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TAXATION AND MARKET WORK: IS SCANDINAVIA AN OUTLIER?

Richard Rogerson

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ABSTRACT

This paper argues that it is essential to explicitly consider how the government spends tax revenues when assessing the effects of tax rates on aggregate hours of market work. Different forms of government spending imply different elasticities of hours of work with regard to tax rates. I illustrate the empirical importance of this point by addressing the issue of hours worked and tax rates in three sets of economies: the US, Continental Europe and Scandinavia. While tax rates are highest in Scandinavia, hours worked in Scandinavia are significantly higher than they are in Continental Europe. I argue that differences in the form of government spending can potentially account for this pattern.

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1. Introduction

A large literature seeks to account for the different evolution of aggregate labor market outcomes between Europe and the US over the last thirty years. Prescott (2002, 2004) and Rogerson (2005) demonstrate that changes in taxes can account for a substantial part of the differences in changes of hours worked between the US and the economies of Continental Europe over this period.[1] While their calculations lend credence to the argument that tax rates are a prime cause of Europe's distinctive labor market outcomes vis-a-vis the US, one source of skepticism is that the tax explanation does not look so promising when one expands the set of countries beyond this group. In particular, the Scandinavian countries have tax rates at least as high as those found in Continental Europe, yet have much higher hours of work. If one focused exclusively on the economies of Scandinavia and Continental Europe, one would presumably be lead to the conclusion that tax rates themselves are not likely to be particularly important in accounting for differences in hours of work.

This paper argues that the evidence on tax rates and hours of work in Continental Europe and Scandinavia should not be interpreted as negative evidence on the mechanisms emphasized by Prescott (2002, 2004) and Rogerson (2005). The argument is a very simple one: the elasticity of hours worked with regard to tax rates is very much dependent on how tax revenues are spent, and the distinctive features of Scandinavian government spending programs can account for much of the apparently different effects of taxes in Scandinavia. I illustrate this point in two different contexts. The first context assumes a standard aggregate framework similar to that used by Prescott (2004) in which there is a representative household and a single consumption good. Prescott assumed that all revenues returned to households took the form of a lump-sum transfer. I show that it matters whether tax proceeds are returned to households as a lump sum transfer versus a manner in which the size of the transfer is affected by the amount of labor supplied, or spent in ways that do not influence the consumers marginal utility of consumption. For example, it matters whether higher taxes fund disability payments which may only be received when an individual does not work, subsidies for day care for working mothers, or unnecessary jobs in the public sector. I show that holding tax rates constant, these compositional changes can have significant quantitative effects.

The second context is motivated by the observation that differences in employment across the US, Scandinavia and Continental Europe in the recent cross-section are almost completely accounted for by differences in employment in the service sector. The second model also assumes a representative household but assumes that there are two different goods, one that will be interpreted as a general consumption good, and the other that will be interpreted as family services, consisting of child care and family services. What matters in general is that this second good has a high spending elasticity with respect

[1] In a different context, Daveri and Tabellini (2000) also emphasize the role of taxes in understanding European labor market developments.

to taxes because it has good nonmarket substitutes. In this model I show that even if the government uses taxes to fund lump-sum transfers, it matters a lot which good the government transfers if individuals must consume the transfer. Intuitively, high taxes cause particularly large decreases in market hours in those activities which have good nonmarket substitutes. But if the government uses tax revenues to fund transfers of these same goods, then it directly offsets some of the largest negative effects of higher taxes on hours of market work. In models with a single good this channel obviously does not exist.

These findings can help us understand the differing outcomes in Scandinavia and Continental Europe. Specifically, I emphasize two key differences in how revenues are spent in the two regions. The first is the much higher rate of government employment in Scandinavia relative to either Continental Europe or the US. If government employment serves as an implicit transfer program in which an individuals receive payments but does not produce something that individuals value, then this will serve to decrease the negative effects of taxes on hours of work. The second is that a much larger share of government spending is devoted to family services such as child care and elderly care. As just discussed, this will also increase hours of work in Scandinavia relative to Continental Europe. The higher employment rate in services found in Scandinavia relative to Continental Europe is also consistent with this economic logic precisely because of the fact that the government provides a transfer of market services to households, thereby increasing the volume of activity in the market service sector.

