffer from an index number problem of whether post- or prereform prices are used as a basis. Blomquist (1983) and Hausman (1981) advocate Diamond and McFadden's measure of the excess burden, which equals the compensating variation less the tax that would be collected at the compensated optimum. Blundell et al. (1988) and Aronsson (1993) define the excess burden as the equivalent variation less the tax collected at the individual's optimum position. The compensating variation uses the posttax prices as a reference case and measures the income compensation required by the individual to reach the same utility level as in the absence of the tax. The equivalent variation uses the (hypothetical) optimum in the absence of the tax as a reference case and measures the income reduction that is equivalent to the tax in terms of utility reduction.

These welfare measures are illustrated in figures 5.4 and 5.5. E_0-E_0 is the pretax budget constraint, and E_0-E_1 is the posttax budget constraint. Point A is the optimum in the absence of taxes, while point B is the optimum in the presence of the tax. In figure 5.4, the individual is compensated for the tax so as to restore the pretax utility level. The excess burden is then computed as the compensation required to achieve this (called the *compensating variation*) less the tax payment made at the compensated optimum (point C). In figure 5.5, we reduce the individual's income in the pretax state so that the income reduc-

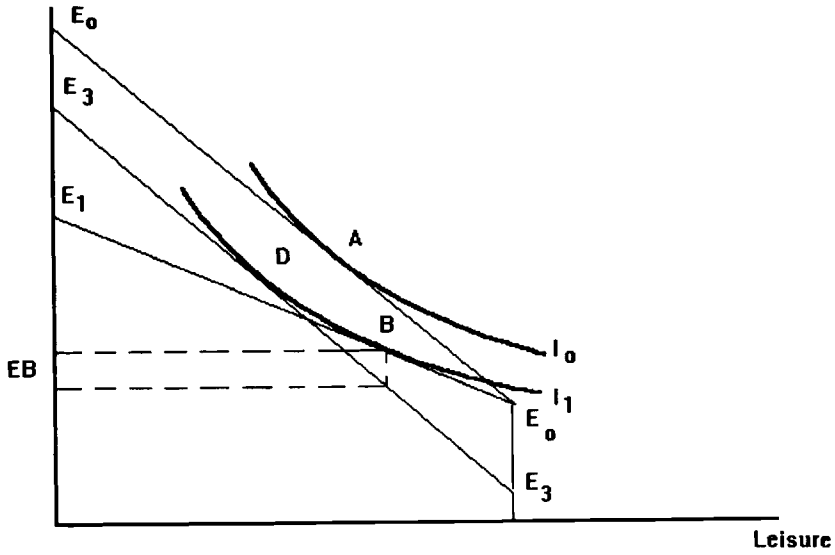

Fig. 5.5 Excess burden based on the equivalent variation

tion (called the *equivalent variation*) is equivalent to the tax payment in terms of the loss of utility. The excess burden is then computed as the equivalent variation less the actual tax payment, that is, the tax payment at point *B*.

The primary difficulty of using these welfare measures is moving from the individual to the society. If we admit differences in tastes or even in the distribution of income across individuals, any aggregate measure of the excess burden will depend on the distribution of income unless the utility function corresponds to the "Gorman polar form."[2] The problem is partly mitigated, although not eliminated, by looking at welfare changes within different interest (or target) groups of consumers. If individuals are identical within a group, then within-group comparisons across alternative reforms are well defined. Comparison of gains and losses across groups, however, requires some subjective notion of equity. Rather than pushing measures of the excess burden this far, it can serve a descriptive role as a scalar measure to summarize the gains and losses of tax reform. It places alternative reforms on a common footing and permits simple description of the distributional effects of a change in the tax or transfer system.[3]

The excess burden of a single tax increases with the curvature of the indifference curve (as measured by the substitution effect) and increases with the

2. The Gorman polar form requires that the expenditure function be written as $e(p, u) = a(p) + ub(p)$, for price vector p and utility u. The functions $a(p)$ and $b(p)$ must be linearly homogeneous and concave. (See Deaton and Muellbauer 1980, 144–45.)

3. For an insightful discussion, see King (1987).

square of the tax rate.[4] Even with a low compensated wage elasticity of labor supply, a high marginal tax rate can yield a large excess burden. Similarly, even at low marginal tax rates, a high compensated substitution effect may produce a large excess burden.

5.2.3 Restrictions and Extensions

The canonical model focuses on only two dimensions of labor supply, participation and hours of work, and even then it is highly stylized. Among the most restrictive assumptions are its static nature (individuals make one choice), its assumption of perfect certainty (workers have complete information on all jobs and on the economy), its simple characterization of jobs and particularly the absence of consideration for the demand side of the market (the wage is a sufficient statistic to describe a job, and workers have complete freedom to vary their hours of work), and its emphasis on atomistic behavior (workers make consumption and labor supply decisions in isolation from others, including family members). Tied to the static nature, with no opportunity to invest in skills (or education), the canonical model is silent on quality dimensions of labor supply. Each of these deficiencies have received attention in the literature, although not usually in connection with the tax and transfer system.[5]

Family Issues

The simplest extension of the canonical model to incorporate family decision making endows the household with preferences defined over the consumption and leisure of each member of the household, for example, $U(c_1, c_2, L_1, L_2)$. Each individual in the household has a time constraint and can work in the labor market at an exogenously determined wage (although, of course, not necessarily the same wage). The key insight is that, since family members jointly determine their labor supply, the labor supply function for an individual in the household depends on the wage rates of all people in the household.[6]

Dynamic Models

In order to construct a simple life-cycle model, suppose that individuals maximize an intertemporally separable utility function:

4. The effects of the tax are compared to the no-tax equilibrium because, by the theory of the second best, in the presence of an initial distortion introducing an additional distortion may or may not decrease welfare (it may attenuate or exacerbate the preexisting situation). Also, with more than one good, we have to consider compensated cross-price effects (the off-diagonal terms of the Slutsky matrix), which may be positive or negative. However, most applications are partial equilibrium in nature and do not model the other distortions or demand for other commodities. Thus, in most applications, the intuition presented in the text will hold.

5. Several surveys of labor supply cover these topics in detail and need not be repeated here (see Pencavel 1986; and Killingsworth and Heckman 1986).

6. Empirical models of household labor supply as well as results from the estimation of such models can be found in Ashenfelter and Heckman (1974), Hausman and Ruud (1984), Kapteyn, Kooreman, and van Soest (1990), and Aronsson (1993).

$$U_0 = \sum_{t=0}^{T} u(c_t,h_t)(1 + \rho)^{-t}, \tag{2}$$

where c_t and h_t represent consumption and hours of work in period t, and ρ is the rate of time preference. The dynamic budget constraint may be written as

$$A_t = (1 + r)A_{t-1} + w_t h_t - \Gamma(w_t h_t + rA_{t-1}) - c_t, \tag{3}$$

where A_t is the asset at the end of period t, r is the interest rate, w_t is the hourly gross wage rate in period t, and $\Gamma(w_t h_t + rA_{t-1})$ is the tax payment in period t. How can we make this model empirically manageable if we do not have information on the path of future wage rates? Following Blomquist (1985) and Blundell and Walker (1986), we note that together A_t and A_{t-1} form a set of sufficient statistics for information about future periods. This means that, if we condition on the asset positions at the beginning and end of period t, it is possible to rewrite the budget constraint in such a way that it becomes similar to that of the canonical model:

$$w_t h_t + \mu_t - \Gamma(w_t h_t + rA_{t-1}) = c_t, \tag{4}$$

where $\mu_t = rA_{t-1} - S_t$, and $S_t = A_t - A_{t-1}$. Hence, μ_t is a measure of nonlabor income that is consistent with intertemporal optimization since it includes not only capital income as in static models but also saving. If the form of the utility function does not change over time, we can derive a life-cycle-consistent within-period labor supply function by maximizing $u(c_t, h_t)$ subject to equation (4).[7]

Just as in the household model of labor supply, where the labor supply function of each individual in the household depends on the wage rates of all people in the household, in dynamic models of labor supply, labor force participation and hours of work depend on current and expected future wages and nonlabor income flows. The dependence on expected future wages and incomes implies that an anticipated future increase in a social insurance benefit or income tax rate may induce a labor supply response in the current period. Many of Sweden's social insurance benefits are work conditioned (i.e., benefits depend on past labor supply; the public pension system is a leading example) and may induce complicated, dynamic labor supply responses as individuals attempt to become entitled to a higher-benefit stream.

Human Capital Accumulation

Models of human capital accumulation incorporate the possibility of spending time in education as part of the utility-maximization problem (see, e.g.,

7. Instead of conditioning on asset positions, Heckman and MaCurdy (1980) and MaCurdy (1981) condition on the marginal utility of wealth and derive what are often referred to as λ-constant labor supply functions. However, the marginal utility of wealth will be a sufficient statistic for information about future periods only if the budget constraint is intertemporally separable, a condition that nonlinear taxation of capital income (which was the case in Sweden prior to the tax reform) violates.

Blinder and Weiss 1976; and Heckman 1976). An individual is assumed to allocate his or her time endowment between leisure, market work, and investments, where the latter is defined as time spent in education. Time spent in education accumulates human capital (knowledge or skill), which, in turn, tends to increase the market wage rate. Hence, the incentive to spend time in education has to do with the assumption that the market wage rate is positively related to the stock of human capital. In a similar way, the opportunity cost is the forgone earnings during periods of investment.

Taxes and transfer programs affect the incentives to spend time in education. This means that, in addition to distorting the life-cycle path of hours of work, taxes and transfer programs will also have an effect on the quality of the labor supply. In appendix A, we illustrate within a simple model of occupational choice how taxes and transfer programs affect the incentives to invest in human capital (see also Edin and Topel, chap. 4 in this volume).

Other Behavioral Effects

Another important insight is that, as marginal tax rates increase, workers have an incentive to seek nontaxable forms of compensation. If it is cost effective for firms to use nontaxed sources of compensation, they will do so. Among other mechanisms, workers may receive compensation in the form of improved fringe benefits or increased on-the-job consumption. The wage is only one form of compensation, and, as marginal tax rates increase, it becomes more costly. Some responses may occur in quantity dimensions; however, with a large number of dimensions to the employment relation, the necessary equilibrating adjustments in any one dimension may be small and empirically difficult to detect. This implies that the structure of compensation is not independent of the tax system.

Just as individuals have an incentive to minimize their tax liability by accepting nontaxed forms of compensation, they also have an incentive to lie to the tax authorities and underreport their taxable income. Tax evasion can be modeled as a form of occupational choice—in one job, within the covered sector, reporting rules imposed on the employer make it impossible for the employee to hide income from the tax authorities; in the other job, within the "uncovered" sector (or, more colorfully, the "underground" sector), it is possible to hide (or shelter) income.[8] Modern tax collection systems make nearly all employee jobs within the covered sector subject to withholding or other collection mechanisms. Self-employment is the prototypical example of a job in the "uncovered" sector. With a change in terminology, the analytic framework of the occupational choice model can be used to investigate this issue (see Cowell 1990).

Given Sweden's overall high level of taxation and benefits, the theory we

8. It is interesting to note that many European countries adopted value added taxes (VAT) because taxpayers did not voluntarily comply with income taxes.

have reviewed suggests possibly large behavioral responses that affect the quantity and quality of the labor supplied to the market. The theory makes it clear that the responses depend on the details of how programs affect budget sets. We turn next to the detailed transfer and tax system.

5.3 Sweden's Transfer Programs

Historians of Sweden's welfare state recognize three epochs in its development. Phase 1 (1890–1930) established national social assistance and social insurance programs. Programs in this phase are comprehensive in coverage but offer meager benefits. Phase 2 (1930–60) established the basic safety net of welfare programs to guarantee an adequate standard of living for all—the aged, the sick, the disabled, the unemployed, low-income families with children—without the stigma of the old poor law. Phase 3 (1960–90) raised the income-replacement ratios to 80–90 percent of market income for those temporarily forced out of gainful employment, led the state to assume large-scale obligations for the care of the elderly and children that previously had been provided within the family, and generalized social services previously available only in large urban areas to small towns and rural areas through massive municipal consolidation (Einhorn and Logue 1989). Hence, most programs date from the turn of the century, and, while their structure has remained unchanged since the first half of the century, the rapid expansion of costly entitlement programs is a relatively new phenomenon. Reforms since 1990 suggest that Sweden has entered a new epoch, phase 4 (1990–), an attempt to scale back the expansive entitlement programs.

Next, we review the major entitlement programs expected to affect labor supply decisions. Table 5.1 summarizes the structure, expenditure, and recent changes in the largest programs.

5.3.1 Pensions

There are two national pension systems developed in Sweden to provide old-age, disability, and survivorship benefits. The basic pension began in 1948 and provides flat-rate payments to all pensioners.[9] The unusual feature of the basic pension is its universality—it is a right of citizenship—no work or contribution requirements exist. The second pension, called the National Supplementary Pension or ATP, was introduced in 1960, began full payouts in 1969, and provides earnings-related payments.

Benefits from the two public pension systems are related by a measure called *the basic amount.* Introduced in 1957, and indexed against inflation, the basic amount is thought to correspond to a yearly income for which a basic pension should be sufficient (Agell 1979). It has also become an index basis for other social benefits.

9. Its predecessor began in 1913, was means tested, and guaranteed a minimum standard for everyone (Hansson-Brusewitz 1992, app. C).

Table 5.1 **Primary Social Insurance Programs**

Program	Main Form of Benefit in 1989	Expenditure in 1989 (SKr million)	Changes during the 1990s
Pension system:			
Old age (basic and ATP)	Flat rate payments to all pensioners. Benefits are indexed for inflation and payable at age 65.		
	Earnings related (ATP) replace 65% of pensionable income during the best 15 years of employment.	97,346[a]	
Partial	Available to individuals aged 60–65 with 10 or more years of employment after age 45. Workers replace 65% of forgone earnings from reduced hours of work. Workers retain right to draw a full pension at official retirement age.	1,523	In July 1994, minimum eligibility age increased to 61, and replacement rate reduced to 55% of forgone earnings. Workers may reduce hours of work by at most 10 hours per week.
Disability	Covers individuals aged 16–65 with reduced capacity to work. Has same structure of basic and supplementary pensions as old-age system. Supplementary benefits based on potential earnings (if not disabled).	22,060	
Health insurance	Public health and hospitals.	84,143	
	Sickness cash benefits replace 90% of earnings. Benefits start on the first day of illness.	55,611	Several reforms during the 1990s reduced the replacement rate and increased the waiting period for coverage. By 1993, no benefits paid for the first day of illness; for the second and third days, 65% of normal earnings replaced. Maximum replacement rate is 80% on fourth day of illness. In 1996, the replacement rate was set to 75% from the second day. Instituted "sickness wage" paid directly by the employer. Replaces public sickness benefits for first two weeks of illness.

(*continued*)

Table 5.1 (continued)

Program	Main Form of Benefit in 1989	Expenditure in 1989 (SKr million)	Changes during the 1990s
Unemployment insurance	Replaces 90% of earnings.	6,225	July 1993 replacement rates decreased to 80%, and benefit period begins on the sixth day of unemployment. New (more stringent) eligibility rules in July 1994.
Family and children:			
Child allowances	Paid monthly to child's guardian until child becomes age 16. Annual base allowance equaled SKr 9,000. Supplementary allowance for third and higher-order births.	10,494	Supplementary allowances for higher-order births reduced by approximately half and were finally abolished in the mid-1990s. Basic allowance reduced.
Parental benefits	At childbirth, parents share 450 days of benefits, 360 of which replace 90% of the earnings, and earnings for the remaining 90 days replaced at the guaranteed rate of SKr 60.00 per day.	12,145	In July 1994, eliminated the 90 days paid at the guaranteed rate. Reinstated in January 1995. The replacement rate was reduced to 75% in 1996.
Child care	Parents pay approximately 10% of publicly provided child-center care.	22,313	

Source: Expenditure estimates from *Statistisk Årsbok 1992* (Stockholm: Statistics Sweden), table 365.
[a]Includes SKr 4,356 million as special housing allowance for the aged. Pension expenditures equal December expenditures multiplied by twelve; all other expenditures are annual values.

The basic pension benefit is a fixed multiple of the basic amount. Since 1968, single individuals receive 95 percent of the basic amount, and married couples, both of retirement age, receive 155 percent of the basic amount. Prior to 1968, these payout proportions were 5.5 percentage points lower for singles and 10.2 percentage points lower for married couples.

