Preliminary and incomplete

Labor Supply, Tax Base and Public Policy in Sweden

by

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1. Introduction

The extensive tax and transfer programs in Sweden have been subject to a considerable amount of research. The basic structures of these programs, as well as the corresponding research about labor supply behavior (broadly defined) among Swedes, were addressed by Aronsson and Walker (1997). In this study, we intend to follow up our paper by discussing the research carried out during the last decade on the labor supply and related issues as well as try to relate this discussion to the incentives generated by the Swedish welfare state.

2. Our point of departure

In this section, we briefly summarize the main findings of Aronsson and Walker (1997) as well as try to explain the basic ideas underlying this follow-up report. Our earlier study gave a broad overview of incentives generated by the tax, transfer and social insurance systems in Sweden as well as an overview of labor supply behavior with an emphasis on studies based on Swedish data. We also tried to relate the incentive structure to the existing empirical results in a careful way by focusing some of the attention on the tax and benefit reforms that took place during the 1980s and early 1990s. In our earlier study, much of the discussion of the effects of the tax and transfer systems on labor supply behavior referred to the hours of work dimension. This is so for obvious reasons; the main body of empirical work on labor supplies focuses on the hours of work. Our literature review showed that male work hours are relatively unresponsive to changes in the tax and transfer system, whereas female work hours appear to be more responsive to economic incentives. Possible reasons for the low responsiveness of work hours (among men) to taxes and transfers will be discussed below in the light of more recent research. We shall also address the question of why Swedes (or Europeans in general) appear to supply much less market work than Americans do.

It is widely recognized that work hours only constitute one dimension of labor supply, and that much of the earlier work in this area is based on relatively simple models. Part of the more recent research on labor supply focuses, instead, on the relationship between the tax

system and the before tax income. This is interesting in the sense of broadening the perspective, since the before tax income not only reflects work hours; it may also reflect effort, occupational choice, wage formation, savings and to some extent also tax avoidance (depending on the income measure used). In this study, therefore, we intend to combine the study of tax base determination with results from traditional labor supply studies in order to get a better understanding of the relationships between economic incentives and behavior. As a complement, we also briefly address relationships between, on the one hand, the tax system and, on the other, union wage formation, savings and tax avoidance, respectively. The incentives associated with unionized labor market are also relevant from perspectives other than just wage formation; for instance, for understanding international differences with regards to work hours as well as the welfare effects associated with public policies. This will be further discussed below.

Other issues of interest refer to behavioral effects, and in particular labor supply responses, associated with the social insurance system, which we intend to discuss more thoroughly here than in our previous study. Since the social insurance systems are very extensive, such a discussion is, of course, interesting in its own. However, it is also motivated for, at least, three additional reasons. First, we have had several important changes in the social insurance system since the mid 1990s with the pension reform implemented in 1999 being the most important example. Second, part of the more recent research on the labor supply (broadly defined) concentrates on the incentive effects associated with the social insurance system, meaning that we have more to say on these issues now than in our previous paper. Third, the issue of demographic change has become an increasingly important issue in economics during the last 10 years, and we would like to connect our discussion with this research as well. As such, the incentive effects associated with the pension system become particularly important to consider

In summary, some of the questions to be addressed below are;

- Why are the estimated effects of taxes and transfers on the hours of work typically modest? We will discuss whether social norms and quantitative constraints contribute to this outcome as well as augment the standard labor supply model with tax avoidance behavior.

• Why are the estimated effects of marginal tax rates on the before tax income often much larger than the corresponding effects on work hours? This leads us to examine relationships between, on the one hand, marginal income taxation and, on the other, wage formation, savings and tax avoidance.

• What factors determine cross-country differences with respect to work hours; in particular differences between Sweden, other European countries and the U.S.?

• How does the labor supply respond to health insurance and the pension system? The effects of the pension system are particularly interesting to analyze because of (i) the major reform implemented in 1999 and (ii) the gradual aging of the population.

3. A brief review of taxation and social insurance

Since this chapter, to a large extent, deals with behavioral (and to some extent welfare) effects induced by taxation, transfers and social insurance, let us start by briefly characterizing these systems. The idea is not to provide a considerable amount of detail; only to provide some basic structure, which is useful for later discussions. We will primarily focus on changes since 1995. For a detailed discussion of the tax, transfer and social insurance systems as well as some of their history, the reader is referred to Aronsson and Walker (1997).

Taxation

The income tax system is divided in two parts; a proportional tax imposed by lower level authorities and a nonlinear national income tax. The tax rates decided upon at the local level differ between local jurisdictions, with an average rate (the average of the sum of the county, municipal and church tax rates) just above 30 per cent. The national income tax has undergone several changes in the 1980s and 1990s. In the early 1980s, the national income tax was highly progressive with many tax brackets; for instance, in 1980, the tax rate ranged from 0 to 58 percent depending on the level of taxable income. In addition, labor income and capital income were taxed jointly, and capital losses were deductible from the labor income when computing taxable income. Adding the local tax rate, an

average earner may have faced a marginal income tax rate of around 50 per cent, and the top rate exceeded 80 per cent.

The tax reform implemented during 1983-1985 meant splitting the national income tax into two parts; a basic part and an added part. All (or most) income earners paid the basic tax, and this tax schedule had two brackets (with tax rates equal to 5 and 17 per cent, respectively, in 1989). The added tax, which contained higher tax rates, was only paid by those with sufficiently high income. Capital losses could still be deduced from the tax base for the basic tax, although it could not be deducted from the tax base associated with the added tax (implying that the latter tax base was broader). The general idea behind this tax reform was to reduce the marginal income tax rates for average and high income earners, while at the same time maintain a progressive tax structure and keep the tax revenues roughly constant. The top rate for the national income tax was 42 per cent in 1989. However, although this reform reduced the number of tax brackets, the system still resembled the pre-reform system in many respects. In 1991, an additional (and major) tax reform was implemented, which meant introducing a simpler system with two tax brackets for the labor income tax; the national tax rate was set to zero for taxable incomes below 170 000 SEK (i.e. individuals with lower levels of income only paid the local income tax) and 0.2 for higher incomes. It also implied a broader tax base, by including some previously fringe benefits, as well as separate taxation of capital income (including capital gains) at 30 per cent. By analogy, 30 per cent of net capital losses were made deductible from the labor income tax payment. Another part of the reform was an increase in the value added tax.

Although the tax system has undergone some modifications since 1991, much of the basic structure of the post-reform system has remained. For the purpose of increasing tax revenues, in 1995, an additional tax bracket was introduced, meaning that the top rate for the national income tax is now 25 per cent. In 2004, the schedule for the national income tax meant a zero tax rate for taxable income up to 291 800 SEK, 20 per cent for taxable income between 291 800 and 441 300 SEK, while it was 25 per cent for taxable income exceeding 441 300 SEK.

Regarding the value added tax, the general rate is 25 per cent. However, for certain types of consumption, the rate is lower; either 6 per cent (e.g. newspapers and books) or 12 per cent (food). The payroll rate is 32.7 per cent.

Sickness insurance

During the 1990s, the sickness insurance was reformed several times. The largest reform occurred in 1991 when sickness benefits were reduced for the first time since the start of the national public system in the mid-1950s. Prior to this reform, workers could collect 90 percent of their usual earnings from the first day of illness. In 1991, the system instituted a "qualifying" day and workers could receive benefits starting from the second day of illness and the replacement rate was dropped from 90 to 75 percent. In the 1990s the replacement rates at different illness durations and the length of the qualifying period changed. Currently, there is a one day qualifying period. Days 2 through 14 are paid by the employer at 80 percent of the worker's salary (up to a certain level; see below). The national health insurance system picks up the cost of the sickness benefits starting in day 15. National health insurance replaces 80 percent of the pre-illness salary (up to 7.5 times the Basic Amount). Employees are required to get a physician's certificate after 7 days. For longer spells, the national insurance system requires monthly checks and review by the local health authority. Depending on the type of illness (and, therefore, inability to work) the sick leave may only refer to part of the normal working time, in which case the benefit is adjusted accordingly. In addition to the national health insurance, there is also supplemental coverage decided upon during bargaining between the parties in the labor market.

Recent reforms were intended to tighten control and increase monitoring of the use of benefits. For example, now employers have an increased incentive to monitor use (and misuse) of benefits, as the cost of the first three weeks of illness falls on them. And, additional medical documentation over the course of the illness is needed to maintain benefits.