An outline of the paper follows. In the next section I document the different evolutions of labor market outcomes in three different sets of economies: the US, four economies from Continental Europe (Belgium, France, Germany and Italy), and four Scandinavian economies (Denmark, Finland, Norway and Sweden). Section 3 presents a benchmark one-sector model of labor supply and taxes, and argues that such a model has difficulty in accounting for the differing outcomes across the three sets of economies. Sections 4 and 5 develop the two extensions described earlier and carry out some illustrative quantitative calculations. Section 4 extends the one sector model to consider a wider array of government spending programs and assesses the quantitative effects of variation in spending programs. Section 5 extends the analysis to a multi-sector model and assesses the role of variations in the allocation of government transfer payments across the different goods. The quantitative analysis suggests that the distinctive features of Scandinavian government spending can account for much of the differences found in the data. Section 6 concludes.

This paper is related to several others in the literature. As already noted, it complements the analyses of Prescott (2004) and Rogerson (2005) by trying to reconcile taxes as the dominant driving force behind differences in hours worked with the observations for Scandinavia. It complements the work of Rosen (1996), who emphasized the distinct nature of Scandinavian government spending, by embedding it into a general equilibrium analysis and assessing its quantitative implications for hours worked. It

is also closely related to two recent papers by Olovsson (2004) and Ragan (2005) on hours worked in Scandinavia. Similar to the approach here, Olovsson stresses differences in government spending and the importance of home production. But differently than the analysis here, he does not explicitly model Scandinavian social policies, nor compare Scandinavia with Continental Europe. The work of Ragan is the closest to the work carried out here. Her analysis, developed independently from that here, differs with regard to various details, but is very similar in spirit to the material in Section 5 of this paper. In particular, she also explicitly considers Scandinavian social policies and contrasts outcomes in Scandinavia with those in both the US and other European countries.

2. Evolution of Hours Worked

This section contrasts the evolution of hours worked across three groups of countries: the US, Continental Europe (Belgium, France, Germany, and Italy), and Scandinavia (Denmark, Finland, Norway and Sweden). In each case I compute the simple average across the countries within each group. The data used in this analysis are annual and come from two databases: the OECD and the GGDC (Groningen Growth and Development Center). My measure of hours worked is total hours of market work divided by the size of the population aged 15-64. Total hours worked is constructed as the product of civilian employment with a series for annual hours of work per person in employment. The series for employment and population aged 15-64 come from the OECD database, and the series for annual hours worked per person in employment comes from the GGDC.[2] I construct this series for each country from 1956-2003. In addition to presenting aggregate data, I will also present information at the sectoral level. Sectoral employment data covers 1960-2000 and is from the OECD data base. Because the emphasis of the analysis is on longer term trends, in what follows I focus on the trend components of the series, which are extracted using the HP filter with a smoothing parameter of 100.

2.1. Evolution at the Aggregate Level

In this subsection I contrast the evolution of aggregates across the three sets of countries. Figure 2.1 shows the evolution of aggregate hours per person of working age.

This figure shows that as of 1956, hours worked are roughly equal in Continental Europe and Scandinavia and lowest in the US. Over time, hours decrease at a fairly steady rate in both Continental Europe and Scandinavia, leveling off later in the period, but the decrease is more pronounced in Continental Europe. In contrast, the hours of

[2] For three of the Scandinavian countries (Denmark, Finland and Sweden) the OECD employment series is missing some values during the first six years, and I have used values from the GGDC series to fill in the missing data. The GGDC employment series has values for 1950 and 1960, so the missing values were filled in by linear interpolation.