The earnings-related ATP covers all individuals over age sixteen with earnings above the basic amount for at least three years since 1960. ATP benefits accrue on pensionable income, defined as all employment-related income (e.g., wages, salary, sickness benefits, parental benefits) between 1 and 7.5 times the basic amount. Entitlement to a full supplementary pension requires thirty years

of work. Full supplementary pension benefits are reduced by one-thirtieth for each year of pensionable income less than thirty. A full ATP pension replaces 60 percent of the pensionable income earned during the worker's best fifteen years (since 1960).[10]

In addition to the public old-age pension, there are also certain contractual pensions. These contractual pensions are not part of the legislation; rather, they are determined by agreement between the parties in the labor market. The benefits are paid out according to centralized negotiated agreements. There are in principle four such contractual pension systems: (1) pensions to national government employees; (2) pensions to local government employees; (3) pensions to white-collar workers in private employment; and (4) pensions to blue-collar workers in private employment. The contractual pensions are not coordinated with the public old-age pensions but supplement the public pensions.

Since 1963, Swedish workers have had the right to draw basic pension benefits starting at age sixty-three or wait until age seventy. Until July 1976, the official retirement age to receive full benefits was age sixty-seven. Workers retiring before the official age receive benefits for the entire retirement period reduced by 0.6 percent per month for each month of early retirement. Workers postponing benefits also receive benefits for the retirement period higher by 0.6 percent per month. A major reform in 1976 gave workers additional flexibility. The pension reform in 1976 reduced the official age of retirement for full benefits to age sixty-five. The penalty for early retirement was reduced to 0.5 percent per month. (The reward for postponing retirement was unaffected.) Most important, the 1976 reform introduced the partial pension system. Individuals age sixty to sixty-five with earnings of at least one basic amount for ten or more years after age forty-five are eligible to receive a partial pension. Workers accepting a partial pension retain eligibility for full pension benefits at the official retirement age. To receive a partial pension, the individual must reduce hours of work by at least five hours per week and must work between seventeen and thirty-four hours following the reduction. The partial pension replaces a fraction of the earnings lost by the work reduction. From July 1976 until January 1981, 65 percent of the forgone earnings were replaced. From January 1981 until June 1987, the replacement rate was reduced to 50 percent. In July 1987, the replacement rate was returned to 65 percent. Recent legislation tightened the requirements and reduced the benefits of the partial pension. As of 1 July 1994, the minimum entitlement age increased from sixty to sixty-one, and workers are allowed to reduce their hours of work by no more than

10. In 1969, a general supplement to the basic pension was implemented for low earners, essentially the recently retired who were not fully vested in the earnings-related ATP pension. The basic pension supplement was tied to the basic amount at 3 percent with a graduated rate of increase of 3 percentage points for every year of work after 1969 until 1976, when the graduated rate increases to 4 percentage points per year of work until 1981, when the maximum supplement of 45 percent is reached. The basic pension supplement is reduced krona for krona by the amount of ATP benefits received.

ten hours per week. Importantly, the replacement rate of forgone earnings was reduced to 55 percent.

Since its inception, the public pension system has included a disability pension for individuals with reduced work capacity due to illness or injury. Individuals aged sixteen to sixty-five are eligible to receive a disability pension if their work capacity has been reduced by at least 50 percent.[11] (Individuals with partial disabilities may receive partial disability pensions of either half or three-quarters of the full pension.) The disability pension is structured in the same way as the public old-age pension and contains a basic and supplementary pension. To calculate the supplementary part of the disability pension, pension points are assigned on the earnings assumed had the individual been able to work (e.g., "assumed pension points"). The assumed pensions points are constant over time and are calculated either as (1) the average pension points obtained in the best two of four previous years of pensionable income or (2) the average of the pension points obtained during the better half of the earnings history.

Since 1960, regulations governing eligibility for disability pensions have changed several times. In June 1970, in addition to medical conditions, special consideration was to be given to labor market conditions of the older (age sixty-three and above) insured individuals. The premise is that "older workers are not to be forced to change location or occupation" (Wadensjö 1985, 5). By July 1972, it became possible to grant a disability pension to an individual age sixty-three or older solely for labor market conditions. Since July 1976, the age limit for both medical and labor market reasons was lowered to sixty. Also, since July 1977, consideration of disability should be independent of the causes of reduced working capacity. The "no-fault" disability pensions gave wider latitude to alcoholism, drug addition, and "sociopathy" as approved diagnoses (Wadensjö 1985, 7).

The pension funds have never been actuarial programs. Prior to 1975, employee contributions and central and local government contributions from general revenue financed the national basic pension scheme. Employee contributions for the basic pensions were levied at a flat rate of 5 percent on their taxable income (maximum contribution SKr 1,500). The supplementary pension plan (ATP) never required direct employee contributions; instead, contributions were paid through a payroll tax on the employer's tax bill. In 1975, employee contributions for the basic pension were abolished and their share offset by an increase in the payroll tax levied on employers.

5.3.2 Health Insurance and Health Services

In the mid-nineteenth century, voluntary sickness benefit societies arose to provide their members health care and income loss protection during a time of

11. Individuals with long-term illnesses of one to two years usually receive disability pensions automatically.

illness. The extent of program coverage as well as cash benefits provided by the voluntary societies were idiosyncratic. Labor unions began lobbying for national health insurance in the early 1920s. Overcoming strong resistance by the medical profession, national health insurance was enacted in 1955. In 1963, the system was integrated into the national insurance system that includes pensions and work injury insurance.

Although many changes have been made to the generosity of benefits, the basic structure of the program remains unchanged since its inception in 1955. The program has two components. First, like most other social insurance programs in Sweden, there is a universal component, and all individuals are eligible to receive the guaranteed benefit. Second, there is a supplemental benefit tied to the individual's employment history to protect earnings against loss during illness. Major increases in benefit levels occurred in 1963, 1967, and 1974. Benefits were not indexed for inflation at this time, and the increases in 1963 and 1967 increased the guaranteed benefit in real terms and maintained the after-tax replacement rate of the supplemental benefits at approximately 80 percent. From their introduction until the 1967 reform, benefits started on the fourth day (three days of coinsurance) of the illness and were, in principle, of unlimited duration. A physician's certificate was needed after the eighth day. In 1967, the waiting period decreased to one day.

The 1974 reform of the health system integrated all health services and made all cash benefits taxable and pensionable income. The minimum replacement ratio was 64 percent from the second day and rose to replace 90 percent of earnings.[12] A 1987 reform eliminated the one-day waiting period, as sickness insurance cash benefits replaced 90 percent of earnings from the first day of illness and no "free days" were deducted. Benefits were reduced in March 1991 and replaced 65 percent of normal income for the first three days of illness, 80 percent from the fourth to the ninetieth day of illness, and 90 percent thereafter. A reform in April 1993 made an additional reduction of benefits. There was no benefit for the first day of sickness. For the second and third days, the replacement ratio was 65 percent of gross earnings. For the fourth day of sickness, the replacement ratio was 80 percent. Since 1996, the replacement rate is 75 percent from the second day of illness. Individuals who have been on sick leave for more than one year receive 70 percent of their income. Since 1992, employed individuals are entitled to a sickness wage paid directly by the employer. The sickness wage replaces health insurance benefits in the first fourteen days of illness.

12. The statutory replacement rate was 90 percent of earnings. The daily replacement rate equals 90 percent of normal twelve-month earnings divided by 365. For the first week of sickness, only normal working days are covered, and benefits are not paid for normal days off (known as the "free-day" rule). No more than two free days can be deducted. If the sickness period lasts more than a week, no days off will be deducted either during the first week or during subsequent weeks of illness.

5.3.3 Child-Rearing Benefits

Sweden has an extensive system of family benefits that may affect time allocation within the household and to the marketplace. We briefly describe the programs below.

Child Allowances

Each child in Sweden receives a general allowance until the age of sixteen. This allowance is tax free and is paid monthly to the child's guardian. These child allowances are in lieu of income tax deductions as in the United States.[13] From August 1948 until July 1983, allowances were roughly indexed to inflation and were the same for each birth. In 1993, the annual basic child allowance was SKr 9,000. In January 1983, a supplement to the basic child allowance was introduced for third and higher-order births. By 1989, the supplemental allowance was 50 percent for the third child, 190 percent for the fourth, 240 percent for the fifth, and 160 percent for the sixth and subsequent children. In 1991, and again in 1994, the supplemental allowances have been reduced for birth orders 4 and above. After the reform in 1994, the supplemental allowance was 100 percent for the fourth and subsequent children. The supplemental allowance was abolished and the basic allowance reduced in 1996.

Maternity and Parental Benefits

Sweden has been at the forefront in legislating child-related benefits. In 1955, maternity benefits were made universal as part of the coverage provided by national health insurance. Prior to this time, childbirth benefits were provided by membership in voluntary recognized insurance societies. Means-tested benefits were available since 1938 to women who were not members of the insurance societies. The passage of national health insurance abolished the maternity benefits provided by the insurance societies. The maternity benefit system followed the usual program structure with a universal minimum benefit guarantee and an earnings-related supplemental component to replace earnings in the event of childbirth. The maximum duration of the benefits was 180 days. The compulsory maternity benefit was repealed in 1974 and replaced by the parental benefit program. In 1974, either parent (but not both simultaneously) could receive benefits in connection with childbirth. Several program revisions increased the generosity of childbirth benefits. In 1993, the couple shared 360 days with the replacement rate of 90 percent of gross earnings up to seven and a half times the basic amount and another 90 days at the guaranteed rate of

13. There are some differences between European countries regarding how support to families with dependent children is organized. These differences are primarily (*a*) whether child allowances are income dependent and (*b*) whether tax deductions are related to family composition. For example, in the German system, child allowances are income dependent, and there is also a special deduction called *the child tax allowance,* which depends on the number of children (see Zimmermann 1993).

SKr 60.00 per day.[14] The replacement rate was reduced to 80 percent in 1994 and to 75 percent in 1996. The benefits can be used anytime until the child's eighth birthday.

Expansion of child-care facilities was regarded in Sweden as the most important family policy issue of the 1970s. Even after substantial expenditures, by the early 1980s sizable "excess demand" for child day-care services remained. Continued expansion of the public child-care sector during the 1980s eliminated most of the excess demand, especially in large urban regions such as Stockholm, Gothenburg, and Malmö. Child-care programs are a municipal responsibility. These programs are financed primarily through local tax revenues and parental fees. Most communities have fees that vary according to the income of the parents. Until recently, parental fees typically covered a small fraction (about 10 percent) of the operating costs (Gustafsson and Stafford 1992). Parental fees have increased lately.

5.3.4 Housing Policy

Sweden formulated a national housing policy in 1948 when it established the National Swedish Housing Board as the central housing authority. An underlying principle of the housing policy was to provide the entire population with healthy, spacious, and functionally equipped housing of good quality at reasonable prices.

A major government policy instrument for one-family owner-occupied dwellings has been interest deductibility of mortgage interest payments. Another major government instrument in housing policy has been in home financing. The central government has provided low-interest and subsidized long-term loans for housing construction.

A third policy instrument is housing allowances available to the elderly and to families, especially low-income families with children. Both types of housing allowances are administered by the communities within rules prescribed by the central government. The legislation on housing allowances for families with children is complicated by frequent changes in benefit levels and income restrictions. However, with one exception, the structure of the program has remained constant. Prior to 1958, housing allowances were restricted to families with two or more children under the age of sixteen. In 1958, housing allowances were extended to families with only one child (under age sixteen). The age limit on children was increased to seventeen in 1972. Housing allowances were extended to childless families and individuals in 1974.

During the period 1948–68, the central government administered housing allowances, although payments varied slightly within region.[15] The number of

14. In July 1994, the ninety days at the (low) guaranteed rate were abolished. From 1995, one month of the parental leave is reserved for the father (and cannot be transferred to the mother).

15. Housing allowances increased with the number of children up to and including the sixth child. The additional benefits per child are equal to the difference in benefits for families with two vs. three children.

families receiving housing allowances peaked in the late 1970s. During the 1980s, income ceilings were not increased for inflation, and the number of families eligible to receive benefits declined. Benefit levels were improved in the late 1980s and restored some of the loss suffered in the 1980s.

A major transformation of housing allowances occurred in 1969. In addition to state (central) government allowances, a state-community housing allowance system began in 1969. The state-subsidized municipal housing allowance covers 80 percent of the monthly housing (rental) cost within prescribed limits. A second change in 1969 revised the application of the income restrictions. From 1969, housing benefits were reduced by a fraction of income in excess of the income limit qualifying for a standard allowance. The percentage applied to reduce benefits increased with income. These limits have also changed several times. The implicit marginal tax rates vary by the number of children in the household and whether it is a single-parent household.

Housing allowances are paid from local income tax revenue. The central government also provides financing for the housing allowances and supplies the state loans and interest subsidies out of general tax revenues.

5.3.5 Unemployment Insurance

Unemployment insurance is administered by recognized unemployment insurance societies, which historically have been operated by trade unions. Society membership was voluntary until 1974, when membership by trade union members became compulsory. Unions continued their responsibility with little change after 1974 when payroll taxes on employers were introduced to help fund unemployment benefits.

To be eligible for unemployment insurance, a society member must register with the local employment office and be fit, able, and willing to work. The individual must also have been a member of the society (and making contributions) for the previous twelve months and during this period have been employed seventy-five or more hours per month for at least five months or sixty-five hours per month for ten months. Benefits are taxable and, prior to 1 July 1993, replaced 90 percent of gross earnings up to a maximum SKr of 598 per day. From 1 July 1993, the replacement rate declined to 80 percent of gross earnings, and, since 1 September 1993, the benefit period begins as of the sixth day of unemployment. The replacement rate was reduced to 75 percent in 1996. Prime-age workers may receive uninterrupted cash payments for a maximum of 300 days (five days per week). Members fifty-five to sixty-four years old are entitled to receive benefits for up to 450 days.[16]

16. It is interesting to make comparisons with other European countries regarding the generosity of the unemployment insurance benefit. In Denmark, the official replacement rate is 90 percent, but this rate is supplemented with a rather low benefit maximum (which gives an average degree of compensation of about 65 percent). The Danish system has no waiting period for unemployment insurance benefits, and the duration of the benefit period is 2.5 years (Pedersen 1993). In Germany,

Individuals who are not members of a recognized unemployment society are also eligible for unemployment cash benefits, although under less-favorable conditions than those of the societies. These benefits fall within the "labor market cash assistance" program. The program is administered by the National Insurance Board, and one-third is financed out of general tax revenues and two-thirds from employers' fees. The state eligibility requirements for public unemployment benefits are the same as those of the societies. However, *employment* is defined liberally, and claimants therefore need have no work record to receive benefits (Wilson 1979, 82). The cash assistance program is extended to new labor market entrants and other nonmembers of the recognized unemployment insurance societies.

5.3.6 Educational System and Policy

The Swedish educational system has undergone a continuing series of reforms since the 1950s. Since the early 1960s, the system has had four major components, compulsory primary school, voluntary secondary school, university and other forms of higher education (*högskola*), and an extensive adult education system. All individuals receive nine years of primary education (ages seven to sixteen). Also, children are entitled to at least one year of preschool before starting (the preschools are part of the public child-care programs and do not belong to the regular school system). Secondary school offers schooling tracks of two, three, or four years' duration and also a large number of specialized courses of varying length. The latter may follow compulsory school or a previously completed line of secondary school. Secondary schools offer both academic programs of study in preparation for university entrance and vocational studies for a broad range of technical fields. A major reform of the vocational education system is currently under way. The reform will standardize vocational education in Sweden. Vocational lines of study will be made more uniform, and the reforms are designed to confer wider and deeper knowledge compared with the previous system of vocational education.

The higher education system was unified through a major reform in 1977. The reform created a single, coherent system for all types of postsecondary education, decentralized decision making, and broadened admissions policies. There are thirty-five higher education institutions (mostly colleges) in Sweden, all (save one) central government agencies. Their employees are national civil servants, and their students pay no tuition. A fundamental principle of Swedish higher education is that all students who need help to finance their studies should receive assistance from the central government for this purpose. The aid takes the form of student grants and loans, generally called *study assistance.* The grants are means-tested but consider only the candidate's income

unemployed persons receive unemployment insurance benefits equal to 68 percent of their previous earnings. After one year, this system is replaced with what is called *unemployment assistance,* with (in principle) unlimited duration, where the replacement rate is 58 percent (Zimmermann 1993).

and resources and disregard the financial resources of the student's partner and/or parents. Study assistance is roughly indexed for inflation and consists of a taxable nonrepayable grant (usually 30 percent) plus a larger repayable loan. The interest rate on the repayable loan portion is quite low, half the state deposit rate. Repayment schedules for the loan are income related, with a general rule of 4 percent of annual income. The rate of interest is fixed annually by the government, and the interest payments are not tax deductible.