The pension system

Sweden retains its position as leader in innovative social insurance programs with its pension reform of 1999 that completely restructured the public pension system in Sweden. The pre-reform pension system was phased in over a twenty year period and became the sole public pension system in 1980. It was a pay-as-you-go defined benefit system that had two components, a basic pension and a supplemental pension. The basic pension offered income security and established the minimum income floor for all workers. The supplement pension augmented the basic pension and targeted payments to replace about 60 percent of the worker's labor market earnings. Under the supplemental pension system, benefits were tied to the worker's highest earnings over fifteen years, and to obtain a full supplement benefit an individual had to work 30 years.

At its inception and into the 1980s the old pension system generated large surpluses. Over time pension benefits became more generous, life expectancies rose and fertility rates fell. Thus, pensioners had to be supported for more years, were entitled to more generous benefits with a declining worker base to support them. These changes necessitated either crippling tax increases or significant cut in benefits. The system was not financially viable, especially once the baby boomers retire and leave the work force in the early years of the twenty-first century.

The pension reform in 1999 offers an innovative and in many ways radical solution to these problems. The largest change is that the public pension system switched from a defined benefit to a notional defined contribution system. In the new system, workers accrue a pension contribution equal to 18.5%. Now, instead of guaranteed benefits upon retirement, workers have guaranteed contributions made each year. Contributions equal to 16 percent points go into the national public pension fund, which is managed by the government. The contribution accruing from 2.5 percent points go to the worker's individual account. The 2.5 percent contribution is mandatory; however, these funds are under the individual's control. The government will collect all revenues and disperse payouts, although the individual funds will be managed by private investment firms selected by the individual from an approved list of investment advisors. The individual accounts represent the second innovation of the new pension system. The last innovation is a significant broadening of the income base entering the public pension system. Besides earnings, the 1999 reforms recognized additional social insurance payments as part of the income base. This includes stipends to students pursuing post secondary education and

parental benefits. Indeed, child rearing activities earn supplemental contributions. Income while serving in the military is now covered, whereas before income during this period was excluded.

Like the previous system, the reform in 1999 will be phased in over a number of birth cohorts; specifically, the birth cohorts 1938 to 1953. Individuals born in 1954 and subsequently will receive pension benefits fully within the new system, whereas individuals born in 1937 and earlier are grandfathered into the old system. The phase-in offer younger cohorts a long horizon to adjust their savings and work behavior to the new system. Note also that the public pension only constitutes part of the old age pension system; it is supplemented by pensions decided upon by the parties in the labor market and payments from private pension funds.

The pension system remains a pay-as-you-go pension system as tax contributions paid by those currently working are used to finance the pension payments of those currently retired. At an 18.5 percent contribution rate, the system's designers expect the new pension system to deliver pension benefits at about the same level as the old system. An interesting political compromise rests with the 18.5 contribution rate. Consensus estimates within the public debate was that a 16 percent contribution would suffice to maintain the (then) existing level of pension benefits. Yet, to ensure income security, a higher contribution rate was accepted with the stipulation that the remaining funds were under individual control.

The new pension system represents a striking departure from Sweden's long history of guaranteed benefits and horizontal equity. Under the new system, different cohorts will receive different pensions for the same accumulated pension wealth as life expectancies change. Members of the same birth cohort will receive different pensions for same life expectancy should the individuals retire in different years (and thus have the opportunity to accumulated different levels of pension wealth to annuitize at retirement). Finally, and most individual-specific, the individual accounts will accumulate wealth based on the individual's investment strategy. Individuals adopting more conservative portfolios will accrue less wealth than those who adopt (relatively) less conservative portfolios. Government oversight of the fund managers and restrictions on the types of investments permitted reduce this form of variability and it may be more symbolic than real. Yet,

within a social insurance system founded on horizontal equity, in which "alikes are treated alike", this source of individual level diversity is a striking (if not a significant) departure from the traditional Swedish social insurance system.

Family policy

As a major component of its family policy programs, Sweden has a comprehensive set of social insurance programs targeted to families with children. At childbirth (or adoption) parents have the right to 450 days of parental benefits to care for the child. Each parent is allocated 60 days that cannot be transferred to the other parent, and otherwise share the benefits. Benefits may be taken from birth till the child is age 8. For the first 390 days, benefits operate like the national sickness insurance benefits and replace 97 percent of 80 percent of the parent's salary. The last 90 days are compensated at a flat rate of 60 SEK per day. Parents who did not establish a labor market connection before child birth have access to a guarantee benefit that pays 180 SEK for the first 390 days, where the last 90 days are compensated at the same flat rate.

Sweden has long had a system of child allowances, guaranteed monthly payments that accrue to all children until the age of 16. Child allowances equal 950 SEK per month per child. Families with three or more children receive supplemental benefits. The supplemental benefit for the third child is 247 SEK per month and additional 750 SEK for the fourth and 950 SEK for the fifth. To put the child allowances in perspective, child allowances represent about 3 to 4 percent of monthly income for the median income family with two children.

Housing allowances: **to be written**

4. Hours of work; some evidence for Sweden and extensions

The determination of work hours is one of the most frequently addressed aspects of the consumer demand theory. There is a voluminous earlier literature dealing with different aspects of this research problem such as estimation methods and the effects of the tax and transfer systems. To provide a starting point for the analyses to be carried out later,

consider the simplest possible model, where the individual chooses the hours of work and the consumption of a single good to maximize utility subject to the budget constraint, i.e.

$$\underset{h,c}{Max} \;\; u(c,h;z)$$

subject to $wh + y - T(wh, y_{tax}) - c = 0$

in which c is consumption, h the hours of work, y nonlabor income, z a vector of observable characteristics, y_{tax} (which is part of y) the taxable nonlabor income and $T(\cdot)$ the tax payment[1]. Since the tax function is generally a nonlinear function of income, this means that the individual faces a nonlinear budget constraint. The outcome of this problem can be written as a labor supply function

$$h = g(w_n, y_n; z) \tag{1}$$

where $w_n = w(1 - T')$ is the marginal wage rate, while y_n is typically referred to as the virtual nonlabor income (which we obtain by linearizing the budget constraint around the optimum), i.e. $y_n = y + T'(\cdot)wh - T(\cdot)$.

Although this model is simple, it is, nevertheless, a suitable starting point. The reason is that the model described above (or slightly more elaborate versions of it) is the most frequent theoretical basis for empirical studies of labor supply. We will, therefore, use this model as a staring point for our analysis, and then extend it to address the problems to be discussed later. Readers interested in more thorough reviews of different labor supply models, as well as the econometric methods typically associated with them, are referred to Blundell and MaCurdy (1999).

Turning to the empirical part of the literature, there is a large number of studies presenting estimates of the uncompensated labor supply elasticity with respect to the marginal wage rate (henceforth called wage elasticity) and the corresponding labor supply elasticity with respect to the virtual nonlabor income (henceforth called income elasticity). Blundell and

[1] Note that we can reinterpret $T(\cdot)$ to include transfer payments as well.

MaCurdy (1999) give a review of these estimates. The estimates of the uncompensated wage elasticity for men are typically small; most studies cover the interval from slightly negative point estimates to point estimates around 0.15. The estimates of the income elasticity are typically negative (as expected) and relatively small in absolute value, although the variation between studies regarding the income elasticity appears to be greater than the corresponding variation with respect to the wage elasticity. For women, the picture is different; both the wage and the income elasticity are typically estimated to be much larger in absolute value than the corresponding elasticity for men, suggesting that women's hours of work are generally more response to economic incentives than the male hours of work.

As we reported in Aronsson and Walker (1997), a similar conclusion is reached if we focus on studies based on Swedish data. This picture is also verified by more recent studies not covered by our earlier survey[2]. Therefore, the hours of work supplied by men are not particularly sensitive to changes in the marginal wage rate and the virtual nonlabor income, whereas the response in the hours of work supplied by women appears to be greater (with elasticity estimates being several times higher) than for men. A summary of results is found in table A1 in the Appendix.