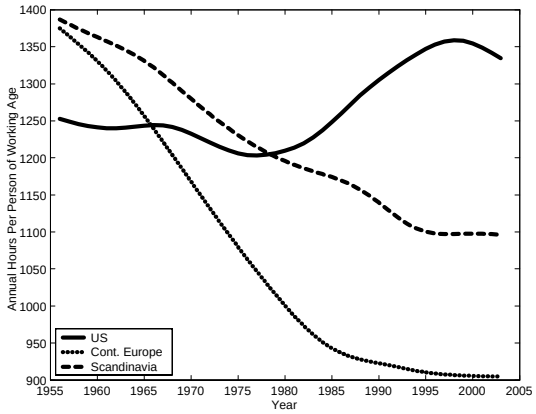

Figure 2.1: Aggregate Hours Worked

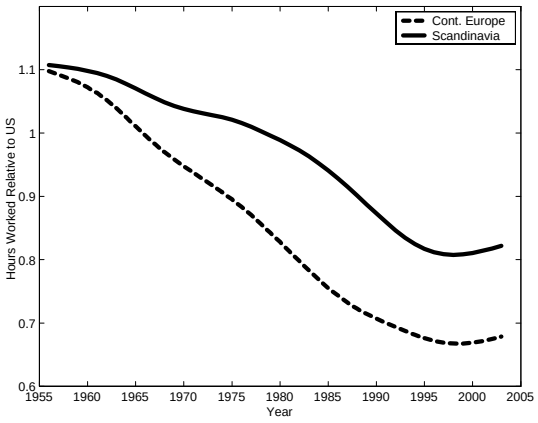

Figure 2.2: Hours Worked Relative to the US

work in the US are relatively flat for the first part of the period, but then increase between 1980 and 2000. To better illustrate the changes in relative hours worked across the three sets of countries it is useful to look at hours worked relative to the US, which is shown in Figure 2.2.

This figure shows that in both cases the decline in relative hours worked continues at a steady rate through to the mid 1990s, at which point they level off. In 1956, hours worked are roughly 10% higher in each region compared to the US, while in 2003 hours worked in Scandinavia and Continental Europe are only about 80% and 70% of the US level.

Although the analysis later in the paper will not consider the separate margins of employment and hours per employee, it is of interest to note the patterns in the two. Figures 2.3 and 2.4 show the evolution of each margin separately in the three regions.

The interesting feature to note in these pictures is that as of 2003, Continental

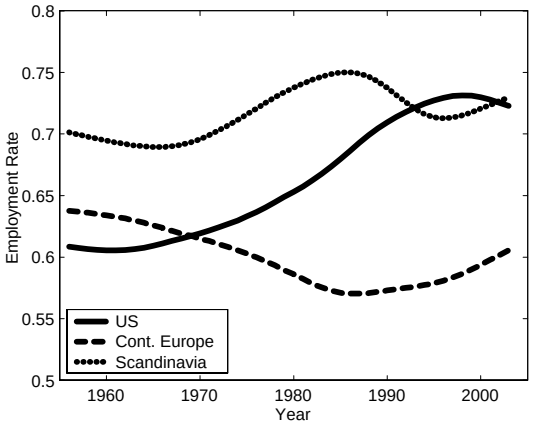

Figure 2.3: Employment to Population Ratios

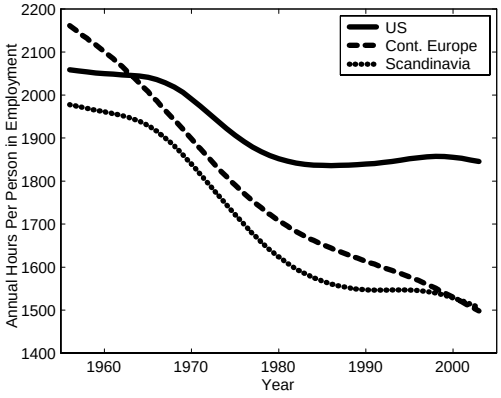

Figure 2.4: Annual Hours Worked Per Person in Employment

Europe has a significantly lower level on both margins than the US, whereas Scandinavia looks like the US in terms of employment to population, and like Continental Europe in terms of annual hours of work per person in employment. Note also that annual hours of work per person in employment decreases in all three regions, whereas the employment to population ratio increases significantly in the US, modestly in Scandinavia and decreases modestly in Continental Europe.