5.4 The Tax System

To pay for this extensive system of benefits, by the late 1980s Sweden had the highest tax burden among OECD countries. The most important direct taxes are the national and local income taxes. The most important indirect taxes are the value added tax and the social security payroll tax on employers. In this section, we describe the development and the administration of these various tax schemes.[17]

5.4.1 Indirect Taxes

A sales tax of 4.17 percent was reintroduced in Sweden in 1960 (it had been abolished in 1948). The base of the sales tax included most consumption items, even basic items such as food. The sales tax was increased several times during the 1960s and by the end of the decade equaled 11.1 percent. In 1969, the sales tax was superseded by an 11.1 percent value added tax. Sweden's general policy has been to increase the value added tax to offset revenue losses from reductions in the national income tax rates (1971 and 1991). Consequently, as is evident from figure 5.6, except for a few temporary reductions, the value added tax increased steadily. Since the fall of 1992, the value added tax is 25 percent, with a few exceptions. The value added tax on food was reduced to 12 percent in 1996.

As a general rule, social security contributions have been formally levied on the employer in the form of payroll taxes. Prior to 1975, employees paid 5 percent of their taxable income for the basic pension and a compulsory health insurance fee that depended on income and region. However, in 1993, a minor employee contribution was reintroduced in the form of a health insurance fee. As of 1 January 1994, employees are also required to pay an unemployment insurance fee. Social security contributions by employers cover approximately 40 percent of the cost of social insurance programs (pensions and health insurance programs). The remaining 60 percent is paid from general revenues of the national and local governments. With the exception of the National Supplementary Pension charge that is levied only on incomes within 7.5 times the basic amount, and unlike social security taxes in the United States, social security contributions are levied without an earnings limit.

17. For more information, see Norrman and McLure (chap. 3 in this volume).

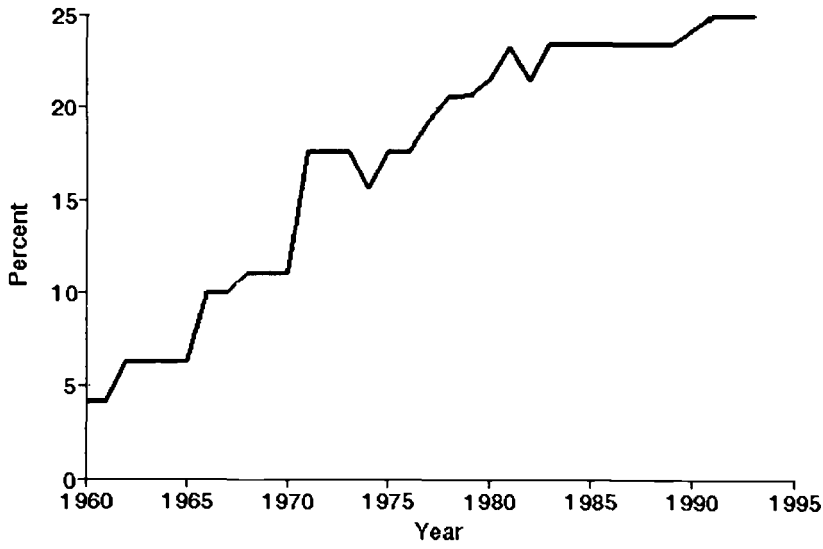

Fig. 5.6 The value added tax

Figure 5.7 shows the pattern of Swedish payroll tax rates over time as a percentage of gross wage rates. The remarkable increase in tax rates reflects the increasing generosity of Sweden's social insurance programs. Only the economic slowdown of the late 1970s broke the sequence of steady rate increases. Subsequently, rate increases were confined to three years, 1983, 1987, and 1991. Concerned about its competitive position in international markets, Sweden made substantial reductions in the payroll tax in 1992 and 1993 and returned rates to their late 1970s level.

5.4.2 Income Tax

Sweden has an integrated and complex income tax system. Individuals pay both a local and a national income tax. Each resident with income above a minimum level must file an income tax return.[18] The national government determines the tax base for both national and local income taxes, but each locality (communities and counties) has the authority to set its own rate. Generally, the same rules governing exemptions and deductions apply, and individuals file only one return for both local and national taxes. Local income taxes are proportional, while the national income tax is progressive. Tax schedules change nearly every year, and, since 1960, two major tax reforms have occurred. The first, in 1971, defined the individual as the unit of taxation and established one national tax schedule independent of marital status and household composi-

18. In addition to individuals actually living in Sweden, residents include any Swede with strong links to Sweden. A Swedish citizen can be taxed in Sweden for five years after departure unless he or she can show that a strong link to Sweden does not exist (Andersson 1986, 3).

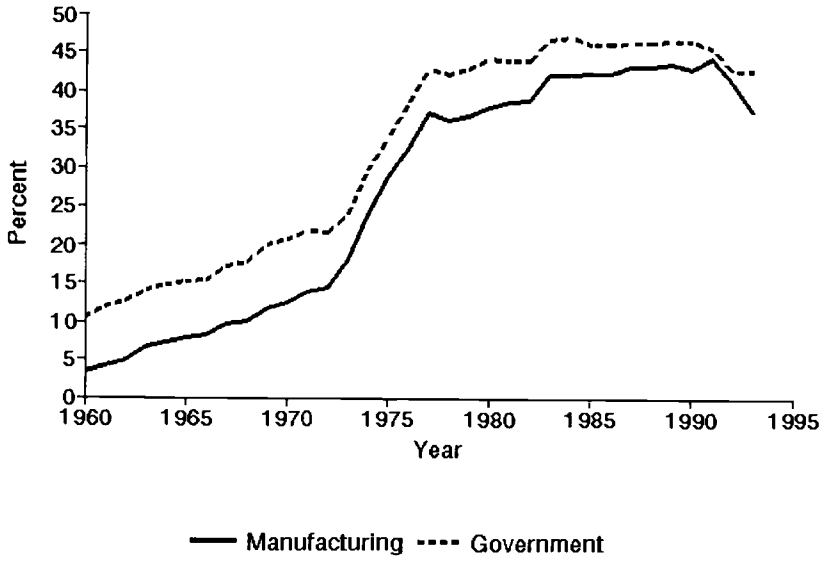

Fig. 5.7 The payroll tax

tion. The second reform, in 1991, simplified the national tax schedule and established more uniform taxation for different sources of income. To appreciate the radical nature of the 1991 reform, and because most empirical studies of taxes and labor supply analyze data from the old regime, we discuss the rules of the pre-1991 tax system.

Swedish tax law recognized six sources of income: agriculture, business, employment, housing, capital, and casual economic activities (capital gains). All receipts were classified into one of these six classes. Each class had its own set of deductions that could be applied only against income within the class. However, a loss in one class could be deducted from income in other classes to reduce the total taxable income. Only a few sources of income were tax exempt—housing allowances, child allowances, and maintenance allowances from a former partner are the primary examples. Since 1974, pension benefits, sickness insurance payments, and unemployment cash benefits are taxable. All labor income is taxable, including an imputed value of nonmonetary benefits (e.g., a company automobile). What made the Swedish tax system so complex is that each person's income was divided between two income categories: A (earned) and B (capital). The 1971 tax reform required that individuals be taxed separately on their A incomes. Couples living together were taxed jointly on their pooled capital income.

Until the 1991 reform, the imputed income from owner-occupied housing was taxable. The tax on owner-occupied housing was progressive, ranging from 2 to 6 percent of the assessed value. However, rules governing the deduct-

ibility of mortgage interest were generous and frequently produced a loss from housing income.

Even before the restrictions on deductions in the 1991 tax reform, the availability of deductions and tax credits in Sweden was much more limited than in the United States. As a rule, deductions are allowed only for expenses necessary for obtaining the income. Various tax credits gave some tax relief to target populations (e.g., the poor, the elderly, and single-headed households with dependent children); however, as a general rule, since 1971 Sweden has had no special tax rules or deductions based on household composition.

Sweden enacted a radical change in the tax system to take effect as of 1 January 1991. With the goal of making the system more neutral, and to treat different kinds of income more equally, the reform broadened the tax base and sharply reduced tax rates. Now, every attempt is made to tax *all* types of compensation (monetary and nonmonetary) for labor and capital on an equal basis and at market value. Some previously exempted fringe benefits are now taxed, and fringe benefits that were previously taxed (e.g., the use of a company automobile) are now taxed at a higher rate. The 1991 tax reform implies that individuals with income under SKr 170,000 pay only the local tax (which remains proportional at around 30 percent), while individuals with higher incomes also pay a 20 percent national income tax. The distinction between A and B income and the joint household taxation of B income had been gradually eliminated during the 1980s. The reform eliminated the income tax on the flow of housing services and instituted a separate proportional tax of 30 percent on capital income (including capital gains). The 1991 tax reform also severely restricted deductions to offset income.

Income tax rates in Sweden are high. Figure 5.8 presents the time-series profile of average local tax rates. The decentralization and expansion of local government services are evident from the rapidly rising local tax rates during the 1960s and 1970s. Figure 5.9 represents the relation between posttax and pretax income for calendar years 1980, 1989, and 1991. The steep progressivity of the Swedish national tax system before the 1991 reform is evident from figure 5.9. In 1980, the marginal tax rates of the national income tax schedule ranged from 0 to 58 percent. Average tax rates of 50 percent were not unusual; local and national tax schedules combined to produce marginal tax rates of over 70 percent. Indeed, tax limitation rules were enacted in 1980 to limit the maximum marginal tax rate at 85 percent. During the 1980s, a series of reforms reduced the number of income brackets and national tax rates. For example, whereas the 1980 national tax schedule had eighteen income brackets, the 1991 tax schedule has only two.

5.5 Effects of Taxes and Transfers on Swedish Work Effort

We review the budget set in 1981 and 1991 for three representative types of individuals to gain an appreciation of the effect of Sweden's changing tax and

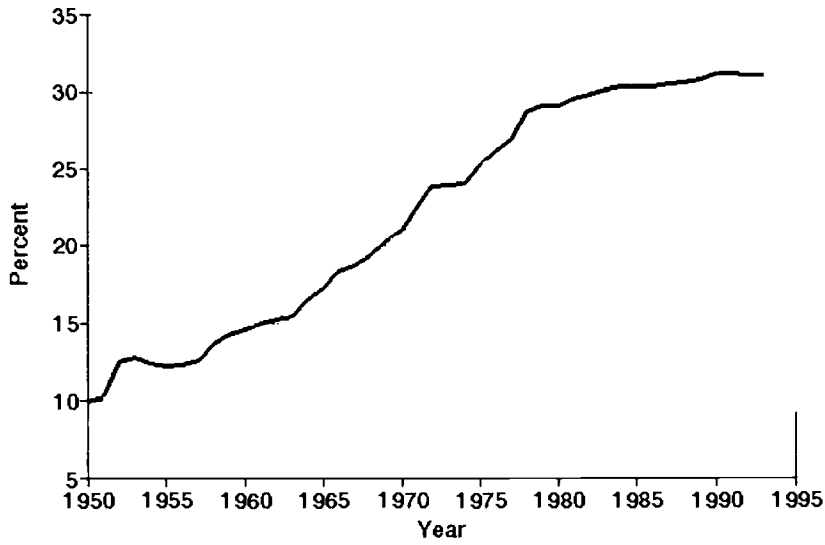

Fig. 5.8 The local tax, 1950–93

social policies on individual work incentives. We then combine knowledge from formal econometric analyses of taxes and labor supply with recent descriptive evidence on time-series trends and cross-sectional patterns to complete our evaluation of taxes and labor supply incentives.

5.5.1 Budget Sets

As Becker (1962) forcefully argued, most of our predictions on individual behavior come from changes in the budget set. It is, therefore, the natural device to summarize the structure of programs and taxes facing Swedish households. To focus our discussion, we compare budget sets from 1981 and 1991 for three types of individuals. We chose 1981 to represent the pre-1991 tax system characterized by its complicated mix of income-dependent programs and fine-grained national tax schedule. The last year is the important "low-marginal" tax system reflecting the 1991 reform. While many of the budget sets and implicit marginal tax rates exhibit stark changes from 1981 to 1991, it is important to recall that a decade of piecewise reforms separate these systems; comparisons between these systems overstate the short-run change faced by any household.

For each of the representative individual types, we present two sets of figures: (1) after-tax household income as a function of annual hours of work and (2) the implicit marginal tax rate (the sum of the value added tax, the marginal income tax from the national and local tax schedules, and the reduction of income-dependent benefits, e.g., housing benefits), also as a function of annual hours of work. Using the estimates reported in Andersson (1989) and Anders-

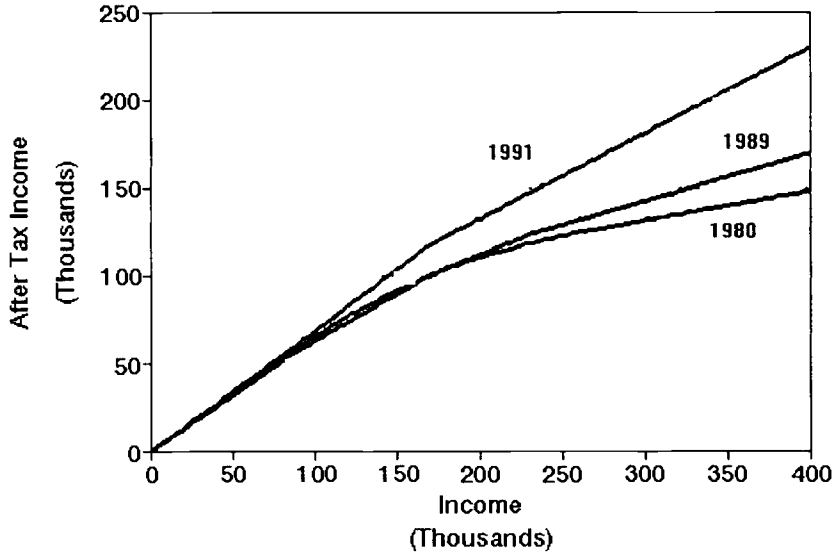

Fig. 5.9 Total income tax, 1980, 1989, and 1991

son and Gustafsson (1992), we incorporate deductions for work-related expenses and union dues. The schedules include standard deductions and, in 1981, the rules for tax reductions and tax limitation.[19] We include the VAT under the assumption that consumer prices increase by the full amount of an increase in the VAT.[20] Because of Sweden's penchant for substituting consumption taxes for income taxes, it is necessary to include the VAT in order accurately to measure the marginal tax rate facing consumers. There are other social programs and fees that will affect the budget set and implicit marginal tax rates for (small) subsets of the population.[21] One important simplification is that households are assumed to have no capital income. Implicit marginal tax rates calculated under this assumption are a lower bound (at given hours of work and earned income) for individuals with a large positive capital income.

19. For other representations of the budget set, see Andersson (1989), Andersson and Gustafsson (1992), and Andersson and Klevmarken (1993).

20. The VAT changed by only 1.5 percentage points between 1981 and 1991, and our estimates of implicit marginal tax rates are not sensitive to the assumed incidence of the VAT. Results in Ballard, Scholz, and Shoven (1987) suggest that a more important issue is the number and type of exemptions to VAT.

21. For example, households with children in public day-care centers pay fees according to their household income. How these situations affect the budget set and implicit tax rate can be found in Gustafsson and Klevmarken (1993). Gustafsson and Klevmarken exclude the VAT and report the implicit marginal tax rate by household income. We include the VAT and report the budget sets and the implicit marginal tax rates by hours of work for a given household member to isolate the incentive effects on labor supply.

Because of the joint taxation of capital income in 1981, capital income affects the 1981 more than the 1991 calculations. Another simplification is the neglect of the incentive effects created by the social insurance system (e.g., sickness benefits, pension benefits)—a consequence of the atemporal nature of these budget sets. However, even in a dynamic framework, these incentive effects would be difficult to measure.[22]

To eliminate the effects of the wage growth between 1981 and 1991 (real female wages grew at an annual growth of 1.5 percent, while real male wages grew 1.3 percent annually between 1981 and 1991), real wages are fixed at their 1991 value. That is, wages in 1991 equal the gender-specific manufacturing wage, while wages in 1981 equal the appropriate 1991 value deflated by the consumer price index. (Because of the wage growth between 1981 and 1991, these wages are higher than the actual 1981 manufacturing wages.) The manufacturing wage is slightly higher than the median wage in the population, but, given the tight distribution of Swedish wages, it is nevertheless representative of the average wage.

Single Male

The three panels of figure 5.10 report the budget set for a single male with no children for a low-wage worker (half the manufacturing wage), an average wage worker (wage equal to the manufacturing wage), and a high-wage worker (twice the manufacturing wage). The panels of figure 5.11 report the corresponding implicit marginal tax rate. Half to twice the manufacturing wage covers all but the highest-wage workers in Sweden. Female wages are 90 percent of male wages, so comparable figures for single women will therefore be quite similar to those presented in figures 5.10 and 5.11.