However, since the budget constraint is nonlinear, and since members of the same household may interact with regards to work hours, we cannot see from the estimates of the (own) wage elasticity and the income elasticity how the hours of work will respond to tax reforms. The labor supply responses to the tax and transfer reforms in the 1980s and early 1990s have been addressed by Aronsson and Palme (1998) and Blomquist et al. (2001). Aronsson and Palme estimate a household labor supply model using data from the Level of Living Survey in 1980; in their study, both the husband and the wife are in the age group 25-55. The model is then used to compute the desired hours of work for the husband and the wife, respectively, under three tax and transfer system; 1980, 1989 and 1991, respectively, (where the changes refer to the income tax, the value added tax, the housing allowance and the child allowance). Their results show a 2.1 per cent increase in the

[2] See e.g. the studies of male labor supply by Blomquist et al. (2001) and Blomquist and Newey (2002) and the study of household labor supply by Flood et al. (2003). The own wage elasticity of female labor supply presented by Flood et al. is lower than the estimates presented in many earlier studies on labor supply based on Swedish data.

desired hours of work for the husband and a 0.7 per cent increase for the wife on average due to the switch from the 1980 to the 1989 system. The seemingly very small response in the wife's hours of work follows despite that the labor supply of wives is estimated to be much more elastic than the labor supply of husbands. The main explanation is a large negative cross-wage effect (from the increase in the husband's marginal wage rate) accompanied by a relatively large income effect from the transfer system. The corresponding changes in desired work hours, due to the shift from the 1989 to the 1991 system, are 3.1 per cent for the husband and 2.8 per cent for the wife, respectively. Blomquist et al. (2001) use data from the Level of Living Surveys in 1973, 1981 and 1991 to estimate the labor supply of married men aged 25-55. The estimated model is used to simulate how the desired hours of work responds to the change in the tax and transfer system between 1980 and 1991 (where the change refers to the income tax, the value added tax, the payroll tax, the child allowance and the housing allowance). The average response in the desired hours of work is estimated to be 2.2 per cent. We shall return to these estimates in section 7, where the relationship between the marginal tax rate and the before tax income is addressed more thoroughly.

Considering that several of the most cited studies on labor supply refer to time periods with increases in women's labor force participation – implying more variation in the hours of work among women than among men - it is not surprising to find that women's hours of work are generally more responsive to economic incentives than the hours of work supplied by men. In addition, the labor supply results for women seem to vary more across studies than the corresponding results for men, indicating (perhaps) that it is more difficult to reach consensus regarding women's labor supply. The results from studies on male labor supply, on the other hand, are surprisingly stable over time and across countries in the sense that the estimates of the wage and income elasticity are typically found to be relatively small in absolute value. How can we explain this seemingly stable result? One possibility is, of course, that the standard labor supply model is correct, in which case the explanation has to do with the preferences for the tradeoff between consumption and leisure. However, alongside this (unlikely) explanation, other studies try (at least in part) to attribute this finding to the character of the standard labor supply model by arguing that it neglects vital aspects of either the preferences or the choice set. We will discuss some of these approaches below by extending the standard model in order to capture quantitative constraints, social norms and tax avoidance, respectively.

Quantitative Constraints

By quantitative constraints, we normally mean demand oriented constraints, such that individuals facing them are off their labor supply curves. The presence of such constraints can, at least in principle, explain why the hours of work appear to be relatively unresponsive to small changes in the marginal wage rate and the virtual nonlabor income, respectively. Using Swedish data on prime-aged married men from the 1981 Level of Living Survey, Sacklen (1999) addresses the issue of quantitative constraints. His study makes use of a question to the participants in the Level of Living Survey, where the respondents were asked to say whether they were satisfied with their work hours, or if they wanted to increase or decrease their hours of work given a corresponding change in their income. Those who claimed to be rationed in this sense were treated as if they were off their labor supply curves. This means that the labor supply of those who report rationing is treated as a latent variable.

A basic hypothesis here is that, once quantitative constraints are recognized and properly addressed, we may expect to find that the underlying (latent) labor supply is more responsive to economic incentives than in the standard model, where the constraints are neglected. However, the results do not support this hypothesis: allowing for quantitative restrictions does not seem to increase the responsiveness of the (latent) hours of work to economic incentives.

Social norms

We shall not address the formation of social norms; only consider the possibility that social norms may influence preferences and, therefore, also the choices made by the consumers. The idea is that social norms may constrain behavior. Therefore, conditional on these norms, the behavioral response to economic incentives is likely to be smaller than if the norms were allowed to adjust as well. Here, we shall briefly address interdependent behavior in the hours of work dimension. To exemplify, consider a slight modification of the utility function used above, $u(c,h,\bar{h};z)$, where $\bar{h}$ is interpretable as the average hours of work in the reference group, with which the individual compares himself/herself. This

variable may reflect a utility loss of deviating from a social norm regarding work hours (which is here assumed to be reflected in the average hours of work). In addition, to simplify the calculations, suppose that the utility function is such that the resulting labor supply function takes the form

$$h = \alpha + \beta w_n + \gamma y_n + \delta \bar{h} + \nu z \tag{2}$$

The parameters β and γ reflect the influence on the hours of work of a change in the marginal wage rate and the virtual nonlabor income, respectively, conditional on $\bar{h}$. In the present context, these are only partial effects; if the marginal wage rate and the virtual income facing all individuals would change (e.g. if the tax system is subject to reforms), so would the average hours of work. Therefore, the total effect of a proportional increase in the marginal wage rate is $\beta/(1-\delta)$, where $\delta \in [0,1)$. If δ is large, we may expect substantial indirect effects via the presence of interdependent behavior. Therefore, in the standard labor supply model, if at least part of the effect of $\bar{h}$ is hidden in the constant, we may underestimate the total response to a change in the tax system.

The study of interdependent behavior in the context of labor supply models has a long history[3]. Using Swedish data referring to prime aged married men, a variant of the model set out above has been estimated by Aronsson et al. (1999). An important and complex issue here is identification. Except for the obvious difficulty of assigning individuals to correct reference groups, one reason is that the average hours of work (which we may here think of as reflecting the social norm) may vary between social reference groups for several reasons; one is interdependent behavior, while another being differences in preferences across groups. To be able to identify both interdependent behavior and preference variation, Aronsson et al. (1999) estimate their model on the basis of three cross-sections from the Level of Living Survey. The assignment of individuals into social reference groups is based on a crude classification, which resembles that used in other studies as well; individuals are assigned to social reference groups on the basis of education, age and the presence of children under the age of 18 in the household. Their empirical approach is then to estimate several different models, allowing them to test

[3] See e.g. Kapteyn (1977), Allesie and Kapteyn (1991) and Woitiez and Kapteyn (1998).

whether interdependent behavior is present as well as to control for differences in preferences between the social reference groups. The results suggest that interdependent behavior is present and affects the labor supply behavior of prime-aged married men. In addition, the effects is estimated to be sizeable; in terms of equation (2), the point estimate of δ is around 0.67. The traditional, and partial, wage and income elasticities, $\beta\overline{w}_n / \overline{h}$ and $\gamma\overline{y}_n / \overline{h}$, are equal to 0.061 and –0.017, respectively, which resemble (or fall slightly short of) those found in earlier studies, which do not address interdependent behavior. The corresponding estimates of the 'full elasticities', $\beta\overline{w}_n /[(1-\delta)\overline{h}]$ and $\gamma\overline{y}_n /[(1-\delta)\overline{h}]$, are 0.187 and –0.052, respectively.

Taken at face value, these results suggest that the effects of interdependent behavior are substantial, and that the traditional labor supply model may imply considerable underestimation of the effects of taxation. However, it is necessary to be careful in the interpretations. First, the construction of social reference groups is somewhat arbitrary. The Monte Carlo simulations carried out by Aronsson et al. (1999) suggest that this is a potential problem; it may lead to overestimation of δ, which is the parameter of main interest[4]. Second, the time dimension is possibly very important here, although it is not formally addressed in the analysis referred to above. As a consequence, there is no formal distinction between 'short run' and 'long run'. In the short run, social norms are likely to constrain behavior – suggesting moderate behavioral responses to policy – whereas social norms may gradually evolve in the long run as a result of the behavior of all individuals. If this argument is correct, then the long run behavioral effects – which also incorporate the effects via changes in the social norm - will exceed those that follow in the short or medium run. As such, this argument also relates to ideas put forward by Lindbeck (1995a), suggesting that welfare policies easily 'overshoot' in the sense that politicians may have chosen less generous welfare programs, had they understood the long run disincentive effects caused by these programs[5]. This implies that the complexities associated with social norms go far beyond the analysis carried out above.

[4] A more thorough analysis of problems associated with identification of endogenous social effects is given by Manski (1993).
[5] See also Lindbeck (1995b).