2.2. Evolution at the Sectoral Level

Rogerson (2004, 2005) shows that the decline in employment in Continental Europe relative to the US exhibits a marked pattern at the sectoral level. Specifically, as of 2000, virtually the entire gap in employment rates between Continental Europe and the US is accounted for by differences in the employment rates in services. In view of this, we next consider the evolution of employment at the sectoral level for the three sets of economies. We focus on the evolution of sectoral employment rates, defined as the ratio of sectoral employment to the population aged 15-64, rather than sectoral hours, since complete series on hours per worker are not available at the sectoral level. The OECD data provides a breakdown into agriculture, industry and services for the period 1960-2000.

Rogerson (2004, 2005) notes that one must be careful when comparing sectoral employment rates across economies to take into account the structural transformation that accompanies the process of development. Specifically, as noted by Kuznets (1967), poor economies devote most of their resources to producing agricultural products. As they develop they first move resources out of agriculture and into both industry and services. Later, they enter a phase in which resources are moved out of both agriculture and industry and into services. It follows that if countries are at different stages of development then one should expect the sectoral distribution of employment to also differ. In the current context this is important because in 1960, both Scandinavia and Continental Europe lag the US in the development process, but by 2000 they have largely caught up, as measured by output per hour.

The next three figures show that all three sets of economies do indeed experience the process of structural transformation as described by Kuznets. For expositional ease, these figures aggregate the agriculture and industry sectors.

In all three cases we see that the employment rate in agriculture plus industry declines over time while the employment rate in services increases. However, while this same qualitative feature is found in the evolutions for all three sets of economies, there are some interesting differences as well. One can see these more clearly if one compares the European evolutions to the US evolutions, so the next two figures show the sectoral employment rates for both European regions relative to the values in the US.

We see that as of 1960, both European regions have higher employment rates in agriculture plus industry and lower employment rates in services. Given that in 1960 both