Several general patterns appear in figures 5.10 and 5.11 that hold for the other representative households. The greatest gains from the 1991 tax reform accrue to high-wage individuals as they benefit from the substantial reduction in marginal tax rates. Low-wage individuals with low labor market attachment (below 750 hours) experience little change in opportunity (fig. 5.10*a*). The many tax brackets are clearly evident by the large number of jumps of the marginal implicit tax function. Jumps in the marginal implicit tax function at low hours of work are the result of the tax bracket and reductions of the income-dependent housing allowances. These generate a nonconvex budget set for some hours of work, as does the increased general deduction on mid-level incomes in 1991. (A nonconvex budget set appears for hours between fifteen and seventeen hundred for low-wage workers in 1981.) The shape of the implicit marginal tax level is similar across wage levels. The basic difference is that it is compressed over fewer hours of work at higher wage levels as the

22. If the social insurance programs were actuarially fair and the present value of taxes paid over the life cycle equaled the present value of benefits received, then the social insurance system would be neutral.

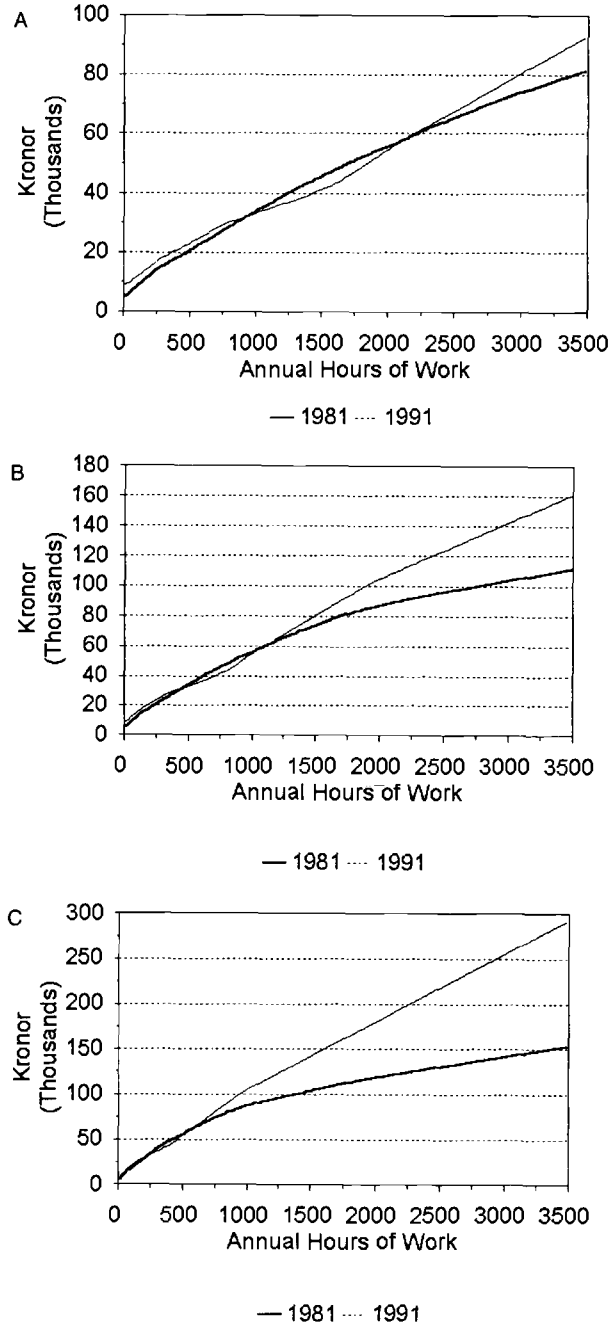

Fig. 5.10 Budget set for a single male. ***a,*** **Budget set low wage (bs_2.wpg).** ***b,*** **Budget set mean wage (bs_0.wpg).** ***c,*** **Budget set high wage (bs_1.wpg).**

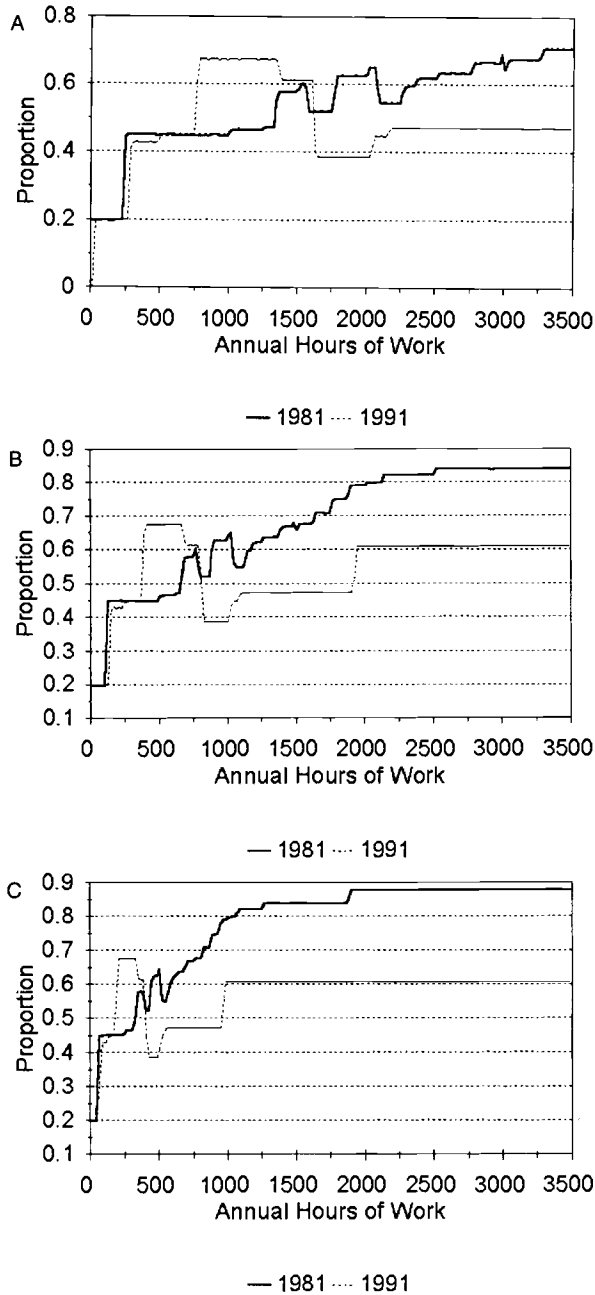

Fig. 5.11 Implicit marginal tax rate for a single male. ***a,*** **Implicit marginal tax rate low wage (mtr_2.wpg).** ***b,*** **Implicit marginal tax mean wage (mtr_0.wpg).** ***c,*** **Implicit marginal tax high wage (mtr_1.wpg).**

income guarantees of the benefit programs and the tax brackets are reached with fewer hours of work. That is, low-wage individuals face the same pattern of marginal tax rate changes with jump points, in terms of annual hours, spaced farther apart. Another key feature is that implicit marginal tax rates are lower for most hours of work for all wage groups in 1991 compared to 1981. Only low-wage earners working less than full-time in 1981 face a lower implicit tax on their work effort in 1981 than in 1991. Even then, the higher implicit marginal tax rate is due to the recovery of the more generous housing allowances in 1991; direct tax rates are lower in 1991 than in 1981.

Married Man

Figures 5.12 and 5.13 present the budget set and implicit marginal tax rates for a married man earning the manufacturing wage with no children and a wife with varying levels of labor market earnings. In both figures, panel *a* assumes that the wife does not work; panel *b* assumes that the wife works part-time (one thousand hours) at a low-wage job (half the manufacturing wage); panel *c* assumes that the wife works part-time at the manufacturing wage; panel *d* assumes that she works full-time at the manufacturing wage; and panel *e* assumes that she works full-time in a high-wage job (twice the manufacturing wage).

The large gain from the 1991 tax reform for high-wage individuals is apparent in all panels of figure 5.12. Men married to wives with no or low earnings face nearly the same budget set in 1991 as in 1981 for low hours of work (say fewer than one thousand hours). For hours of work chosen by most males (fifteen hundred to two thousand), the tax reform of 1991 substantially increases their consumption set. A household with both adults working full-time at an average wage will experience roughly a 20 percent increase in after-tax and after-program income. Gains are smaller for households with lower levels of labor market earnings.

Figure 5.13 presents implicit marginal tax rates corresponding to the budget sets in figure 5.12. Because the individual, not the household, is the basic tax unit of the Swedish tax system, a married man's marginal tax rate is independent of the household structure. Housing allowances depend on household income, so his implicit marginal tax rate is dependent on his partner's labor market activity. The effect of interdependence is concentrated in low annual hours of work for the male, and the range of affected hours increases as spouse's earnings decrease. For example, once the spouse works full-time at the manufacturing wage or at a higher wage rate, the household is no longer eligible to receive housing allowances, and the male's implicit marginal tax schedule is independent of his wife's earnings. Indeed, across all alternative earning levels for the wife, males working 1,250 hours face the same implicit marginal tax schedule appropriate for that year. For men working more than 1,250 hours, the 1991 tax reform reduced their implicit marginal tax rates by as much as 20–25 percent.

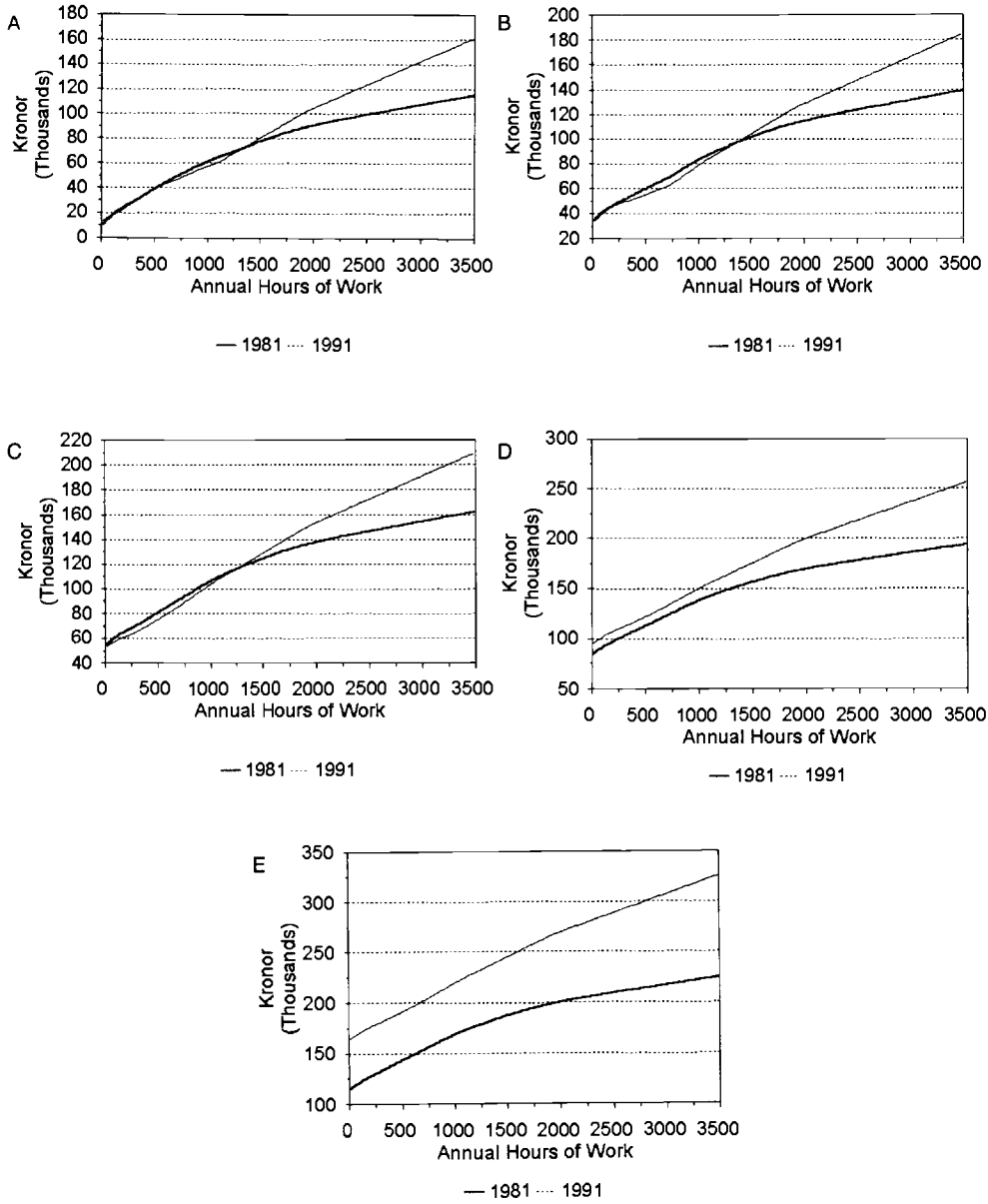

Fig. 5.12 Budget set for a married man. ***a,*** **Budget set nonworking wife (bs_11.wpg).** ***b,*** **Budget set wife works part-time at low wage (bs_9.wpg).** ***c,*** **Budget set wife works part-time at mean wage (bs_7.wpg).** ***d,*** **Budget set wife works full-time at mean wage (bs_6.wpg).** ***e,*** **Budget set wife works full-time at high wage (bs_10.wpg).**

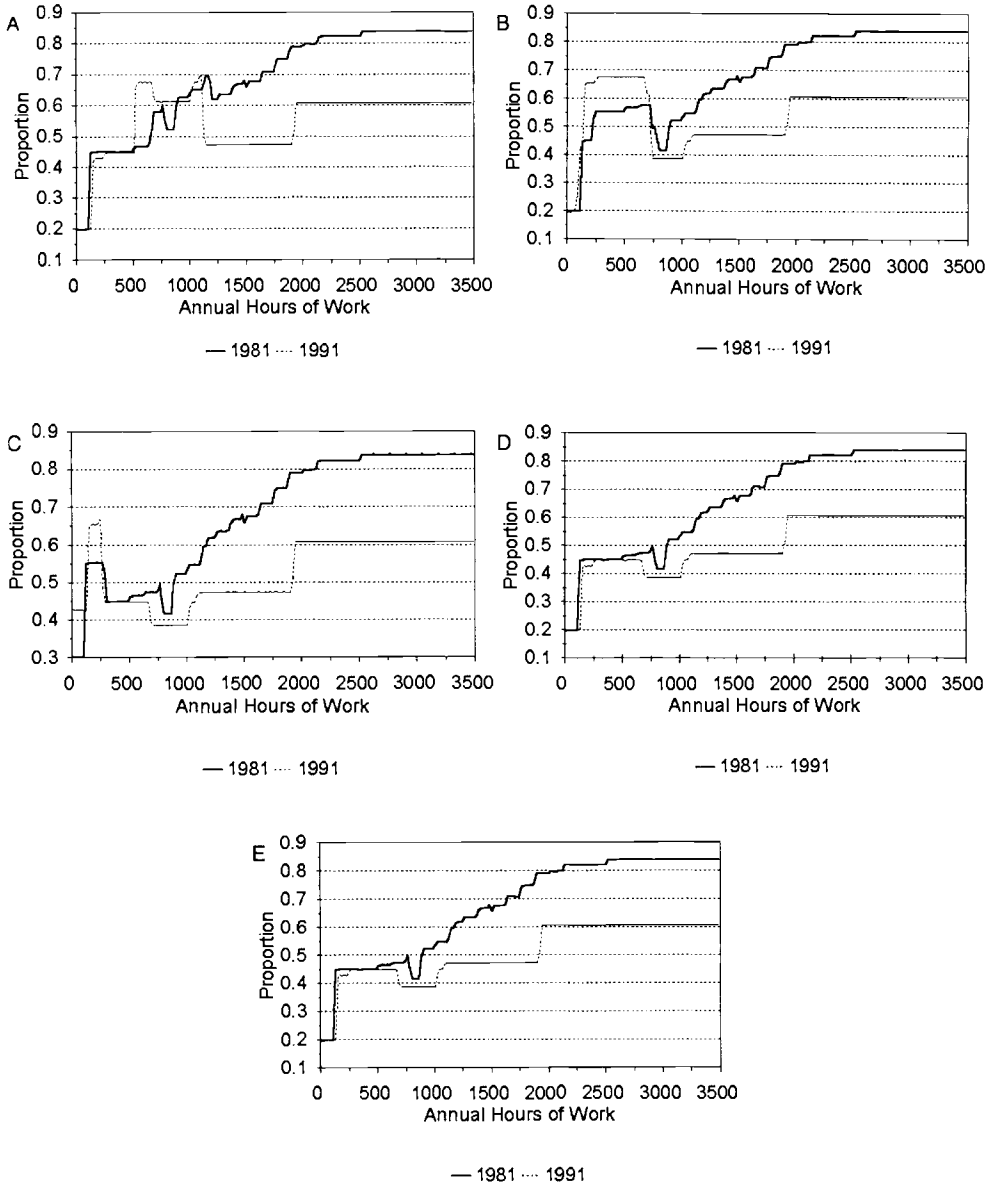

Fig. 5.13 Implicit marginal tax rate for a married man. *a*, Implicit marginal tax rate nonworking wife (mtr_11.wpg). *b*, Implicit marginal tax rate wife works part-time at low wage (mtr_9.wpg). *c*, Implicit marginal tax rate wife works part-time at mean wage (mtr_7.wpg). *d*, Implicit marginal tax rate wife works full-time at mean wage (mtr_6.wpg). *e*, Implicit marginal tax rate wife works full-time at high wage (mtr_10.wpg).