Tax avoidance and the choice of assets

Clearly, economists would generally expect the highly progressive income tax characterizing Sweden in the 1970s and 1980s to have caused serious disincentive effects. Yet, these expected behavioral responses were not found in the empirical work based on data for that time period (at least not for men). Can asset trade, which is carried out for the purpose of avoiding taxation, explain the seemingly moderate influence taxes have on the labor supply? If it can, then the tax tables may exaggerate the effective degree of tax progression for certain groups of wage earners. We will formalize our argument by using a model developed by Agell and Persson (2000), which only requires a slight extension of the reference model set out above. Consider an economy with two types of assets, a tax-exempt asset and a taxable asset, the returns on which now constitute the 'nonlabor income' part of the reference model. Let e denote the initial endowment, x the tax-exempt asset and d the taxable asset. Both assets are risk-free and give the rates of return r for the taxable asset and ρ for the tax-exempt asset. By using the wealth constraint, $d = e - x$, the optimization problem of a typical individual can be written as

$$\underset{h,c,x}{Max} \;\; u(c,h;z)$$

$$\text{subject to} \quad wh + \rho x + r(e-x) - T(wh + r(e-x)) - c = 0$$

$$x \geq 0$$

We assume that $T(\cdot)$ is such that $T'(\cdot) > 0$ and $T''(\cdot) > 0$ for $wh + r(e-x) \geq 0$. The tax system described here resembles, at least in part, the Swedish system before the 1983 tax reform, where negative asset income was fully deductible from labor income when calculating the taxable income. As such, this description is interesting in the sense of allowing us to focus on a tax system thoroughly studied in the context of labor supply, although the earlier literature simplified the analysis by assuming that the nonlabor income is exogenous. By substituting the budget constraint into the objective function, we obtain a utility maximization problem in h and x. The first order conditions are written as

$$u_c(c,h;z)w(1-T') + u_h(c,h;z) = 0 \tag{3}$$

$$\rho - r(1-T') \leq 0 \;\; (= 0 \text{ if } x > 0) \tag{4}$$

In general, the higher the wage rate, the higher will be the taxable income and the higher the marginal tax rate. This suggests that, when the pre-tax wage rate is sufficiently high, $x > 0$, whereas $x = 0$ for lower pre-tax wage rates. If the individual decides not to use the tax-exempt asset, then the labor supply takes the same form as in the reference model described above. If, on the other hand, the individual decides to place part of his/her endowment in the tax-exempt asset, meaning that $x > 0$ at the optimum, then equation (4) implies that $\rho / r = (1 - T')$. Therefore, equation (3) can be rewritten as

$$u_c(c, h; z)w\frac{\rho}{r} + u_h(c, h; z) = 0 \tag{5}$$

The labor supply implicit in equation (5) takes the form $h = h(w\rho / r, \hat{y}; z)$, where $\hat{y}$ denotes the virtual nonlabor income, i.e. $\hat{y} = \rho x + r(e - x) + T'(\cdot)wh - T(\cdot)$. This result has a very interesting implication; conditional on the ratio between the rates of return, ρ / r, a small tax reform will only give rise to an income effect. In addition, note that the taxable income does not depend on the parameters of the utility function, which is seen by solving equation (4) to obtain $wh + r(e - x) = T'^{-1}(1 - \rho / r)$.

This model is interesting in the sense of pointing out the distinction, in terms of labor supply, between tax avoiders and those who do not use the possibility to adjust their marginal income tax rate via the tax-exempt asset. For avoiders, who lower their effective marginal income tax rate via avoidance behavior, the statutory marginal income tax rates exaggerate the distortions imposed by the income tax system. Therefore, avoiders will, in a sense, create their own labor supply incentives, which suggests that the work disincentives associated with the tax system may not have been as great as they may have appeared from the tax tables in the late 1970s and early 1980s. If these disincentives were not as large as they appeared to be, then the seemingly small labor supply responses to taxation become easier to understand. Agell et al. (2004) carry out simulations in order to compare the labor supply behavior of avoiders and nonavoiders even further. Part of this exercises serves the purpose of illustrating the relationship between, on the one hand, the degree of tax progression (measured as the marginal over the average tax rate) and, on the other, the labor supply and the deadweight loss of taxation. In general, the higher the degree of tax

progression, ceteris paribus, the lower the income at which tax avoidance pays off, in which case the effective tax schedule resembles a linear tax. In this case, we would expect to find weaker evidence for substitution effects of taxes than in the traditional model, where tax avoidance is not an option. Furthermore, in the case of tax avoidance along the lines discussed here, the traditional model is misspecified with the consequences of biased parameter estimates. Finally, by neglecting the welfare costs associated with portfolio adjustments, the formula for calculating the deadweight loss would, itself, be subject to bias in the standard model.

Empirical research based on the Swedish tax system from the 1980s suggest that people responded to the incentives associated with tax avoidance; individuals with high labor income were found to be more inclined to have tax-favored assets than those with lower labor income[6]. Similarly, a decline in indebtedness seems to have taken place after the 1991 tax reform was implemented[7]. These results are interpretable to support the idea that individuals choose their portfolios in order to avoid taxation which may, in turn, have implications for their labor supply behavior. In addition, and perhaps even more important, if individuals respond to taxation via their portfolios, we may expect taxation to have a larger effect on the taxable income than on the hours of work. This will be further discussed in section 6 below, were we examine the relationship between the marginal income tax rate and the taxable income.

5. The social insurance system

A distinguishing feature of the Swedish social insurance system is its two-part structure – nearly every program offers some minimal or guaranteed benefit and another component that replaces a fraction of earnings. For example, sickness insurance system, parental insurance and unemployment insurance systems all have this feature. The work conditioned benefits are distinctly more generous than the guaranteed benefits and offer a strong incentive for employment. Yet, the existence of the work-conditioned benefits requires that we distinguish between contact or paid hours of employment and active hours of work, hours spent working producing a good or service. The recent OECD country report on Sweden does this and the results are striking. Workers in Sweden were on the job and actively working an average 35.4

[6] See Edin et al. (1995).
[7] See Agell et al. (1998).

weeks per year, while the average for Europe was 40.7 weeks. The number weeks away from work due to holidays varied little across countries in Europe. Hence, the primary difference in annual hours worked in Sweden versus the European average was in "weeks absent for other reasons". In Sweden the weeks absent (excluding holidays) is more than twice the average for Europe (9.8 versus 4.5). We explore some of the features of the social insurance programs that may give rise to this difference.

Sickness Insurance

Recent reforms requiring increased medical documentation of the illness and for the employer to pay sickness benefits for the first fifteen days of an absence were intended to increase monitoring of usage and thereby tighten control over benefit costs. Nevertheless, use of sickness insurance benefits continues to remain high in Sweden, and work days lost due to illness is highest in Sweden than in any other European country.

Using the conceptual framework presented in section 4 it is straightforward to explain the effect of sickness insurance benefits on labor supply. As mentioned in section 4, demand side considerations (e.g., set up costs and returns to coordination) may dictate the number of hours per period that must be supplied. Jobs can be seen as a tied-sale of a bundle attributes of which hours of work is only one of many attributes describing working conditions and the nature of the job. Workers select the job that gives them the highest utility. Because it is cheaper to do so employers have an incentive to offer job-packages that workers prefer. Nevertheless, technology limits the choices available and some workers may select jobs with required hours of work greater than desired (as defined by the labor supply function in equation 1). Access to sickness insurance benefits permit workers to adjust their hours of work to more nearly equate desired and demanded hours. The qualifying period and less than full replacement rate means the adjustment will be less than complete. In this interpretation there is nothing stochastic or unexpected on the use of sickness insurance – the worker accepts the job demanding a fixed number of hours, knowing he or she can adjust the level of effort downward through the use of sickness insurance.

Building on the same structure we can view the labor supply function (1) as implicitly defining the (unrestricted) supply price of labor. Inverting equation (1), $w_n = g^{-1}(h, y_n; z_n)$, w is the worker's asking price (net of taxes and transfers) to supply h units of labor at a given level of effort or intensity. We can think that the effort required on the job may vary over the

business, with more effort requested in expansions and less in economic contractions. Once again, sickness insurance benefits permit the work to moderate the demands over the cycle. This framework implies we should see a pro-cyclical use of sickness benefits – the number of sick days should increase when demand for labor is high and should decline when demand for labor is low. We reported in Aronsson and Walker (1997) from 1967 (when the 3 day qualifying period was reduced to a single day) through the early 1990s usage of sickness cash benefits has been strongly pro-cyclic. Indeed, during the last decade a simple correlation of unemployment and sick days is -0.9.

This interpretation of the disincentive effects of sickness insurance benefits reappears in empirical studies over the last fifteen years. In our 1997 paper we cited Björklund's (1991) study using cross sectional data to characterize the determinants of paid sickness days. Björklund finds that workers on jobs requiring monotonous work made greater use of sickness benefits and young workers take a greater share of benefit for short-spells than for long-spells. The later finding suggesting that usage may be more related to worker preferences than medical need.