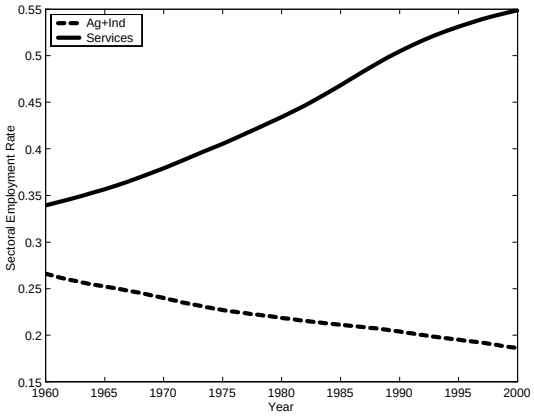

Figure 2.5: US Structural Transformation

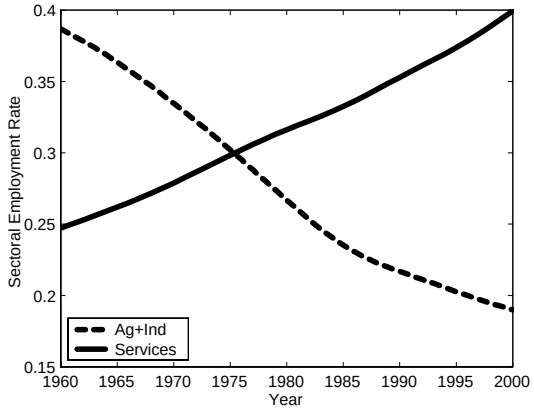

Figure 2.6: Continental Europe Structural Transformation

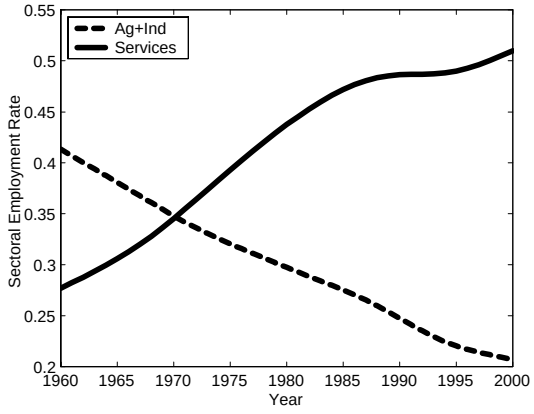

Figure 2.7: Scandinavia Structural Transformation

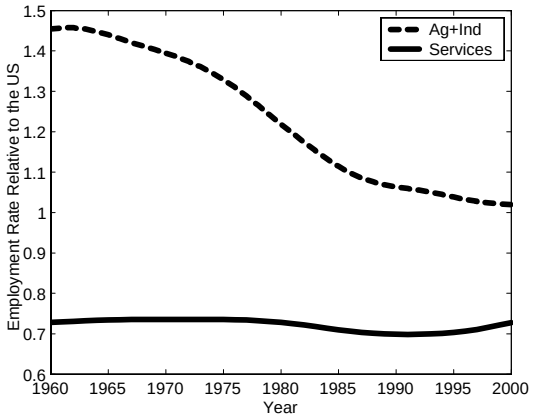

Figure 2.8: Continental Europe Structural Transformation Relative to the US

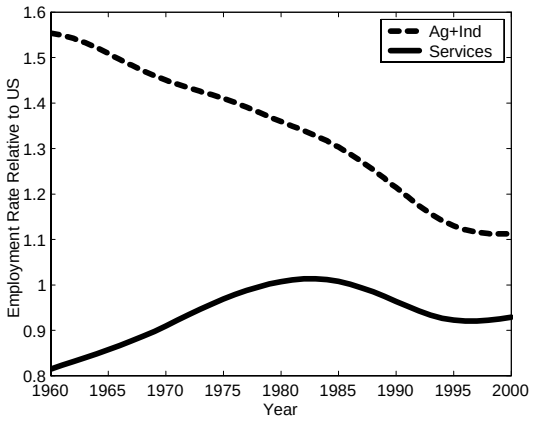

Figure 2.9: Scandinavia Structural Transformation Relative to the US

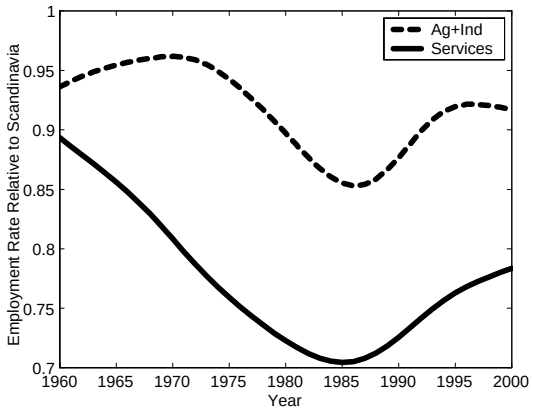

Figure 2.10: Relative Sectoral Employment Rates in Europe

of these regions lag the US in the development process, this pattern is not surprising. However, since both regions largely close the gap with the US in terms of productivity over the next forty years, holding all else constant we would expect that the distribution of employment across sectors would approach the distribution found in the US. When we look at the evolution of the relative employment rates in agriculture and industry combined, we see evidence of convergence to the US level in both cases. In continental Europe the employment rate in these sectors drops from 1.45 of the US value in 1960, to almost 1 in 2000. For Scandinavia the ratio falls from around 1.55 to 1.1. In services we see a different pattern. While in Scandinavia the ratio goes from .82 to .93 (after reaching 1 in the early 1980s), the relative employment rate in services in Continental Europe is basically flat at .73.