Woman with Two School-Age Children

Figures 5.14 and 5.15 present the budget set and implicit marginal tax rates for a woman earning the manufacturing wage and living in a household with two school-aged children. In panel *a*, the woman is assumed to be single, while, in the remaining panels, she has a partner assumed to be working full-time. In panel *b*, the partner works in a low-wage job; in panel *c*, the partner works in an average-wage position; and, in panel *d*, the partner works in a high-wage job. With (school-aged) children present, the budget sets in figure 5.14 incorporate the (nontaxed) child allowances, measured in 1991 kronor; these amount of SKr 11,314 in 1981 and SKr 18,000 in 1991 and account for a large part of the improvement of the budget set for the single-parent household (panel *a*).

Nonconvexities in the budget sets are also apparent, although many are outside the usual levels of annual hours of work. For unmarried women, one nonconvex portion occurs between twenty-three hundred and three thousand hours in 1981. However, nonconvexities resulting from the additional general deduction affect households at low hours of work, for example, in the neighborhood of five to eight hundred hours. Finally, as for previous households, the largest gains accrue to households with the largest labor market income.

Figure 5.15 presents implicit marginal tax rates corresponding to the budget sets in figure 5.14. Somewhat surprisingly, only for women married to the average wage earner is there a significant range of hours of work for which the implicit marginal tax rate is higher in 1991 than in 1981. Even then, this range is confined to a region of low hours of work (two to eight hundred hours). In this range, each hour of work by the woman reduces the household's housing allowance. The loss of housing allowances is partially offset by the additional general deduction, which is exhausted at 1,250 hours of work. From 1,250 hours, the implicit marginal tax rate equals the marginal tax rate. For all other groups, and for all other hours of work, implicit marginal tax rates are lower in 1991 than in 1981.

5.5.2 Trends in Participation and Hours of Work

Since 1980, labor force participation rates by young men and women have been similar, in terms of both level and time-series pattern (see app. B). The recent economic problems have been particularly marked for the youngest age group; their participation rates have dropped by approximately 20 percent (11 percentage points) in the last three years. For the other two age groups, gender differences in participation rates have narrowed, yet the time-series profiles are quite different across gender. Among prime-age workers (aged twenty-five to fifty-four), female labor force participation rates rose sharply, increasing 35 percentage points in twenty-five years. Since 1985, labor force participation rates for both men and women of this age group have generally exceeded 90 percent. While female participation rates rose rapidly, labor force participation

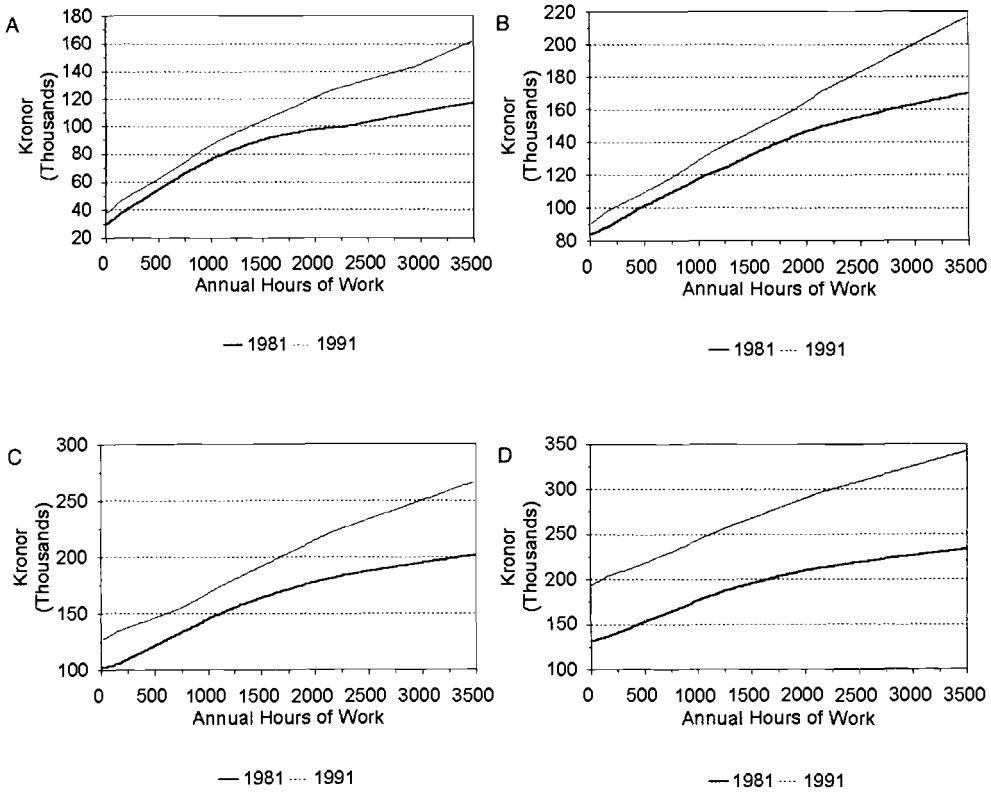

Fig. 5.14 Budget set for a woman with two children. *a*, Budget set single woman (bs_12.wpg). *b*, Budget set husband works full-time at low wage (bs_13.wpg). *c*, Budget set husband works full-time at mean wage (bs_14.wpg). *d*, Budget set husband works full-time at high wage (bs_15.wpg).

rates for prime-age males remained within a narrow band around 95 percent. For the oldest age group of workers (aged fifty-five to sixty-four), male participation rates have steadily fallen from the mid-1960s, and female rates have steadily increased. By 1992, men near retirement have labor force participation rates only 5 percentage points greater than comparably aged women (72 vs. 67 percent).

Time-series patterns in average weekly hours of work exhibit a similar U shape. Weekly hours of work declined from the early 1960s until the early 1980s; then weekly hours increase during the 1980s and level off or slightly decline in the 1990s. Increases in hours of work during the 1980s were stronger for women than for men and for prime-age workers than for older workers. While the time-series profiles are similar, women consistently work six to eight

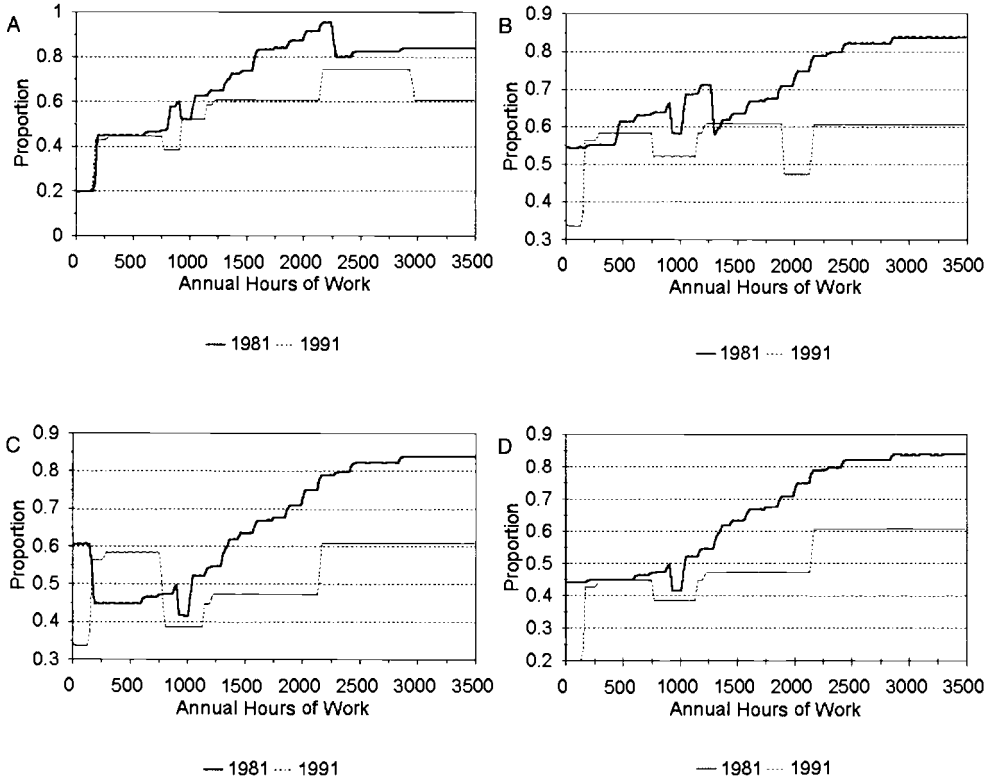

Fig. 5.15 Implicit marginal tax rate for a woman with two children. *a*, Implicit marginal tax rate single woman (mtr_12.wpg). *b*, Implicit marginal tax rate husband works full-time at low wage (mtr_13.wpg). *c*, Implicit marginal tax rate husband works full-time at mean wage (mtr_14.wpg). *d*, Implicit marginal tax rate husband works full-time at high wage (mtr_15.wpg).

fewer hours per week than do men. Only among the youngest age group has the gender gap in hours increased, and even for this group the increase is modest and has been stable since the mid-1970s.

The large number of legislative changes to Sweden's social insurance programs and tax system during the last thirty years makes it nearly impossible to use aggregate time-series data to identify the behavioral responses to any single policy. Even if the policy environment were stable, the irregularities of the budget set confronting Swedish consumers vitiates any attempt to glean behavioral responses from the aggregate time-series data. Consequently, we do not attempt to do so and make only one broad observation. The large increase in female wages generated by the "solidarity" wage policy initiated in the early 1960s, the adoption of the individual as the unit of taxation (which lowered

the marginal tax rate facing Swedish women), and the increasing marginal tax rates that occurred during most of this period and gave strong incentives to equalize taxable income among household members all contributed to the impressive increase in labor force participation by Swedish women. Obtaining more precise estimates of the effect of the Swedish welfare state on labor supply requires a review of the microeconometric evidence.

5.5.3 Econometric Evidence

In this section, we review the empirical labor supply literature to assess the incentive effects of Sweden's tax and cash benefits on labor supply. Several recent surveys address similar issues.[23] We concentrate on studies of Swedish behavior and augment this literature only as needed. We review the empirical literature on taxes and labor supply first and then discuss estimates of the welfare costs.

Labor Supply Elasticities

The canonical model presented in section 5.2 has been the workhorse in estimating labor supply elasticities. To a greater or lesser extent, researchers have invoked its structure in an attempt to recover the holy trinity of labor supply studies—the uncompensated wage elasticity, the income elasticity, and the compensated wage elasticity. The canonical model's simple theoretical structure does not translate into a simple econometric model. Even more surprising, the consensus model of labor supply does not lead to consensus estimates of the labor supply elasticities. The range of labor supply elasticities is large, especially considering the amount of resources devoted to the task. The lack of consensus has led to a proliferation of studies, each making one or two extensions to the canonical model of participation and hours of work. To labor supply analysts, the question seems to be how to tweak the canonical model to improve its fit. To most outside observers, the question frequently is, "Why did you expect the canonical model to fit in the first place?" Yet, as we now discuss, knowledge about labor supply behavior has accumulated.

Studies of male labor supply are most prevalent because the high participation rates of males permit simpler econometric procedures. Table 5.2 presents estimates of the labor supply elasticities for men from recent studies using Swedish data. All the papers represented therein explicitly consider Sweden's tax and benefit system. The studies differ in their specification of the budget constraint facing the male worker—as either convex or nonconvex and as smooth or "kinked," the latter usually characterized by piecewise linear segments. The studies also make different assumptions about the source of distur-

23. Pencavel (1986) reviews studies of male labor supply, while Killingsworth and Heckman (1986) survey the literature on female labor supply. Both are wide-ranging surveys that discuss taxes and labor supply as one (small) portion of their papers. Killingsworth (1983) offers a comprehensive review of both literatures. Hausman (1985) concentrates on the public finance aspects of labor supply. Atkinson (1987) reviews the incentive effects of social insurance programs.

Table 5.2 **Male Labor Supply Elasticities, Swedish Data**

Study	Description	Elasticities		
		Uncompensated	Income	Compensated
Blomquist (1983)	LNU 1973, married men aged 25–55, linear l.s.	.08	−.04	.11
Blomquist and Hansson-Brusewitz (1990)	LNU 1980, married men aged 35–55:			
	Linear l.s., convex b.c.	.081	.002	.082
	Linear l.s., nonconvex b.c.	.076	−.008	.079
	Linear l.s., nonconvex b.c., random preferences	.127	−.013	.133
	Quadratic l.s., convex b.c.	.12	−.008	.123
Aronsson and Karlsson (1993)	LNU 1980, married men aged 25–55:			
	Quantity-constrained linear l.s., convex b.c.	.086	−.021	.109
	Nonlinear l.s.	.111	−.009	.115
Flood and MaCurdy (1992)	HUS 1984, married men aged 25–55:			
	L.s. convex	.16	−.10	.24
	IV, linear l.s., wage, nonlabor income exogenous	.107	−.079	.169
	IV, linear l.s., wage, nonlabor income endogenous	−.244	.028	−.266

Note: LNU = Level of Living Survey; HUS = Swedish Household Market and Nonmarket Activities Survey; l.s. = labor supply; b.c. = budget constraint; IV = instrumental variables.

bances (e.g., are hours of work measured with error? are consumer preferences fixed or allowed to have unobserved differences across members of the population [random preferences]?). For all these important econometric differences, with the exception of the last row of the table, all the uncompensated wage elasticities are positive but small. For this dimension, an increase in the wage generates a small but positive increase in hours of work. The range of the uncompensated wage elasticities is similar to Hausman's (1985) summary of estimates obtained from studies incorporating explicit controls of the U.S. tax and benefit system and is higher than Pencavel's (1986) estimated range of from −.17 to 0, with a mean of −.12, from his comprehensive review of labor supply studies. In part, the positive uncompensated wage effect may be due to the restriction to prime-age males aged twenty-five to fifty-five by the studies reported in table 5.2. It is unlikely to be due to the reliance on linear labor supply functions and its monotonic effect of wages on labor supply. Two studies permitting more flexible functional forms also report positive uncompensated wage effects. The estimated income elasticities also show a narrow range and a small effect. Unlike studies of U.S. and British data, the estimated income elasticities are quite small and precisely estimated. Increased nonlabor

Table 5.3 Female Labor Supply Elasticities

Study	Description	Elasticities		
		Uncompensated	Income	Compensated
Blomquist and Hansson-Brusewitz (1990)	1980 LNU, married women aged 25–55, linear l.s., convex b.c. (FIML)	.790	−.243	.863
	Linear l.s., random preferences	.773	−.061	.794
	Linear l.s., convex b.c., two-step estimator	.386	−.030	.395
Aronsson (1991)	1980 LNU, married women aged 25–55, nonlinear l.s. with minimum hours constraint	.93	−.04	1.07
Hausman and Ruud (1984)	Married women aged 21–65, 1975 PSID, U.S., linear l.s.	.76	−.36	1.12
Mroz (1987)	Married women aged 30–60, 1975 PSID, U.S., instrumental variables	.215	−.030	.239
Blundell and Walker (1982)	Prime-age British women, FES 1974, linear l.s., convex b.c.	.43	−.22	.65
Blundell, Duncan, and Meghir (1993)	Prime-age British married women, FES 1979–89, nonlinear l.s. two-step estimator	.232	−.374	.380

Note: The first three studies use Swedish data, the studies by Blundell and his coauthors analyze British data, and the last two studies use U.S. data. Also, l.s. = labor supply; b.c. = budget constraint; FIML = full information maximum likelihood.

income has a negative but small effect on hours worked. The small uncompensated wage elasticity and small negative income elasticity yield a positive, although again small, compensated wage effect of around .10, near Pencavel's point estimate of the compensated wage effect of .12. The main implication from the estimates in table 5.2 is that men's hours of work are not very responsive to changes in wages and nonlabor income. The estimates show that moderate changes in the marginal tax rate will not induce a large labor supply response by men. However, for nonconvex sections of the budget, small wage changes may induce large changes in hours of work.