Henrekson and Persson (2004) investigate the responsiveness of sick days to the major reforms of the sickness insurance system from 1968-2002. The National Insurance Board (RVF) reports sick days funded by the national sickness insurance system. The national register data reports sick days funded by the sickness insurance system. These register data undercounts true number of sick days during the 1990s as occupation sickness insurance plans offered additional coverage that partially offset the cost of the qualifying period and covered earnings above the basic amount threshold of the national system.[8] Henrekson and Persson's aggregate time series data do not permit parameterizing the reforms in terms of their direct monetary incentives. Instead, the authors code the reforms by time varying indicator variables and limit their analysis to only the major reforms. They adopt a distributed lag specification with the number of sick days as the dependent variable and include controls for the age composition of the working population, gender mix, and unemployment rate as regressors. They find that sick days and unemployment are negatively related. Indeed, they find the 1991 reform that increased the length of the qualifying period and reduced benefits reduced sick days to decline by 20 percent. The careful and thorough analysis provides

[8] These authors report that the national registers underreport the true level of sick days by 10 percent. The OECD country report on Sweden discussed below may be overly conservative in its comparisons of labor market absences of Sweden and other European countries.

compelling evidence of the link between the structure and generosity of the sickness insurance plan and hours of work.

Nevertheless, it is important to recognize the cost of the sickness insurance program is two-fold. First, by offering a means to smooth consumption of leisure within a year the sickness insurance system provides an incentive to decrease the labor supply. Second, taxes are necessary to finance the benefits, and the higher tax rates create its own disincentive for working.

It is also hard to justify the recent legislation of work sabbaticals starting in 2005. Individuals can petition for a sabbatical year in which they will receive 85 percent of their unemployment benefit, but no less than 320 SEK per day. The person's position will be filled by someone registered with the Employment Office as unemployed and preference in placement will be given to those who are chronically unemployed, occupationally handicapped or recent immigrants. Unemployment benefits replace 80 percent of the previous income up to 680 SEK per day (those with income-related benefits exceeding this limit may receive up to 730 SEK per day for the first 100 days of unemployment). So the sabbatical program offers a maximum subsidy equivalent to about two-thirds of the prior year's earnings. And since the unemployment income ceilings become binding about the median (or somewhat below) of the earnings distribution, the sabbatical program gives greater incentives to workers in the lower half of the earnings distribution.

The program is small (10,000 workers in 2005) but is likely to face pressure to expand. Yet, it is difficult to see what productive service this program can achieve. Sabbaticals within academia and within professional organizations are intended as periods of investment in which the person builds skills related to their position. The stated intention of the sabbatical year program is to give "an employee an opportunity for recreation, skills enhancement or starting a business, while giving an unemployed individual the chance to build a stronger position in the labor market."[9] And presumably, only applications from low-skilled workers will be accepted, as these positions are most easily filled by other members of the low-skill target group. Given the cost-benefit analyses of training programs in general, it is difficult to believe payoffs will be large enough to merit these investments. Plus, Denmark's very poor experience with a similar program argues against it.

[9] Swedish Institute (2005), p. 4.

Parental benefits

Historically, Sweden has been one of the leaders in offering benefits connected to childbearing and child rearing. Sweden offers subsidies to defray the medical costs of child bearing and child allowances to offset child-related expenditures necessary for young children and adolescences. As part of its family policy, parent benefits offer either parent subsidies to stay home with the child. It is important to recognize that parental benefits are one component of family policy and have the intended role of helping parents, and primarily women, balance the demands of family and the workplace. Thus, an evaluation of their effects requires a broader perspective than simply their incentive effects on labor supply. Even on labor supply the effects are complicated and somewhat offsetting. Of course, upon childbirth parental benefits offset the cost of leaving the market and will increase time away from work. Within the OECD framework described above, absences while on parental benefits fall within "absent for other reasons." However, guaranteed benefit levels are so low, prospective parents have an incentive to enter the labor market prior to *each* birth.[10] Empirical studies are few, [11] but the net effect for labor supply is likely to be negative particularly as the entitlement period is substantially shorter than the benefit period.

The recent OECD country report on Sweden is critical of the level of parental benefits in Sweden, labeling the benefits as very generous and questioning their value on child development and welfare. We recognize the likely disincentive effects on labor supply, but are less critical of the current generosity of parental benefits. Households and individuals make decisions within the current and anticipated social insurance programs. For example, private savings decisions are made with knowledge of the benefit levels of the public pension system. And, fertility decisions are made anticipating the programs and subsidies available to families with children. Reductions in child-related subsidies and programs that are interpreted as signaling the future policies may be even less supportive to families with children and may decrease fertility. In light of the of Sweden's aging population policies that may lower fertility merit further attention.

[10] See Mortensen (1977) for an elegant early analysis of entitlement effects evaluating the employment effects of unemployment insurance within the United States.
[11] See Walker (1996) for an (unsuccessful) attempt to measure the effects of parental benefits on fertility and female employment. Fertility is not completely controllable and to the extent births are unplanned weakens entitlement effects on employment.

Public Pensions

Sweden's 1999 reform introduced a *notional* or quasi-funded pay-as-you-go (PAYG) system. The system is PAYG as tax revenue collected from the currently working cohort finance benefits paid to the retirees (from prior cohorts). The quasi-funded component is that each worker's contributions accumulate and are credited with an attributed rate of return equal to the growth of average pensionable income of all insured persons. These are paper transactions, whereas the 2.5 contribution of the individual account are real investments and are managed by the worker (or the default investment manager assigned by the insurance board).

There is a vast empirical literature on the old pension system[12] and very little on the 1999 pension reform. It is an open question whether the 10 to 12 percentage point increase in labor force participation by men and women (respectively) since its inception is causal. Some of the incentives below suggest it may be.

The shift from the old defined benefit PAYG system to the notional defined contribution (NDC) system will induce both short-run and long-run effects on labor supply. In the long run as Lindbeck and Persson (2003) and Feldstein and Leibman (2002) show, a notional or quasi-funded benefit system can reduce the distortionary incentive effects caused by a tax on labor to finance benefits. That is in a PAYG in which is there is no relationship between taxes paid and benefits eventually received the implicit rate of return on tax contribution is -100%, and the deadweight loss reflects the entire pension tax on labor income, say τ_p. Under an NDC, the individual sees that taxes paid are returned as future benefits with an implicit rate of return equal to the growth rate of the population times the growth rate of labor income. If the implicit rate of return on pension contributions is close to the rate of return on other forms of savings the individual could otherwise make the distortion of labor supply is much reduced. Indeed, if the implicit rate of return is exactly equal then the distortion on labor supply is zero. Lindbeck and Persson (2003) show that for reasonable growth rates (and assuming 32 years between cohorts) the reduction in the tax wedge on labor income could be as much as 10 percentage points. The reduction in marginal tax rates should therefore increase labor supply (broadly defined, not just in terms of hours of work). The reduction of deadweight loss

[12] See for example the various studies by Marten Palme.

generated by the NDC is welfare improving potentially of both "young" and "old" generations.

The short-term incentive effects are more transparent. The switch from a defined-benefit to a defined contribution plan changes the nature of pension accruals. Under the NDC, another year of work will increase pension wealth because of the direct contribution from earnings, the return on accumulated contributions, and if the person is past normal retirement age, increased annuity values for shorter benefit period. In the defined benefit system, the pension depends on years of employment and average earnings over the best 15 years of employment. For someone with fewer than 30 years of employment or with earnings above their 15th highest earnings, additional year of employment would thus increase the annuity paid at retirement by increasing either the replacement rate and the average earnings (or both) used within the benefit formula. However, for someone not satisfying these two requirements, except for actuarial adjustments, the additional gain to working another year is zero

Labor market participation declines sharply for both men and women at age 60 in Sweden. Many of these workers are likely to have years of employment, and continued work will not increase their pension annuities via this requirement. For someone with no reduction in labor supply (and hence earnings) and experiencing constant wage growth of π percent, another year of work will increase the average maximum earnings by pi percent. Yet, if workers have not maintained their hours of work as they approach retirement, their 15 highest years of earnings may not be the last fifteen years. For these workers the growth rate in average maximum earnings will be less than π, thus lowering the incentive to remain in the market. Even on this dimension the NDC provides a larger incentive to work, as the contribution rate is to equal the growth in average pensionable income.

The NDC pension reduces the marginal tax rate of pension contributions and provides additional incentives for elderly workers to postpone retirement. These margins are operative for healthy, productive and employed workers. A pernicious problem within Sweden's pension system is the large proportion of workers who enter retirement and the public pension via social insurance programs, notably disability and sickness insurance systems.[13] As the OECD notes, the new pension system may exacerbate the problem because social insurance

[13] Palme and Svensson (2002) estimate approximately 20 percent of men and 27 percent of women exit the labor market via the social insurance programs.

income (e.g., sickness benefits and unemployment benefits) qualify as labor market income and pension contributions.