It is also revealing to compare the sectoral employment rates between the two European regions. This is done is Figure 2.10, where we plot the values in Continental Europe relative to Scandinavia.

The fact that the 1980s are a strong decade for employment growth in Scandinavia creates some "cyclical" movements during this period, but the trend behavior depicted in the figure is that the relative employment rates in agriculture and industry combined are roughly constant, whereas in services there is a substantial decline in Continental Europe relative to Scandinavia.

2.3. Summary

The key patterns depicted above can be summarized as follows. First, in both European regions, aggregate hours of work exceed the US level by about 10% in 1956, and fall relative to the US at a fairly steady pace until the mid 1990s. Second, the decline in Continental Europe exceeds the decline in Scandinavia–as of 2003 hours of work in Scandinavia relative to the US are about .82, while for Continental Europe the value

is .68. Third, while the evolution of sectoral employment rates in the three economies exhibit similar qualitative patterns, a major anomaly is the service employment rate in Continental Europe relative to the other two sets of economies. The gap in hours worked between Scandinavia and Continental Europe in 2000 is almost entirely accounted for by the lower employment level in services in Continental Europe.

3. Taxes and Hours Worked–A Benchmark One Sector Analysis

This section uses a standard one-sector representative agent framework to assess the implications of a benchmark case of government tax and spending policies on hours of work. Although the model below can be cast as the steady state analysis in a representative agent version of the standard growth model, for expositional purposes I will abstract from capital accumulation and therefore focus on a static version of the model.[3]

3.1. Model

There is a representative household with preferences defined over consumption (c) and leisure ($1-h$) given by $u(c, 1-h)$. The function u is assumed to have the standard properties: it is twice continuously differentiable, increasing in both arguments, concave in c and $(1-h)$ jointly, and strictly concave in each argument separately. The individual is endowed with one unit of time. There is a production technology that uses labor to produce the single good. This technology is assumed to be constant returns to scale, and we furthermore choose units so that one unit of labor produces one unit of the consumption good. We assume a government that levies a proportional tax τ on labor income and uses the proceeds to finance a lump sum transfer T to households.

I solve for the competitive equilibrium for this economy. The optimization problem of the household is:

$$\max u(c, 1-h) \tag{3.1}$$

$$s.t.\ c = (1-\tau)h + T$$

$$c \geq 0,\ 0 \leq h \leq 1$$

This leads to a first order condition:

$$(1-\tau)u_1((1-\tau)h + T, 1-h) = u_2((1-\tau)h + T, 1-h) \tag{3.2}$$

[3] The results obtained here are identical to those that would emerge from a steady-state analysis in the standard growth model.

Substituting the government budget constraint $\tau h = T$ into the household's first order condition yields:

$$(1-\tau)u_1(h, 1-h) = u_2(h, 1-h) \tag{3.3}$$

This condition completely characterizes the equilibrium value of time devoted to market work as a function of the tax rate τ.