Table 5.3 reports estimates of female labor supply elasticities. Even from these two studies using Swedish data and explicitly incorporating taxes, the range of estimates of female labor supply elasticities is larger than for men. Uncompensated wage elasticities are positive and several times larger than for males. The greater responsiveness of women's labor supply to changes in wages is repeatedly found in nearly all empirical analyses. Given the large increase in female labor force participation rates in Sweden and elsewhere, it would be surprising to estimate negative uncompensated wage elasticities for women.

Reviewing the income elasticities reported in table 5.3, estimated income elasticities are small, while the compensated wage elasticities are large, near 0.8, several times larger than the comparable value for males.

The middle two entries in table 5.3 are commonly cited studies using U.S. data. These studies are included in the table to exhibit the wide range of estimated elasticities in the literature. Notice that, from just two studies using comparable procedures and comparable data, the uncompensated elasticity varies by a factor of more than two, the income elasticity by a factor of ten, and the compensated elasticity by a factor of four.

The paper by Blundell, Duncan, and Meghir (1993) reports labor supply elasticities for married women in Britain. The British study also incorporates explicit controls for taxes and benefits using a more robust estimation procedure of the labor supply function. Including this additional study increases the range of estimates for uncompensated wage effect but adds little to the range of the income elasticity or the compensated elasticity. From these estimates, it is clear that women's labor supply behavior is more responsive than men's to changes in wages and incomes, although the range of estimates remains uncomfortably large.

Welfare Effects of Taxes and Benefits

Estimates of the excess burden are commonly used to measure the welfare costs of taxes and benefits. Table 5.4 reports several estimates obtained from Swedish data. The first three studies in the table consider only the effect of income taxes—that is, they replace only the income tax with a lump-sum tax while leaving other taxes in place. The estimates measure the excess burden as a percentage of the income tax revenue. As expected under Sweden's progressive tax system, the loss increases as one moves up the income distribution. Also, as expected in the light of recent reforms, the welfare costs of the income tax appear to have decreased considerably during the last decade.[24] As a comparison, we also include the results reported by Hausman (1981), which are based on data for the United States from 1975 and refer to the excess burden of the federal tax in a model of male labor supply. Notice that Hausman's estimate of the excess burden for the United States is smaller than most of excess burdens reported in table 5.4, reflecting Sweden's high marginal tax rates.

The results suggest that the excess burden in the prereform system may have been considerable.[25] Considering the magnitude of indirect taxes in Sweden,

24. The qualitative conclusion of a large reduction in the excess burden from the 1991 income tax reform is also supported by the results in a recent paper by Aarberge, Dagsvik, and Strom (1993).

25. The large excess burdens reported by Aronsson and Palme (1994) are similar to those reported by Hansson (1984). Hansson applies a general equilibrium model to data from 1979 and computes the marginal cost of public funds, which measures the change in the excess burden from additional tax revenues and depends on how these additional tax revenues are spent. Hansson reports some huge excess burdens (214–620 percent) from the taxation of labor. With an assumed elasticity of substitution between labor and capital of 0.79–0.96 and a postulated savings function,

Table 5.4 Estimates of the Deadweight Loss of the Swedish Tax System

Study	Group	Tax	Deadweight Loss as a Percentage of Tax Revenue
Blomquist (1983)	Low-wage males aged 25–55	Progressive tax	4
	Middle-wage males aged 25–55	Progressive tax	14
	High-wage males aged 25–55	Progressive tax	28
Blomquist and Hansson-Brusewitz (1990)	Married males aged 25–55	Progressive tax	16
	Married women aged 25–55	Progressive tax	26
Aronsson (1993)	Married couple with median income	1980 income tax	30
		1989 income tax	23
		1991 income tax	8
	Married couple with above-median income	1980 income tax	33
		1989 income tax	28
		1991 income tax	11
	Married couple with below-median income	1980 income tax	27
		1989 income tax	16
		1991 income tax	5
Hausman (1981)	Prime-age males in the U.S.	1975 income tax	22
Aronsson and Palme (1994)	Married couple aged 25–55	1980 tax and benefit system	45
		1989 tax and benefit system	40
		1991 tax and benefit system	32

an obvious weakness of these studies is their narrow focus on the excess burden of income taxes. Aronsson and Palme (1994) incorporate the VAT and examine the labor supply and welfare effects of the sequence of tax and benefit reforms in Sweden during the last decade. The bottom portion of table 5.4 reports their estimates of the excess burden (defined as a percentage of the net tax payment, where the latter is measured as the sum of payments of income taxes and value added tax less transfer payments received). When indirect taxes are incorporated, their results indicate that much higher excess burdens occur. The relative

nearly all the inefficiency of the taxation of labor in Hansson's estimates operates through the capital market. When the capital stock is assumed fixed (so there is no substitution between labor and capital), as in the partial equilibrium framework of the labor supply studies, Hansson's measure of the excess burden declines (to a first approximation) to 16 percent. Hansson's paper cautions against the narrow focus of the labor supply studies and an overemphasis on excess burden *levels*. Rather, relative comparisons (within a given parametric model) of the excess burden of alternative reforms are informative, not the absolute level of any excess burden. Thus, the microeconometric estimates of the excess burden from the labor supply studies give important insights into the distributional consequences of tax reforms.

ranking of estimated excess burdens across population groups and across tax reforms is similar to the earlier studies. They also find, in agreement with the regressive nature of consumption taxes, that the distribution of disposable income is more unequal in the 1991 regime than in the 1980 and 1989 regimes.

Summary

Although there remain serious econometric issues (see app. C) in the existing labor supply studies, we believe that this work reveals some important insights, which deserve to be summarized. First, the labor supply behavior of women appears to be more sensitive to changes in marginal wage rates and virtual nonlabor income than that of men. Second, the labor supply response (as measured by hours of work) to tax reform is likely to be relatively moderate, primarily because of the inelastic labor supply functions. For example, Aronsson and Palme (1994) predict that the average labor supply increase among prime-aged individuals following the 1991 tax and benefit reform is about one hundred hours per year for men and even smaller for women (by comparing the predicted behavior under the 1989 tax and benefit system with the predicted behavior under the 1991 system). Third, the welfare loss associated with the prereform tax system may have been considerable. Hence, even in the light of small labor supply elasticities, the high marginal income tax rates produce a large excess burden. The tax and benefit reform of 1991 appears have led to a large reduction of these welfare losses.

5.5.4 Evidence on the Effect of Sickness Benefits and Pensions

We consider next the effect of programs commonly perceived to have induced strong disincentives to work—the sickness insurance cash benefit and the pension system.

The Sickness Insurance System

Figure 5.16 presents the unemployment rate for individuals aged sixteen to sixty-four and the number of days per employee of sickness benefits paid (the left-hand vertical axis) from the initiation of the national insurance system in 1955 until 1991. The vertical lines at 1963, 1967, 1974, and 1987 denote the major reforms of the system. Several striking features appear in figure 5.16. Notice first that, as early as 1955, the mean number of sick days is nearly twelve days per insured worker. By the end of the sample period, per capita usage of benefits more than doubled, reaching a peak of twenty-five days in 1988. Even the initial usage is high, and it is important to realize that other reasons for excused (and usually compensated) work absences are not included in the sickness cash benefit. (Permanent and temporary disabilities fall within the pension system, while other common sources of job absences such as pregnancy, childbirth, and temporary child-care benefits are in the child-care system and have a separate accounting.) Even by international standards, Sweden's

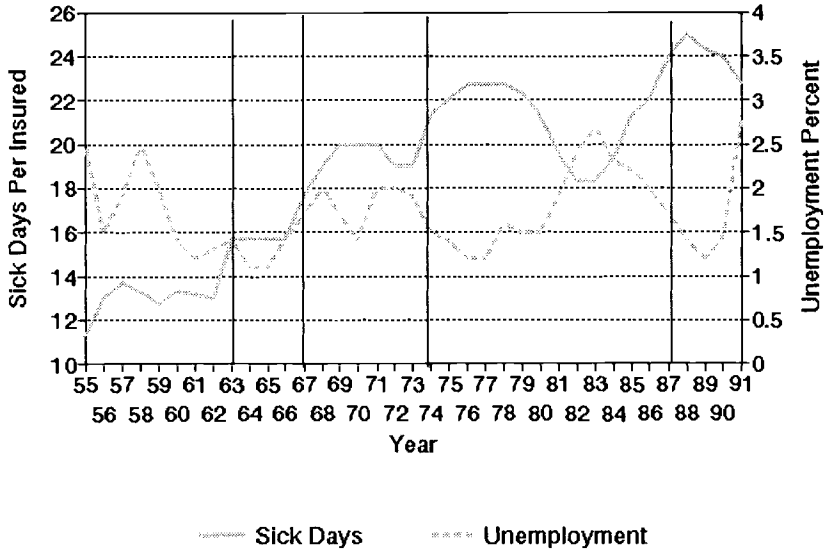

Fig. 5.16 Sickness benefit days

use of sickness benefits is high. Henrekson, Lantto, and Persson (1992) report that only Denmark's use of sickness benefits is close to Sweden's.[26]

Taken at face value, the increased usage of sickness cash benefits implies increased morbidity within the Swedish population, a conclusion at odds with its fine public health record. However, the timing of increased usage coincides with program reforms improving the generosity of the system. Noticeable increases in usage occurred in 1963, 1967, 1974, and 1987. The most persuasive evidence that increased usage of cash benefits does not reflect the health status of the population comes from a comparison with usage rates over the business cycle. Until the three-day coinsurance period was removed in 1967, there was no relation between sickness days and the cycle. However, since 1967, usage of sickness cash benefits has been strongly procyclic (the simple correlation between unemployment and sickness days is -0.7). It appears that sickness benefits are used to smooth hours of work. When demand for labor is high (unemployment is low), sick days increase; when demand for labor is low and unemployment is relatively high, the use of sick days is low. This is exactly the pattern that would emerge if workers use sickness benefits to intertemporally smooth their consumption stream.

Additional evidence on the disincentive effects of sickness cash benefits

26. International comparisons are always difficult; however, from the information reported in Henrekson, Lantto, and Persson (1992), sickness insurance systems in Denmark and Sweden appear to be among the most generous.

comes from a cross-sectional study by Björklund (1991). Björklund analyzes the determinants of paid days of sickness benefits. He separates usage for a twelve-month period into two categories: accumulated days of sickness benefits from all short spells and accumulated days of sickness benefits from all long spells. Short spells are seven or fewer days, absences for which no medical certificate is required, while all longer absences are classified as long spells. He regresses these variables on characteristics of the worker and the job. Björklund finds that, for both long and short spells, workers on jobs requiring monotonous work make greater use of sickness benefits. Also, usage of sickness benefits differs significantly by age. Young workers take more days of sickness benefits in short absences, while older workers are more likely to take their sickness benefits in long spells. These age patterns follow morbidity patterns and suggest that young people's usage of sickness benefits is less related to medical need than to work preferences.

In order to reduce these apparent work disincentives, the sickness cash benefit system was subject to reforms in both 1991 and 1993. As was explained in subsection 5.4.2 above, these reforms were designed primarily to reduce the generosity of benefits corresponding to shorter spells of illness. The influence of the 1991 reform is discussed in a recent paper by Johansson and Palme (1993). Using panel data for the period 1981–84, Johansson and Palme estimate a model of worker absenteeism where the decision to be absent from work is closely related to (or part of) the labor supply decision. As the influence of the sickness benefit is taken into account in the estimation, the estimated model provides a natural framework for the simulation of reforms. The simulation conducted by the authors is to compare the predicted and observed behavior in 1990 and 1991. As the experiment turned out, the average number of sick days was predicted to fall by 4.45 percent (an underprediction of the actual reduction, which was 6.25 percent). About 79 percent of the predicted change in sick days can be attributed to the 1991 reform of the sickness benefit system, while the rest can be attributed to the change in the unemployment rate (which was higher in 1991 than it was in 1990). A natural conclusion is, therefore, that recent reforms of the sickness benefit system appear to have reduced work disincentives.

The Effect of Publicly Provided Pensions on Labor Supply

The labor force participation of men nearing retirement age (fifty-five to sixty-four) declined from 90 to 75 percent during the thirty years spanned by the AKU (Arbetskraftsundersokningen) surveys. This large decline in labor force attachment is frequently attributed to the increased generosity of the public pension system. The vast (and growing) literature on the labor supply incentives of old-age security programs implies that this reasoning is far too simple. In his encyclopedic review of the literature, Atkinson (1987) describes a depressingly wide range of findings regarding the incentive effects on labor supply. Although no study has found that increased social security benefits lead to

a large increase in labor supply, studies are evenly divided between finding moderate to large negative effects and no or negligible positive effects. While informative on the algebraic sign of the effect, the literature again provides little guidance on magnitudes.

The inherent complexity of the retirement problem contributes to the conflicting findings in the literature. The retirement decision is fundamentally an intertemporal decision and requires a dynamic model. Also, modeling the retirement decision highlights the many different dimensions of labor supply. The most frequently analyzed dimension is the dichotomous participation decision—whether to continue working or to retire. Yet programs such as the partial pension that subsidize reductions in hours of work before full departure from the labor market encourage the analysis of hours worked in addition to the participation decision. The work-conditioned benefit schemes of the supplementary pension system (ATP) generate entitlement effects that may induce workers to increase their labor supply in the periods prior to retirement. Thus, total hours of work over the life cycle may increase. Indeed, Hansson-Brusewitz (1992) finds a positive effect on total labor supply from the partial pension system and the earnings replacement rates of the supplementary old-age pension.

Several studies exist of the effect of disability pensions on labor supply incentives. Evidence of disincentive effects emerges more frequently than in the retirement literature, but again the range of estimated effects is depressingly large (Atkinson 1987). Consideration of Sweden's situation suggests a negative effect on participation. Administered exactly like the old-age pension, cash benefits for a disability pension rise as benefits for the basic and supplemental pensions rise. The major revision in the disability program was the incorporation of nonhealth considerations in awarding disability pensions to those near retirement. Direct evidence is not available, but several time-series trends suggest a negative incentive effect on labor force participation. First, the number of new disability pensions has risen seven times faster than the population eligible to receive a disability pension. From 1971 to 1988, the population aged eighteen to sixty-four increased 6 percent. The number of new disability pensions over the same period increased 42 percent. Roughly 15 percent of new awards are temporary disability pensions, a share that has been stable over time, which means that the fraction of the population on disability pensions increased dramatically during the last twenty years. Adding to the public burden, the age composition of disability pensions has slightly shifted to younger ages. In 1971, 44 percent of the new disability pensions were awarded to individuals sixty to sixty-four years old. In 1988 (the last year of data), that fraction had declined to 38 percent. Moreover, an increased willingness to award labor market disabilities to older workers is apparent from the data. In 1977, 3.6 percent of all new pensions were due to labor market disabilities. In the mid-1980s, as the number of new disability pensions increased, a remarkable 20 percent of all disability pensions were for labor market reasons (recall that,

since 1972, older workers may receive a disability pension rather than be forced to change location or occupation). By the late 1980s, the share of labor market pensions had declined to 10–11 percent. Among those receiving a labor market pension, the age composition of recipients of labor market pensions has tended toward younger workers among the sixty to sixty-four age group. The insurance board is more willing to extend labor market disability pensions and is more willing to award them to younger workers.

The extension of disability pensions to labor market conditions does not explain all the rise in disability pensions. That is, even without the labor market conditions provision, the share of the population covered by a disability pension increased during the last twenty years. Sweden's fine public health record means that the increased prevalence of disability pensions is *not* due to a less-healthy work environment. The rapid rise in disability pensions and its burden on society warrants a review of its effects on labor supply.

5.5.5 Education and the Investment in Human Capital: The Supply of Skilled Labor

In this section, we review the evidence on the incentive effects on the quality composition of the workforce. Uncovering effects of the tax and benefit system on quality or skill is difficult because it is harder to identify changes in compositions than changes in magnitudes. Moreover, the large number of compensation mechanisms implies that incentive effects can be spread across many monetary and nonmonetary forms. In the same vein, adjustments made through the underground economy will also not be observed. Hence, empirical evidence on this dimension is less systematic and more qualitative than the evidence on quantity dimensions of labor supply. Rather than consider changes in the occupational distribution (which can be due to technological advances, i.e., demand-side influences), we concentrate on the willingness of individuals to invest in human capital.[27]

We first review the trends in educational attainment. Since 1960, the Swedish labor force has become more skilled as better-educated young members joined the workforce. From 1960 to 1986, the share of the labor force with twelve or more years of schooling rose from 5 percent to approximately 30 percent.[28] The growth appears to have peaked in the mid-1980s as the share of the workforce with college degrees has remained constant.

Such economywide measures as the educational attainment of the workforce respond at the slow rate of demographic change; to move the aggregate measure requires that new entrants have much higher educational attainments than retiring older members. A review of enrollment rates offers another perspective on educational process. Enrollment rates peaked in the late 1960s, declined during the 1970s, and then increased steadily during the 1980s. Until the early

27. For a complementary review of this literature, see Edin and Topel (chap. 4 in this volume).
28. A review of other education levels (e.g., postsecondary schooling) yields similar patterns.