Issues of moral hazard and adverse selection are faced by all insurance programs. The social cost of allowing easy access to the social programs is the lost output from the worker and the deadweight loss associated with the higher tax rates needed to finance the extra payments. We recognize these costs, but see the issue less in terms of the design of the social insurance programs and more in terms of their administration.

6. Other aspects of the tax base

So far, we have mainly focused on the hours of work. From a tax revenue perspective, as well as for purposes of comparison, it is of interest to understand how and why taxation affects the before tax income. In addition, by extending the analysis to the before tax income, several additional mechanisms will appear; for instance, in addition to the hours of work, the before tax income also reflects effort, occupational choice, wage formation, savings and possibly also tax avoidance. We may, therefore, expect the taxable income to respond differently to tax policy changes in comparison with the hours of work. This section begins by analyzing the relationship between the marginal tax rate and the before tax income. We will then continue by briefly discussing how wage formation and savings, respectively, may respond to tax policy. Occupational choice will be addressed in section 7.

The relationship between marginal tax rates and the before tax income

The literature on tax base determination, initiated by Lindsay (1987) and further developed by Feldstein (1995), offers an interesting complement to the traditional study of labor supply, since it allows us to address several aspects of behavior simultaneously. As we indicated above, although the framework for studying tax base determination typically resembles the traditional labor supply framework, it does not restrict the attention solely on the hours of work. Depending on the definition of income, it may also (at least in principle) capture avoidance as well as the effects of tax policy on the gross wage rate, effort and savings. To illustrate the basic idea, let us briefly discuss the analytical framework used by Gruber and Saez (2002), which bears some resemblance with the reference (labor supply)

model discussed above. Let the budget constraint (linearized at the optimum) be given by $a(1-\tau)+y_v-c=0$, where a denotes the before tax income, τ the marginal tax rate, c consumption and y_v the virtual income. Utility maximization subject to the budget constraint gives rise to an income supply function, which can be written as (using the linearized budget constraint)

$$a = a((1-\tau), y_v; z) \tag{6}$$

where z is a vector of characteristics. The change in the before tax income, following a small change in the tax system, can be recovered by using the relationship

$$da = -\frac{\partial a}{\partial(1-\tau)}d\tau + \frac{\partial a}{\partial y_v}dy_v \tag{7}$$

By analogy to the traditional labor supply model, a change in the marginal tax rate is decomposable into a substitution effect and an income effect. Following Gruber and Saez, by using the short notations

$$\kappa_1 = \frac{\partial a}{\partial(1-\tau)}\frac{(1-\tau)}{a} \text{ and } \kappa_2 = \frac{\partial a}{\partial y_v}(1-\tau),$$

together with the Slutsky type equation $\kappa_1^c = \kappa_1 - \kappa_2$, we can rewrite equation (7) as follows;

$$da = -\kappa_1^c a\frac{d\tau}{(1-\tau)} + \kappa_2\frac{dy_v - ad\tau}{(1-\tau)} \tag{8}$$

By choosing functional form for equation (6) – or, equivalently, equations (7) or (8) - while at the same time adding a stochastic part to this function, the behavioral effects represented by κ_1, κ_2 and κ_1^c are (at least in principle) estimable by means of econometric methods.

There is an empirical literature dealing with the relationship between income and marginal tax rates, where the results seem to differ considerably across studies. Part of the differences in results is likely to be due to differences regarding the way in which income is measured, e.g. whether the analysis refers to taxable income or a broader income concept. Let us here concentrate on the results of Gruber and Saez and then make comparisons as we go along. Their study is based on data for the period 1979 to 1990 covering several tax reforms as well as covering tax changes for a broad set of income groups. The long time period also makes it possible to control for the influence of how lagged income affects changes in the subsequent income; information of importance for identifying the relationship between the tax system and the before tax income. The analysis carried out in the paper refers to two income concepts; taxable income and broad income, where the latter is defined as the sum of all items that compose total income less capital gains[14]. A basic hypothesis is that the taxable income is more sensitive to marginal taxation than broad income, since changes in taxable income (in addition to the effects via the hours of work, wage formation, effort, occupational choice, savings, etc.) also reflect (additional aspects of) tax avoidance.

Indeed, this is precisely what Gruber and Saez find. First, the elasticity of taxable income with respect to the net of tax rate, $(1-\tau)$, is estimated to be around 0.4 on average, suggesting a considerable behavioral response. This number is an average estimate in comparison with earlier literature[15]. The corresponding elasticity for broad income is 0.07. Second, the income effects are very small, implying that the uncompensated and compensated effects on income of a change in the net of tax rate are similar. Third, a large part of the effect on the taxable income of a change in the net of tax rate is due to behavioral responses in the upper part of the income distribution. The latter has important implications for the optimal tax structure. By using the estimation results for purposes of simulations, Gruber and Saez argue that, if the government has distributional objectives,

[14] Broad income contains wages, salaries and tips, interest income, dividends, alimony received, business income, total IRA distributions, total pensions and annuities, income reported on schedule E, farm income, unemployment income and other income.

[15] Studies concentrating on the upper part of the income distribution typically estimate a higher number. On the other hand, some of the earlier studies that do not refer to the U.S. seem to imply a much weaker relationship between marginal tax rates on taxable income. For instance, Aarbu and Thoresen (2001) estimate the relevant elasticity to be between –0.6 and 0.2 using data for the Norwegian tax reform in 1992, whereas Sillamaa and Veall (2001) estimate the corresponding elasticity for Canada to be around 0.25 using data from the tax reform of 1988.

then the optimal tax structure is likely to contain a large lump-sum demogrant, which is rapidly taxed away as income increases. This may imply increasing effective marginal tax rates among low-income groups, while the tax schedule is more flat (or even regressive) among the middle- and high-income groups. We will return to issues relating to the optimal tax structure below.

There are several (yet unpublished) studies based on Swedish data dealing with the influence of marginal tax rates on the before tax income. Let us start by briefly discussing a paper by Ljunge and Ragan (2004). Instead of considering taxable income and broad income, respectively, as in the paper by Gruber and Saez, they focus their attention on the determinants of labor earnings. Although this choice of dependent variable means neglecting some of the possible effects of taxation due to tax avoidance, it will, nevertheless, reflect the joint effect of taxation on several interesting aspects of behavior. As such, we may expect the behavioral responses to be different from those presented for work hours. Ljunge and Ragan use the panel data set LINDA, and focus on individuals aged 25-55 during 1989. Their study period is 1989-1994, meaning that attention is paid to the 1991 tax reform in terms of its effect on labor earnings. The result imply that the compensated elasticity of earnings with respect to the net of tax rate is around 0.35, which is a relatively large response (recall that the corresponding elasticity for taxable income in the U.S. is measured to be around 0.4 by Gruber and Saez). The uncompensated elasticity of labor earnings with respect to the net of tax rate is estimated to be in the interval 0.25-0.33. In addition, there is considerable variation across groups. For instance, single men and women have higher estimated (compensated) elasticities than married men and women, whereas both low income earners and high income earners have higher estimated elasticities than income earners in the middle of the distribution. On average, the estimated behavioral response to the 1991 tax reform is an increase in earnings by 10-15 percent.

Given that the labor earnings appear to be very responsive to changes in the marginal tax rates, one would be inclined to guess that the relationship between marginal tax rates and taxable income is even stronger, since this relationship also reflects a broader spectrum of possibilities with respect to tax avoidance. Using the panel data set LINDA or the years 1989 and 1992, while focusing on the age group 25-60 in 1989, Hansson (2004) estimate the elasticity of taxable labor income with respect to the net of tax rate to be around 0.4, while at the same time recognizing that the 1991 tax reform in Sweden implied changes in

the definition of taxable income (separate taxation of capital income). She also finds that the relevant elasticity may differ considerably across groups (with women being much more responsive than men). However, since she does not incorporate a measure of virtual income in her model, it is not clear whether the relevant elasticity estimate should be interpreted as a compensated or an uncompensated effect. The results appear to be somewhat sensitive to the use of estimation method (the choice of instrument for the marginal tax rate). Selen (2004) estimates a model similar to that of Gruber and Saez using the household income survey (HINK), where the data refers to the period 1989-1992. He concentrates the analysis to the age group 25-55 in 1989. His results imply a slightly lower estimate of the (compensated) elasticity of the taxable income with respect to the net of tax rate; in the interval 0.2-0.4. In a way similar to Gruber and Saez, he also considers different measures of income, and the results imply that the taxable income is generally more responsive to changes in the marginal tax rates than, for instance, earned income.

Although we believe that the study of how marginal tax rates affect the before tax income is interesting in the sense of providing a broader view of tax responses than the traditional study of labor supply, it is important to be careful when interpreting these results. This is so for at least two reasons. First, this research area is relatively new by comparison; in fact, the Swedish studies referred to above are working papers from 2002-2004. To be useful for purposes of policy evaluations and recommendations, these studies should be supplemented by additional research. Second, and more importantly, the theoretical foundations for the study of before tax income is not always convincing; the income supply model by Gruber and Saez is only one possible model, and it resembles the labor supply model 'too much' to provide a very interesting alternative. For instance, the income supply model is, itself, silent about important issues such as wage formation as well as about the opportunities and constraints underlying avoidance behavior. As a consequence, we may not learn so much about the mechanisms underlying behavior just by studying the relationships discussed here. It is, therefore, important to go into additional detail about the components of the tax base. We shall do just that below by briefly discussing wage formation and savings, respectively.

Wage formation and taxation

The influence of taxation, and in particular tax progression, on pre-tax wage rates may, to a large extent, depend on the wage formation system. If the labor market is competitive, we may expect higher tax progression to increase the pre-tax wage rate via a reduction in the labor supply. As such, this tends to offset part of the negative effect that higher tax progression would otherwise have had on the employment. If, on the other hand, the pre-tax wage rates are determined by bargaining between unions and firms, which is common in the European labor markets, this result may no longer apply. On the contrary, we shall argue below that standard models for union wage setting, as well as the empirical evidence associated with them, tend to predict exactly the opposite. We shall also argue that the study of wage formation provides a natural complement to the literature on labor supply, since the study of wage formation provides an alternative link between the tax system and labor income.

The literature dealing with the effects of the tax system on wage bargaining in unionized economies dates back to, at least, the 1980s, and one of the most important propositions is that changes in the marginal and average tax rates may have qualitatively different effects on the bargained wage rate[16]. To be more specific, an increase in the marginal tax rate, with the average tax rate held constant, is predicted to decrease the pre-tax wage rate decided upon via bargaining. Therefore, higher tax progression may also increase the employment, which is assumed to be determined by the labor demand. A change in the average tax rate, with the marginal tax rate held constant, may either increase or decrease the pre-tax wage rate. In the typical model used to analyze wage formation and taxation, the union is assumed to have preferences for employment among its members and the post-tax income per employed union member; since the employment is determined by the labor demand, this means that the bargained wage rate reflects a tradeoff between employment and post-tax income per employee. An increase in the degree of tax progression, measured by the marginal over the average tax rate, then implies that a given increase in the post-tax income per employee becomes more costly in terms of lost employment. The union, therefore, responds by opting for a lower pre-tax wage rate.

In their seminal paper, Lockwood and Manning (1993) present empirical results based on British time series data, which support the theoretical prediction regarding the relationship

[16] See e.g. Hersoug (1984).

between tax progression and the pre-tax wage rate. The analysis by Lockwood and Manning is based on a model, where the profit function and union preferences are given iso-elastic functional forms, implying that the (logarithm of the) wage rate can be written as a function of, among other things, the (logarithm of the) degree of tax progression. Following e.g. Musgrave and Musgrave (1984), the degree of tax progression is measured by $v = (1-\tau_m)/(1-\tau_a)$, where the subindices "*m*" and "*a*" refer to the marginal and average tax rate, respectively. Empirical results similar to those of Lockwood and Manning have also been found for several other countries with unionized labor markets. Let us here consider studies based on Swedish data. Holmlund and Kolm (1995) use data from the Swedish income distribution surveys, HINK, which include time series data for different income groups as well as micro level panel data. The time series data refer to the time period 1975-1992 and the panel data to the period 1989-1992. The form of the estimated models resembles that of Lockwood and Manning. In the panel data regressions, the elasticity of the pre-tax wage rate with respect to the marginal tax rate, with the average tax rate held constant, is estimated to be –0.6 for the average worker, whereas the corresponding estimate for the time series regressions is around –0.25. There is also evidence suggesting that this effect is stronger among the highest income earners. Aronsson et al. (1997) estimate a union wage model based on panel data at the firm level for the Swedish pulp and paper industry during the period 1972-1990. Their study recognizes, and incorporates into the analysis, the whole nonlinear choice set, meaning that the econometric method resembles that used in the labor supply literature. The elasticity of the pre-tax wage rate with respect to the marginal tax rate, with the average tax rate held constant, is estimated to be -0.5 on average. The corresponding elasticity with respect to the average tax rate, with the marginal tax rate held constant, is estimated to be 0.5.

It is interesting to compare these results with those discussed earlier on the determinants of the hours of work and earnings. The results regarding the influence of tax progression on pre-tax wages may, at least to some extent, explain why labor earnings appear to be more sensitive to taxation than the hours of work. The decrease in tax progression associated with the 1991 tax reform may only have slightly increased the hours of work conditional on the pre-tax wage rate. However, according to the results presented above, lower tax progression would also be expected to increase the pre-tax wage rate, which tends to

increase labor earnings both directly and indirectly via the labor supply function (provided that employed individuals behave in accordance with their labor supplies).

Savings

There is a large literature dealing with intertemporal aspects of consumer behavior. Part of this research attempts to analyze whether consumption is (mainly) determined by permanent resources, or whether transitory elements of income also have important effects on the consumption (which might be the case if consumers are subject to credit market constraints)[17]. Another important aspect is uncertainty with its implications for savings behavior. Since the main part of earlier work focuses on other aspects of savings behavior than policy induced incentives, which is the main issue here, we will not go into formal theories of savings behavior here. Our idea is, instead, to try to relate the study of savings to the discussion how taxation affects the tax base; so the question is how the tax system affects the size and composition of savings in Sweden.

It is easy to imagine that the tax system may have had some influences on the savings behavior in Sweden. In her review of household savings and wealth formation in Sweden during 1975-1996, Pålsson (1998) argues that household savings most likely increased following the 1991 tax reform and that the share of financial wealth increased relative to other forms of wealth. Indeed, before the reform, we had a system of joint taxation of labor income and capital income, and capital losses (e.g. interest payments on debt) were deductible from the (taxable) labor income. Such a system provides strong incentives to borrow (e.g. for housing) and weaker incentives to save in financial wealth. In addition, as mentioned above, there is some empirical evidence suggesting that the 1991 tax reform may have had some influence on the composition of assets.

However, to our knowledge, very few earlier studies relate savings behavior in Sweden to public policy. A notable exception is Koskela and Viren (1994), who analyze the determinants of the aggregate savings rates in the Nordic countries and also compare the Nordic countries with the rest of the OECD. In their study, which is based on data from 1972 to 1991, one of the (possible) explanatory variables is the income tax rate. Their

[17] See e.g. Miles (1997) and the references therein.

approach is to estimate the savings rate as a function of, among other things, the income growth rate, the ratio of social insurance expenditures to GDP, the unemployment rate, information about the age structure of the population, the real interest rate (or the nominal interest rate and the inflation rate as separate arguments) and the average marginal income tax rate. They also include the lagged savings rate in order to incorporate dynamics in a simple way. The results are mixed in the sense of giving no clear picture of how taxation affects the savings behavior. By using data for all countries, the results suggest a negative effect on the savings rate due to an increase in the tax rate. However, when the analysis is based on time-series data for each Nordic country (Denmark, Finland, Norway and Sweden), there is only weak (or no) evidence of tax induced effects on the savings rate. One possible interpretation of the results is, of course, that we need some cross-sectional variation to be able to identify the effects of taxation. Another is that the changes in taxation during the study period caused no (major) changes in the savings rate.

7. Cross-country comparisons

Most earlier studies on work hours and, in particular, how the hours of work respond to taxation, transfer payments and social insurance are based on within-country micro data. More recently, however, several studies[18] have emerged with the explicit purpose of explaining cross-country differences with a focus on differences between Europe and the U.S. These differences have increased in general since the early 1970s and are now substantial: Americans tend to work much more than Europeans do. An important question is whether the differences in work hours between Europe and the U.S. can be explained by differences in taxation and transfer programs, or whether they are (mainly) attributable to other factors such as labor market institutions and legislation.