1970s, men were more likely to remain in school during their early twenties than were women. Since then, women are more likely to remain in school. The rates also exhibit a strong cyclic pattern, rising during the 1977–78 recession and again during the stagnant years of the early 1980s; they fall slightly in the mid-1980s and then rise again strongly during the recent economic slowdown. Indeed, Edin and Holmlund (1993) document that the relative supply of skilled workers closely corresponds to movements in the wage premia to college-trained workers. However, while this is evidence of the validity of a neoclassical model of the labor market, it is hard to discern direct supply effects.

Most interesting from our point of view is an analysis of the return to education incorporating the effects of the tax and transfer system. With both subsidies and taxes, no theoretical predictions were forthcoming on the incentives to invest in education (see app. A). Estimates by Edin and Holmund (1993) show that the progressive tax system (and probably wage solidarity) had the effect of depressing the return to education. According to their estimates, in 1968 the internal rate of return to higher education for a male worker was 11.9 percent. By 1974, the rate had fallen to 3.6, and it fell again to a minuscule 0.5 percent in 1981! Hence, it is not surprising that the share of college graduates in the workforce remained constant since the mid-1980s. Since its trough in 1981, the internal rate of return increased slowly during the 1980s. By 1991, the estimated return was still below its 1968 level but above its 1974 value. Including the loans and subsidies, the estimated return for 1991 about doubled, and it appears that educational subsidies have a larger effect than does the income tax system.

While no strong evidence appears on educational attainment decision, weak evidence suggests that the tax and transfer system (*a*) distorted the incentives and (*b*) may have reduced the incentive to receive education. Other factors did not remain constant during the period (e.g., macroeconomic conditions and government training programs, although the latter is probably not relevant for this group), making it impossible to make strong statements on this issue.

5.5.6 Tax Avoidance, Tax Evasion, and the Underground Economy

The high marginal tax rates (statutory and implicit) make honesty expensive in Sweden. Did Swedes continue to comply with the legislated tax burdens as marginal rates increased dramatically during the 1970s and early 1980s? Or did Swedes begin to free ride and reduce their burden by underreporting their taxable income? No convincing evidence exists to answer this important question. The little evidence that exists does not suggest rampant tax evasion or other fraudulent behavior. Studies of taxpayers from the United States reveal high rates of compliance (although at marginal tax rates far below Sweden's). A few surveys attempt to gauge individual perceptions of the fairness of the Swedish tax system (Vogel 1974; Wärneryd and Walerud 1982). These studies show only a slight increase in the perceived unfairness of the tax system. Pub-

lic opinion polls report that support for Sweden's social insurance programs is high and that strong sentiments continue against inflating deductions or underreporting taxable income. The continued broadening of the definition of taxable income suggests that public decision makers are not unaware of these issues.

While there is little evidence of tax evasion, there is evidence of tax avoidance. Feldstein (1993) notes, for example, that there is substantial sensitivity of deductions for mortgage interest and charitable contributions to marginal tax rates. This redirection of expenditures in response to the high marginal tax rates creates additional deadweight losses that are conceptually different from the conventional measures of excess burden. Changes in the marginal tax rate can induce changes in labor supply and may also induce changes in the structure of taxable income. The occupational choice model implies that high marginal tax rates encourage individuals and firms to structure employee compensation in untaxed or effectively low-tax forms. Examples of nontaxed compensation include first-class travel, use of a corporate automobile, and in-house sports facilities. Forms of compensation that are taxed at effectively low rates include deferred compensation plans, life insurance, and stock options. High-income and wealthy individuals also have the income flow from assets, capital income, to supplement labor market earnings. Difference in income tax rates on earned and capital income create additional incentives to structure asset portfolios to minimize tax liability (holding constant risk exposure of a portfolio). Preferential tax treatment of capital gains provides an additional incentive to time the realization of capital gains to the individual's advantage.

A review of the effects of taxation on the incentives to save and the portfolio effects is beyond the scope of this review.[29] The magnitude of these effects, and particularly the sensitivity of taxable income to changes in marginal tax rates, is unresolved. Feldstein (1993) finds that elasticity of taxable income with respect to a change in marginal tax rates is at least one and may be higher. Yet neither Scholz (1993) nor Slemrod (1992), analyzing the last major tax reform in the United States (the Tax Reform Act of 1986), find evidence of portfolio effects. Using a different approach and different data, Triest (1992) finds some support for the endogeneity of deductions. That a central aspect of the 1991 income tax reform in Sweden was to simplify and unify the treatment of capital income suggests that these are nontrivial issues.

It is easy to miss the provocative implications that these studies have for the analysis of taxes and labor supply. One way to organize these findings is to distinguish between the effect of taxes on real dimensions (e.g., labor supply, savings, and portfolio risk exposure) and the effect of taxes on the recognition and reporting of income. Feldstein (1993), Slemrod (1992), and Scholz (1993) suggest that taxes affect reported taxable income but have little direct effect on behavior generating that income. The minimal behavior effect of taxes esti-

29. For a fine review, see, however, Sandmo (1985).

mated in the labor supply literature and summarized in the preceding sections is consistent with this interpretation.

Moreover, the responsiveness of reported taxable income to a change in the structure of taxes has important policy implications. Knowledge of the responsiveness is absolutely central for predicting the expected revenue gain (or loss) from a change in the structure of taxes. As Feldstein (1993) points out, because there is so much flexibility in the recognition of income, naive predictions of revenue gains from an increase in tax rates that do not recognize these opportunities may overstate actual revenue gains. Forecasting errors is one cost, but a far larger cost is that tax avoidance activities require real resources. Tax planners, tax accountants, and tax lawyers engaged in tax avoidance all represent a reallocation of resources and an inefficiency that is in addition to the excess burden calculations presented earlier.

The responsiveness of labor supply, savings, and financial portfolio composition are all outcomes of complicated, multidimensional choice processes. It is not surprising that they show little responsiveness to taxes in the short run because tax consequences are only one of many aspects of the decision. In terms of labor supply, most individuals cannot offer an indivisible unit of labor supply as posited in the canonical labor-leisure model. Rather, changes in hours occur through entry and exit decisions or, as the evidence from Björklund (1991) suggests, through adjustments made via days of sickness benefits.[30]

5.6 Summary

The income tax and every social insurance program affect the budget sets of consumers and consequently their incentive to work. The influence of taxes and transfer programs on labor force participation and hours of work has been the subject of extensive research during the last twenty years. Answers are elusive, and measuring the labor supply effects, the efficiency costs, and the distributional consequences of these government interventions remains an active and challenging area of economic and policy research.

From the extensive research, several observations emerge for the Swedish context. We take labor force participation first. Because benefit levels are closely related to earnings, the structure of social insurance benefits gives strong incentives for all individuals (men and women) to participate in the

30. Studies by Feldstein (1993) and others imply that the real limitation of the existing labor supply studies is their reliance on a two-good (static) model. Triest's (1992) results on the endogeneity of deductions imply that a three-good model is required to capture the differences between deductible and nondeductible consumption expenditures. The three-good model would be an important first step toward capturing some of the responsiveness found by Feldstein (1993) and others. Since housing expenditures are a significant expenditure for most households, and because housing has been and is heavily subsidized through the deductibility of mortgage interest, a natural first investigation along these lines would be to analyze the joint determination of labor supply, housing, and nonhousing consumption.

labor market. Moreover, individual taxation and high marginal tax rates provide strong incentives to equalize labor earnings between household partners. Econometric studies applying the canonical model to Swedish data confirm that female labor supply is more elastic than male, with most of the response at the extensive margin of labor for participation and not via hours of work (among those already working).

The response in the hours of work to tax and benefit reforms among those who are already participating appears to be of less importance. Although estimation procedures vary considerably across studies, a common finding of the econometric studies of male labor supply behavior is that the estimated compensated wage elasticity is small. However, even in the presence of low compensated labor supply elasticities, the high marginal tax rates of the 1970s and 1980s produced large welfare costs.

Our broad perspective on labor supply recognizes that hours of work is only one dimension of labor supply and that sole concentration on it will miss responses in other dimensions. As observed hours of work is the outcome of both supply and demand factors, hours of work may exhibit little responsiveness to changes in taxes because demand-side factors (e.g., coordination activities) may impose quantity restrictions on the structure of the work week that will limit the flexibility of workers to change their hours of work in the short run. Indeed, Björklund's evidence of the strong cyclic use of sickness benefits reveals that work disincentives are present and cautions against the belief that high marginal tax rates or subsidies have weak labor supply effects because few have been recovered from labor supply functions estimated from hours of work data. Similarly, Edin and Holmlund's finding that the share of students is sensitive to the return to higher education provides initial evidence that the quality dimensions (e.g., skill) of labor supply are also important.

These studies suggest that responses to changes in tax and program incentives occur in labor supply dimensions that are hard to measure and that consequently have received less attention in the economics literature. High marginal tax rates give consumers strong incentives to change the structure of compensation away from monetary sources, to work in the underground economy, and to misreport taxable income. Almost by definition, the latter two responses defy measurement. The large number of potential dimensions over which to define compensation (both in terms of fringe benefits and in terms of the timing of compensation) also serves to severely complicate the measurement problem. Moreover, the intertemporal nature of many of these decisions implies that there may be a long lag between policy change and behavioral response. The complexity of the measurement issue means that clear, conclusive evidence on the disincentive effects in these dimensions does not exist.[31] The challenge

31. Other authors have noted the wide range of labor supply elasticities and the resulting lack of consensus about the magnitude of disincentive effects (Atkinson 1993; Gustafsson and Klevmarken 1993). Perhaps not surprising, most of the controversy centers on the magnitude of more

for future research is to determine the magnitude of behavioral responses in these dimensions.

To guide the policy discussion, we speculate on the relative magnitudes and the expected effect of recent policy reforms.

5.7 Expected Future Changes

The 1991 income tax reform lowered marginal tax rates and broadened the tax base. Motivated by concern over the disincentive effects created by high marginal tax rates, it is the last of a sequence of reforms intended to simplify and unify the tax system. The best available evidence suggests that the 1991 reform led to a considerable reduction in the excess burden, especially for high-wage workers. The small labor supply elasticities estimated in several recent studies using Swedish data imply little response in labor force participation or hours of work. The broadening of the tax base and the more uniform treatment of capital income remove incentives to avoid taxation by searching for other forms of compensation. Even without direct labor supply effects, these latter reforms should tighten the connection between realized and taxable income.

As a response to the recent financial crisis, several changes have been initiated to reduce the work disincentives of the social insurance programs. A one-day waiting period has been introduced into the sickness insurance system, and benefit levels have been reduced in both the unemployment insurance and the sickness insurance systems. The increased use of deductibles (the one-day waiting period) and coinsurance (reduced compensation of earnings) will ameliorate the disincentive effects of these programs. Moreover, having employers bear some of the program costs for the first fourteen days of absence should further lessen the abuses of the sickness insurance system.

Several proposals will extend these and other reforms into other social insurance programs (e.g., Lindbeck 1993; Lindbeck et al. 1993, 1994). Increased use of coinsurance and deductibles is strongly advocated. Equally persuasive is the suggestion that the actuarial nature of insurance be introduced into health and pension systems. On the firm side, these reforms would introduce differentiated insurance fees for disability insurance to reflect the frequency of injury. For consumers, the suggestion is that both the sickness insurance and the pension systems become actuarially based programs whereby the expected present value of benefits equals the expected present value of lifetime fees (Lindbeck

subjective and speculative effects. Those most concerned about the disincentive effects stress the important but hard-to-measure dimensions of labor supply, including intertemporal aspects and general equilibrium effects, and sometimes including broad-ranging considerations of the effect on family structure and the loss of personal freedom (e.g., Lindbeck 1993). Others more concerned about equity restrict attention to a few dimensions of choice and recognize the positive incentive effects (e.g., risk sharing, consumption smoothing, work incentives of the employment conditioned benefits) and the need to balance efficiency and equity trade-offs (e.g., Atkinson 1993).

et al. 1994, 37–38). Development of an actuarially based social insurance system will require removing those components of the social insurance system that do not provide risk insurance (e.g., parental benefits and child-care benefits) but are more properly seen as transfer programs for particular subpopulations. Incorporation of these latter programs as a separate item in the government budget will initiate an important, and long awaited, distinction between insurance and transfers (Lindbeck et al. 1994, 38).

Development of an actuarial system is required for the long-term viability of the social insurance systems. Maintaining pay-as-you-go social insurance programs makes the system vulnerable to changes in macroeconomic conditions such as the economic downturn of 1991–93, which has resulted in a substantial redistribution of income to the elderly (Lindbeck et al. 1994, 28) or secular demographic trends. The aging of the Swedish population and its implications for intergenerational transfer payments are widely recognized (Johnson 1993) and loom just beyond the horizon. Although the consequences of the demographic shift will not appear until well into the next century, equity considerations and the importance of the long-term contractual nature of public pensions require immediate, although gradual, reform.[32]

The reforms discussed above can be accomplished within the basic structure of the current welfare state—that is, the basic structure of the welfare state will remain roughly the same as prior to these reforms. The long evolution of the Swedish welfare state makes it too strong to admit radical reforms in the short run. Democratic systems reflect the will of the people, and it is fair to say that Swedes have (at least approximately) the tax system and social insurance programs they desire. Public opinion polls reveal substantial agreement with the basic structure of the welfare state (Huber and Stephens 1993). It is reasonable to believe that the Swedish welfare state will retain its Nordic flavor and will not approach the relatively laissez-faire structure of the United States. However, although very large changes are unlikely (at least in the short run), it is important not to underestimate the problem of a large budget deficit, as well as other economic problems, facing Sweden as a small open economy. Seen in this light, a gradual process of reform may reshape entitlement programs in the years ahead. Recent reforms have reduced the disparities between individual and social benefits, but income tax rates in Sweden are still high and generate continual pressures on the Swedish welfare state.

32. The Swedish Parliament is well aware of these issues. In April 1994, it adopted a set of principles for the reform of the public pension system. Making the system more actuarially based is among the set of principles adopted.

Appendix A
Occupational Choice in the Presence of Taxes and Transfers

We first explore the equilibrium in the absence of taxes and transfers. Workers may supply one unit of labor to either of two occupations. Occupation 0 requires no education, while occupation 1 requires s (exogenous and fixed) years of school. Once employed, individuals work in the chosen occupation forever. Ex ante, individuals are otherwise identical but differ in their tastes for schooling. Those with the lowest values of ξ have the least distaste for school. Let $\Psi(\xi)$ represent the monetary value of the psychic costs of schooling for a type-ξ individual. The cost function is such that $\Psi(0) = 0$, $\Psi' > 0$, $\Psi'' > 0$.[33] The distribution of ξ in the population has density $f(\xi)$.

To focus on supply decisions, demand for each occupation is infinitely elastic at earnings E_j in occupation j, $j = 0, 1$. Hence, workers face an exogenously determined and constant earnings differential of $\Delta = E_1 - E_0$. Workers entering occupation 0 can do so immediately (time 0), with a real interest rate r, and have net wealth equal to $W_0 = E_0/r$. Workers entering occupation 1 defer their earnings stream for the length of schooling. A type ξ's gross wealth from entering occupation 1 is $W_1 = (E_1/r)e^{-rs}$ and net wealth is $W_1 - \Psi(\xi)$.

An individual will acquire an education and enter the skilled occupation if it yields the highest net wealth,

$$W_1 - \Psi(\xi) - W_0 \geq 0, \tag{A1}$$

or

$$K \geq \Psi(\xi);$$

where

$$K = \frac{\Delta}{r} + \frac{E_1}{r}(e^{-rs} - 1).$$

The inequality condition in (A1) holds as an equality for the individual indifferent between the two occupations. That individual has index $\xi^* = \Psi^{-1}(K)$. Individuals with lower values of ξ attend school and enter the skilled occupation. With a (fixed) population of size N, supply to the skilled occupation is

$$N^s = N \int_0^{\xi^*} f(z)dz = N \int_0^{\Psi^{-1}(K)} f(z)dz. \tag{A2}$$

33. While it is important for educational policy, it is not important for this application whether Ψ measures preferences or opportunities.

Now introduce a progressive income tax. Earnings in the low-education occupation are untaxed, while those in the high-education occupation are taxed at rate τ. Entry into the skilled occupation is determined by modifying the decision rule in equation (A1) as

$$(A3) \qquad \begin{aligned} (1-\tau)W_1 - \Psi(\xi) - W_0 &\geq 0, \\ K - \tau W_1 &\geq \Psi(\xi). \end{aligned}$$

The progressive tax system reduces the value of entering the skilled occupation, and the number supplied to the occupation declines. By reducing the earnings differential between occupations, the tax system reduces the incentive for some individuals to acquire the skills to enter occupation 1. Notice that, unlike incentives that change hours or labor force participation, incentives here change the composition of the labor force, not necessarily the size.[34]

Progressive taxes reduce investment in human capital. It is easy to see that transfer programs that subsidize education or reduce its psychic cost to consumers will lead to increased investments in human capital and to an increased supply of skilled workers. Whether the net effect of the modern welfare state creates positive or negative incentives for investing in human capital is context specific and depends on the system of benefits and taxes.