Differences between Europe and the U.S. with respect to work hours per person have been analyzed by e.g. Prescott (2004) and Olovsson (2004) in the context of numerical general equilibrium models. From our perspective, the study by Olovsson is particularly interesting, as it deals explicitly with a comparison between Sweden and the U.S. He uses an intertemporal model of a competitive economy, where preference and production parameters are set to reflect results in the empirical literature (to the extent that this is

[18] See e.g. Davis and Henrekson (2004), Prescott (2004), Olovsson (2004) and Alesina et al. (2005).

possible), whereas the policy parameters are chosen either to reflect Sweden or the U.S. This enables him to compare how differences in public policy between the two countries affect the hours of work per person that the model predicts. By assuming, to begin with, that the resource allocations can be described as steady states, Olovsson shows that differences in public policies between the two countries can explain the differences with regards to work hours. It appears as if the distortions generated by the labor income tax are particularly important here. His model also predicts a gradual reduction in the hours of work in Sweden between 1960 and 1980, the direction of which is consistent with the observed behavior, although it overestimates the hours of work per person during this period (implying that the predicted reduction is much greater than the reduction of work hours that actually took place).

Are these results reasonable? Arguably, by just looking at the estimates of the wage and income elasticity discussed in section 4, differences in tax and transfer programs are not likely to be the only explanations behind differences in work hours: at least not for males. The corresponding estimates for females, on the other hand, cover a much broader range, suggesting that we cannot rule out the tax-related explanation (at least not as easy as we can for men); let be that the observed differences with regards to work hours between Sweden and the U.S. are not attributable only to women. Alesina et al. (2005) use panel data for the OECD countries in order to estimate how the hours of work (at the country level) depends on differences in the average marginal tax rate. This is accomplished by regressing the hours of work per person (measured among individuals aged 15-64) on the average marginal tax rate, while at the same time controlling for country specific fixed-effects and period-specific effects. Their estimation period is 1960-1995. In this baseline estimation, the results imply a negative and significant relationship between the marginal tax rate and the hours of work per person, which is consistent with the result presented above. However, by adding a measure of union density (the fraction of the labor force that are union members) and a measure of employment protection, this significant result disappears; instead, both the union density and the employment protection variable show negative and significant relationships with the hours of work. Therefore, it seems as if unionization and regulations better explain differences between Europe and the U.S. than does the tax system. At the same time, since the marginal tax rate is correlated with the other variables, it might be difficult to discriminate between the explanations.

There are several reasons why unions may contribute to reduce the hours of work per person. First, unions are typically assumed to bargain for a wage rate that exceeds the market clearing wage rate which, in turn, gives rise to unemployment (although a higher wage rate may increase the hours of work per employee, if the decision regarding work hours is made by the employed individual himself/herself). Second, and perhaps more important, if the unions are able to directly affect the hours of work (instead of only indirectly via wage formation), then we must also recognize that the unions may prefer fewer work hours per employee than the employed individuals themselves. To see this more clearly, consider a utilitarian union, whose objective function is written as (using the same notations as in section 4)

$$U = N(w,h)u(wh - T(wh), h; z) + [M - N(w,h)]u(b,0; z) \tag{9}$$

where M is the number of union members, N the number of employed members and b the unemployment benefit (which for simplicity is assumed to be fixed). We assume that $N_h = \partial N / \partial h < 0$, implying some degree of substitutability between employment and the hours of work per employee, h. The desired hours of work per employee, from the perspective of the union, are defined by the first order condition

$$N_h[u^e - u^u] + N[u_c^e w(1 - T') + u_h^e] = 0 \tag{10}$$

where $u^e = u(wh - T(wh), h; z)$ and $u^u = u(b,0; z)$ represent the utility of the employed and unemployed members, respectively, while (as before) subscripts denote partial derivatives. Since $N_h < 0$ by assumption, and if the utility of being employed exceeds the utility associated with unemployment, so $u^e - u^u > 0$, it follows that the second term on the right hand side is positive; $u_c^e w(1 - T') + u_h^e > 0$, indicating that each employed individual would prefer to work more hours at the given wage rate.

The idea that unions are able to directly affect work hours becomes more plausible, the stronger the trade unions. Unions may engage in pressure group activities; the expected return from doing so may also be greater in the context of the political systems

characterizing some of the major European countries than in the U.S. As such, unions may have had greater opportunity to affect market outcomes as well as legislation in Europe.

We do not want to draw strong conclusions from these results. This is so for several reasons. First, although union wage setting and measures of regulations may correlate with the hours of work per person at the country level, so does the marginal tax rate according to the results presented by Alesina et al. (2005). Therefore, it may very well be the case that both the tax system and the labor market institutions contribute to explain the differences with regards to work hours, and we are not yet able to establish which aspect is most important. Second, despite that earlier empirical research on labor supply typically finds small behavioral responses to changes in the marginal wage rate and the virtual nonlabor income, these mechanisms might not be the only channels through which public policies affect the hours of work. One such additional channel was briefly touched upon in section 5; namely social norms. In addition, general equilibrium effects associated with changes in taxation may imply sizable behavioral responses, although some of them are difficult to establish in the context of empirical research based on micro data. Future research might be able to shed more light on cross-country differences in the hours of work and, in particular, on the extent to which these differences are attributable to the tax system or labor market institutions.

8. Welfare and tax progression

The labor income tax reforms carried out in Sweden and other countries in the 1980s and 1990s typically meant lower tax progression. Part of the ideas behind these reforms was the logic of supply side economics; lower tax progression was expected to increase the employment via labor supply responses (and possibly also increase savings) as well as reduce the social costs of taxation. Although the labor supply elasticities with respect to the marginal wage rate and the virtual nonlabor income are typically found to be small for men, large tax reforms may, nevertheless, have sizable effects both on the labor supply behavior and the excess burden. This is, in turn, further strengthened by the responsiveness of women's labor supply to economic incentives. We discussed these issues at some length in Aronsson and Walker (1997), where we also showed that calculations based on the standard labor supply model implied considerable reductions of the excess burden following the Swedish tax reform in the early 1990s. Later, these ideas have gained new

support from the literature dealing with the determinants of the before tax income, showing that the taxable income is more sensitive to marginal tax rates than what the hours of work appear to be. As a consequence, estimates of the welfare costs of taxation are likely to be even greater in these models than in the standard model for work hours.

If we disregard traditional arguments for using distortionary taxation, such as the desire to carry out redistributive policy under asymmetric information (i.e. if we disregard the idea that ability is private information), we normally find that distortionary taxes are costly (not beneficial) from the point of view of economic efficiency. In fact, if the government were able to observe differences in ability, then it would also be able to redistribute and finance public consumption by using ability-type specific lump-sum taxes, implying that there would be no reason to distort economic behavior at the margin. Therefore, it is not surprising to find that lower tax progression is welfare improving.

However, once we relax the assumption of perfect competition, then the argument for using distortionary taxation will change. Although many types of imperfections may serve to illustrate this point, it is particularly interesting to return to the discussion of wage formation in a unionized labor market. As we argued above, in unionized labor markets, an increase in the degree of tax progression decreases the before tax wage rate which, in turn, tends to decrease the unemployment. This mechanism is recognized in the literature dealing with optimal labor income taxation in economies with imperfect competition in the labor market[19]. In general, imperfect competition in the labor market does not, itself, imply positive marginal labor income tax rates or a progressive tax structure at the second best optimum. Instead, a number of channels, such as the form of the objective function of trade unions and the set of tax instruments available, are typically significant for the final outcome. However, if unemployment prevails at the equilibrium (i.e. the government is not able to implement the first best), then the tax structure will be progressive under certain conditions. The reason is, of course, the mechanism described above in combination with social preferences for higher employment. To gain further knowledge, it is important to quantify the determinants of the tax structure. This has been done by means of numerical analysis by Sörensen (1999), who calibrates his model in order to mimic certain aspects of the Danish economy as well as compares union wage setting with other wage formation

[19] See e.g. Fuest and Huber (1997) and Aronsson and Sjögren (2004a, 2004b).

systems. His results are consistent with the basic intuition; namely that imperfect competition in the labor market tends to imply that the optimal tax structure is progressive. In addition, his numerical examples show that the degree of tax progression may be nonnegligible.

Although the study of optimal tax progression under imperfect competition in the labor market may not yet admit a strong conclusion – there are still too few studies available (and far too few attempts to quantify the effects) - it has, nevertheless, a straight forward address to the standard labor supply model. To the extent that the study of union wage formation captures important characteristics of the labor market, there are reasons to believe that the standard labor supply model and the (newer) income supply model may exaggerate the social costs associated with tax progression. Future research may shed light on the magnitude of this effect.

9. Summary and discussion

To be written.

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