Reinterpret ξ as the reciprocal of ability and Ψ as direct educational expenses so that high-ability individuals have low values of ξ and low costs of acquiring the skills to enter occupation 1. Full deductibility of educational costs offsets, but does not eliminate, the reduced supply to the skilled occupation.[35] The reduced supply to occupation 1 means that the average ability increases in both occupations. In a richer specification of the labor market, with more attention paid to the demand side, we should expect to see some response by firms to the higher ability levels in each occupation, perhaps by changing the wage rate or one or more conditions of employment. Hence, the assumption of an exogenous constant wage is artificial and restrictive; the tax system can have important effects on the demand for labor. Knowledge of both supply and demand effects is required to fully evaluate a tax reform.

34. If earnings in the first occupation were also taxed, say at rate $\tau_0 < \tau$, and we assume that consumers have nonlabor income, then some individuals will choose not to work, and labor force participation will decline. There will still be a compositional effect, and, depending on the relative magnitudes of the tax rates, the fraction of the labor force employed in the unskilled sector may increase. Heckman (1976) shows that the deductibility of interest payments increases human capital investments with a proportional tax system.

35. The decision rule is $K - \tau W_1 \geq (1 - \tau)\Psi(\xi)$.

Appendix B
Tax Rates and Labor Supply Measures

Table 5B.1 **Components of the Payroll Tax for Manufacturing Workers and Total Payroll Tax in Manufacturing and the Civil Service, 1960–93**

	Manufacturing					
Year	ATP Pension	Health	Add for Law Enforcement	Determined during Bargaining	Total	Total Civil Servants
1960	1.9	1.1	.4	.0	3.4	10.50
1961	2.7	1.1	.4	.0	4.2	11.80
1962	3.4	1.1	.4	.0	4.9	12.70
1963	4.1	1.5	.4	.6	6.6	14.20
1964	4.9	1.5	.4	.6	7.4	14.90
1965	5.4	1.5	.4	.5	7.8	15.10
1966	5.8	1.5	.4	.5	8.2	15.50
1967	6.2	2.6	.4	.5	9.7	17.20
1968	6.6	2.6	.4	.5	10.1	17.80
1969	7.1	2.6	1.4	.6	11.7	19.90
1970	7.6	2.9	1.4	.6	12.5	20.70
1971	7.8	3.1	2.4	.6	13.9	21.80
1972	8.0	3.1	2.35	1.0	14.45	21.70
1973	8.0	3.2	4.35	2.55	18.1	24.10
1974	8.0	3.8	8.05	4.25	24.1	29.70
1975	8.3	7.0	8.95	4.47	28.72	33.70
1976	8.6	8.0	11.66	4.4	32.66	38.70
1977	9.2	8.0	14.88	5.0	37.08	42.80
1978	9.1	9.6	12.37	5.1	36.17	42.10
1979	8.9	10.6	11.78	5.4	36.68	42.80
1980	9.2	10.6	12.65	5.36	37.81	44.30
1981	9.4	10.5	13.11	5.51	38.52	44.00
1982	9.4	10.5	13.16	5.66	38.72	43.90
1983	9.6	9.5	17.16	5.78	42.04	46.60
1984	10.0	9.5	16.66	5.9	42.06	47.00
1985	10.0	9.5	16.96	5.86	42.32	46.20
1986	10.0	9.3	17.15	5.86	42.31	46.20
1987	10.2	9.3	17.58	6.1	43.18	46.30
1988	10.6	10.1	16.37	6.1	43.17	46.30
1989	11.0	10.1	16.37	6.0	43.47	46.40
1990	13.0	10.1	15.87	3.9	42.87	46.57
1991	13.0	10.1	14.93	6.3	44.33	45.63
1992	13.0	7.8	14.03	6.18	41.01	42.48
1993	13.0	8.3	9.73	6.18	37.18	42.48

Table 5B.2 **Average Local Tax Rate and Value Added Tax, 1960–93**

Year	Average Local Tax Rate	Value Added Tax Rate	Year	Average Local Tax Rate	Value Added Tax Rate
1960	14.63	4.20	1977	26.85	19.38
1961	15.00	4.20	1978	28.71	20.63
1962	15.24	6.30	1979	29.02	20.63
1963	15.46	6.30	1980	29.09	21.58
1964	16.5	6.30	1981	29.55	23.3
1965	17.25	6.30	1982	29.74	21.51
1966	18.29	10.00	1983	30.14	23.46
1967	18.71	10.00	1984	30.30	23.46
1968	19.34	11.10	1985	30.37	23.46
1969	20.24	11.10	1986	30.34	23.46
1970	21.00	11.10	1987	30.44	23.46
1971	22.54	17.65	1988	30.56	23.46
1972	23.79	17.65	1989	30.80	23.46
1973	23.94	17.65	1990	31.16	24.23
1974	24.03	15.66	1991	31.15	25.00
1975	25.23	17.65	1992	31.04	25.00
1976	26.15	17.65	1993	31.04	25.00

Source: The average annual local tax rates are from Lodin (n.d.).
Note: The VAT is reported as a percentage of the pretax price.

Table 5B.3 **Labor Force Participation Rates by Gender and Age, 1963–92**

	Males			Females		
Year	16–24	25–54	55–64	16–24	25–54	55–64
1963	71.9	96.3	89.6	62.3	56.4	39.9
1964	71.8	96.3	88.5	62.4	55.5	40.1
1965	71.7	96.1	88.3	60.5	56.0	39.2
1966	70.3	96.3	88.4	60.2	57.4	42.2
1967	68.0	95.6	89.2	57.6	57.7	43.5
1968	68.4	95.1	89.0	59.7	59.8	42.9
1969	68.2	95.0	86.6	58.8	61.5	44.3
1970	67.0	94.8	85.4	59.4	64.2	44.5
1971	66.9	94.7	84.7	60.1	66.5	44.7
1972	67.1	94.2	83.5	60.8	67.8	45.5
1973	67.9	94.3	82.7	60.1	69.8	46.3
1974	70.5	94.5	82.0	63.5	71.4	47.6
1975	72.4	95.2	82.0	66.1	74.2	49.6
1976	72.9	95.7	81.3	67.7	75.6	50.2
1977	71.9	95.5	79.7	68.0	77.5	51.7
1978	70.8	95.3	79.1	68.1	79.3	53.3
1979	71.8	95.3	79.2	69.7	81.1	54.5
1980	71.5	95.4	78.7	70.1	82.9	55.3
1981	67.9	94.9	78.4	67.8	84.8	57.5
1982	67.0	94.9	77.7	66.4	85.8	58.9
1983	65.7	95.0	77.1	65.1	87.0	59.7
1984	64.6	94.9	76.2	64.8	88.1	59.6
1985	65.7	95.2	76.0	66.4	88.9	59.9

Table 5B.3 (continued)

	Males			Females		
Year	16–24	25–54	55–64	16–24	25–54	55–64
1986	65.2	95.3	75.5	65.6	89.8	61.4
1987	66.1	94.7	74.9	66.6	90.4	64.1
1988	67.9	94.7	74.9	67.8	90.8	64.7
1989	69.4	95.1	74.8	69.0	91.0	64.3
1990	68.9	95.1	75.5	67.7	91.3	66.3
1991	65.3	94.6	75.5	64.4	90.5	66.9
1992	58.6	93.6	73.6	58.4	89.5	65.9

Source: AKU surveys.

Note: Since 1987, the method used by the AKU to measure unemployment and hence labor force participation changed slightly.

Table 5B.4 **Hours of Work per Week by Age and Gender, 1963–92**

	Males			Females		
Year	16–24	25–54	55–64	16–24	25–54	55–64
1963	43.6	47.1	46.0	40.7	34.0	34.6
1964	43.7	46.4	45.2	40.7	33.9	33.6
1965	43.8	46.5	45.7	40.4	33.3	33.0
1966	43.3	46.1	45.8	39.5	32.6	31.9
1967	42.6	45.6	44.6	38.9	32.6	32.0
1968	41.6	44.7	43.9	37.9	32.0	31.9
1969	41.5	44.8	43.6	36.8	32.0	32.1
1970	40.8	44.6	43.8	36.9	31.9	31.2
1971	40.2	43.8	43.6	36.4	31.7	31.1
1972	38.2	42.4	42.1	35.3	31.0	30.6
1973	38.0	42.1	41.9	35.1	31.1	30.0
1974	38.0	42.1	41.8	36.0	31.1	30.0
1975	38.0	41.8	41.6	34.4	31.2	30.0
1976	38.1	41.8	41.1	34.0	30.9	29.9
1977	37.6	41.4	40.4	33.5	30.7	29.5
1978	37.3	41.3	39.9	33.3	30.7	29.0
1979	37.3	41.2	39.7	33.0	30.8	29.2
1980	37.2	41.2	39.2	33.0	30.8	29.4
1981	37.0	41.0	39.1	32.7	30.9	29.1
1982	37.1	41.1	39.1	32.6	31.3	29.2
1983	36.8	41.2	39.6	32.4	31.5	29.5
1984	37.1	41.6	39.5	32.1	31.9	29.9
1985	37.2	41.6	39.8	32.4	32.3	30.5
1986	37.0	41.6	39.6	32.4	32.5	30.8
1987	37.7	42.4	40.4	32.7	33.2	30.6
1988	37.6	42.5	39.9	33.1	33.6	31.0
1989	37.5	42.7	39.9	33.3	34.0	31.4
1990	37.5	42.6	40.0	33.1	34.3	31.6
1991	37.2	42.2	39.5	32.7	34.1	31.5
1992	36.7	42.3	38.9	32.2	34.1	31.4

Source: AKU surveys.

Appendix C
Econometric Issues Surrounding Recent Estimates of Labor Supply

In an area so dominated by econometric issues, it is difficult to avoid these issues in our discussion of the literature. Indeed, understanding these issues should also help understand the wide range of elasticities shown in tables 5.2 and 5.3 above.

Until the mid-1970s, the literature either neglected taxes and transfer programs in the estimation of the labor supply function or tried to incorporate it using relatively simple methods. For example, a common approach was to linearize the budget constraint around the observed hours of work—a method that, in the presence of steeply progressive tax schedules, fails to recognize the endogeneity of the marginal wage rate (a review of this literature can be found in, e.g., Heckman and MaCurdy [1981]). The more recent literature, which represents the budget set as a series of piecewise linear segments, arose as a procedure for incorporating the endogeneity of the marginal wage rate in estimation. In principle, such an approach can be used to represent any budget constraint and can therefore be used to handle complexities such as nonlinearities and nonconvexities (e.g., poverty traps, kinks, and flats) during the estimation. The generality is more illusionary than real, however, because numerical problems effectively prohibit all but simple assumptions of the source of stochastic disturbances (Heckman and MaCurdy 1981).

Several criticisms can be directed at the taxes and labor supply literature. First, until recently, labor supply analysts have put their main effort into locating the "kinks" in the consumer's budget set (see the special issue of the *Journal of Human Resources,* vol. 20, no. 3 [1990]). Because of the aforementioned computational limitations, the focus on nonlinearities and "kinks" in the choice set has, to a large extent, restricted the representation of consumer preferences to the individual, static (and often linear) labor supply model, while richer behavioral specifications went unexplored. Consequently, the labor supply research became more focused on the (one-period) trade-off between consumption and leisure, as other important dimensions of the labor supply were, to a large extent, neglected. For example, the assumption of exogenous gross wage rates neglects the possibility that labor supply is part of a decision involving human capital accumulation. A third line of criticism recognizes that structural econometric models impose restrictions on the labor supply parameters. Below, we briefly review some of this criticism and discuss its importance for the reliability of the results presented in previous subsections.

Papers such as MaCurdy, Green, and Paarsch (1990) and Blundell, Duncan, and Meghir (1993) show that there is a relation between integrability conditions (i.e., the Slutsky condition) and the model's statistical coherence (the latter is needed to ensure meaningful probability statements). Satisfaction of

the Slutsky condition is necessary for the estimated labor supply model to fulfill the axioms of choice. The welfare analysis of tax reform presented above is valid only if the Slutsky condition is fulfilled. In the case of labor supply models under piecewise linear budget constraints—once the problem is made stochastic by the introduction of unobserved heterogeneity—there is a strong link between integrability conditions and coherency. More precisely, statistical coherency requires that the model fulfill the Slutsky condition. As a consequence, the estimated model is not a suitable framework for testing hypotheses related to the axioms of choice. The latter is a particular problem for the linear labor supply model since coherency in this case may require a forward-sloping labor supply curve everywhere, but the discussion easily generalizes to nonlinear labor supply functions as well. Therefore, one of the more recent topics in the labor supply research has been to develop estimation methods that eliminate or at least weaken the link between coherency and integrability conditions (see, e.g., Blundell, Duncan, and Meghir 1993). There have also been attempts to weaken the link between local coherency conditions and the global properties of the model by using more flexible specifications of consumer preferences.

It is also important to examine to what extent the common choice of linear labor supply functions has affected the conclusions concerning the labor supply responses to wages, nonlabor income, and the tax system. For example, Blundell, Duncan, and Meghir (1993) find evidence of backward-bending labor supply curves for part of the sample of British women using a more flexible model. However, for Sweden, the choice of a linear labor supply function appears to be less restrictive. While Blomquist and Hansson-Brusewitz (1990) found evidence in favor of the quadratic labor supply function for men, their counterfactual policy simulations of these specifications yield similar predictions. In a nonlinear labor supply model accounting for quantity constraints, Aronsson and Karlsson (1993) found no evidence of a backward-bending labor supply curve for men. Moreover, their study also found that the behavioral differences between a linear and a nonlinear model are small. For women, we are, as expected, less conclusive about the restrictiveness of commonly used functional forms because of the wide dispersion of the results. However, Aronsson (1991) estimates a nonlinear labor supply function for women, accounting for both taxes and quantity constraints, and found no evidence in favor of a backward-bending labor supply curve.

Another line of criticism questions the assumption that the gross wage rate and nonlabor income are exogenous (Flood and MaCurdy 1992). Flood and MaCurdy (1992) present estimates for several specifications of male labor supply functions under different estimation methods and exogeneity assumptions. When they fit a linear labor supply function assuming a convex budget set and that wages and nonlabor income are exogenous, Flood and MaCurdy (1992) estimate a negative income elasticity, a small positive uncompensated wage elasticity, and a small positive compensated wage elasticity (the first column

of Flood and MaCurdy estimates in table 5.2 above). They recover qualitatively the same labor supply elasticities when they change the estimation method from a maximum-likelihood estimator to an instrumental variables estimator while maintaining all other assumptions of the previous specifications (row 2 of the Flood and MaCurdy estimates in table 5.2). However, when the gross wage and nonlabor income are considered endogenous (row 3 of the Flood and MaCurdy estimates in table 5.2), their instrumental variables estimator yields a positive income elasticity, a large (in absolute value) negative uncompensated wage elasticity, and a negative compensated wage elasticity. Hence, relaxing the assumed exogeneity of wages and nonlabor income leads to a violation of the Slutsky equation (i.e., the negative compensated wage elasticity). Flood and MaCurdy conclude that their instrumental variables results give strong support for considering richer specifications of labor supply behavior—life-cycle and household models of labor supply. However, in apparent neglect of the same evidence, the authors conclude that their instrumental variables results treating gross wages and nonlabor income as endogenous are most likely to be correct. Unfortunately, Flood and MaCurdy do not elaborate or support this conclusion.[36] Moreover, to generalize from their specification requires evidences that the convex budget set procedures work well in the presence of nonconvex budget sets. The latter is a problem, especially when the nonconvexities appear near the observed hours of work, which may be the case for low-income earners according to the budget sets described in section 5.6.1 above.

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36. As is usual when reviewing instrumental variables estimates, one can argue with the choice of instruments that are assumed always to be exogenous. For Flood and MaCurdy (1992), these variables are husband's and wife's educational attainment, interaction between the husband's education and his age and age squared, and several demographic variables, including the number of children younger than seven years old in the household, the number of people in the household, whether the household owns or rents its home, an age dummy (for younger than fifty-five years old), and an urban residence dummy. All these can be considered endogenous from the perspective of the wider class of behavioral models that they support. Without additional evidence, it is not clear whether the endogeneity problems operate through the wage and nonlabor income variables or through the maintained set of "exogenous" variables.

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