3.2. Quantitative Assessment

Prescott (2004) can largely be reinterpreted as a quantitative assessment of the extent to which the above framework with varying levels of τ can account for differences in labor input in the US and several European countries, both in the cross section and over time. Given that there are some slight differences in the exercises, I report results for the current model.[4]

Preferences are restricted to be of the form: $u(c, 1-h) = \alpha \log c + (1-\alpha)\frac{(1-h)^{1-\gamma}}{(1-\gamma)}$. The first order condition then becomes:

$$\frac{\alpha(1-\tau)}{h} = (1-\alpha)(1-h)^{-\gamma} \tag{3.4}$$

which simplifies to:

$$\frac{h}{(1-h)^{\gamma}} = \frac{\alpha}{1-\alpha}(1-\tau) \tag{3.5}$$

To assess the quantitative significance of these tax and spending policies on time devoted to market work I calibrate the model to match features of the US economy and then consider the implications for changes in tax rates holding all of the preference parameters fixed. Following Prescott (2004), I take $\tau = .40$ to correspond to the US tax rate, and take $h = 1/3$ as the fraction of discretionary time devoted to market work. Given a value of γ this can be used to infer a value of the parameter α. There is considerable controversy over the appropriate value of γ in this type of exercise. In a dynamic setting this parameter describes the willingness of the household to intertemporally substitute leisure. Many studies using micro data conclude that this willingness is very small for prime aged married males, while other studies have found much larger values for married females.[5] Rogerson (2006) argues that existing evidence from micro data is likely to be of little use in determining the relevant elasticity to study the consequences of changes in aggregate tax rates. Specifically, in the micro data much of the

[4] Prescott (2004) carries out his analysis in the context of the growth model, and as a result hours worked in any given period depend both upon current conditions as well as expected future conditions. In his analysis the ratio of current consumption to output enters into the analysis since it captures the influence of future factors. One issue is that differences in c/y might be due to factors other than taxes on labor.

[5] A recent paper by Imai and Keane (2004) incorporates learning by doing and finds a much higher estimate of the intertemporal elasticity of substitution.

variation in wages is idiosyncratic. Given the need to coordinate working times across individuals, one would not expect much response of individual hours to idiosyncratic wage changes.[6]

Table 1 shows the relative time devoted to market work associated with various tax rates higher than the 40% value used for the US, for several different values of γ. Recall that α is recalibrated for each value of γ.

Table 1					
Market Work Relative to $\tau = .40$					
τ	γ =1.00	γ =2.00	γ =3.00	γ =5.00	γ =10.00
.45	.94	.96	.97	.98	.99
.50	.88	.91	.93	.95	.97
.55	.82	.86	.89	.92	.95
.60	.75	.80	.84	.88	.93
.65	.68	.74	.79	.85	.91
.70	.60	.68	.73	.80	.88

Note that the reductions for the $\gamma = 10$ case are only about 30% as large as the changes for the $\gamma = 1$ case. Obviously the value of γ is significant in terms of assessing the quantitative significance. Prescott (2003) concentrated on the $\gamma = 1$ case in presenting his results. While this value may be at the upper end of the reasonable range, given that we are interested in aggregate labor supply here and not simply that of prime aged married males, the other extreme would seem to be a value of around $\gamma = 3$. While the magnitudes still vary within this range, a 20% increase in taxes is seen to have a considerable impact for all values of γ within this range.

3.3. Application to Continental Europe and Scandinavia

We now examine the cross-country patterns described in Section 2 in light of the above calculations. Specifically, we ask to what extent the above model can account for the aggregate changes in hours of work across the US and Europe with taxes as the main driving force. An important first step is to ascertain the changes in tax rates across countries over time. Mendoza et al. (1994) provide a method to compute average tax rates on consumption, capital income and labor income based on available data. Data limitations prevent this method from being applied prior to 1970 for most countries. For the countries being studied here, there are estimates of these tax rates through 1991. Prescott (2003) modifies the procedure of Mendoza et al. somewhat to determine marginal tax rates on consumption and labor income. He concludes that effective marginal tax rate on labor income (i.e., the combined effect of taxes on labor income and consumption, given by $1 - (1 - \tau_l)/(1 + \tau_c)$ where τ_l and τ_c are the marginal tax rates on labor income and consumption respectively) has been constant at about .40 in the US since 1970. For France, Germany and Italy he finds that this tax rate increased

[6] See also Prescott (2006) for a discussion of this issue.

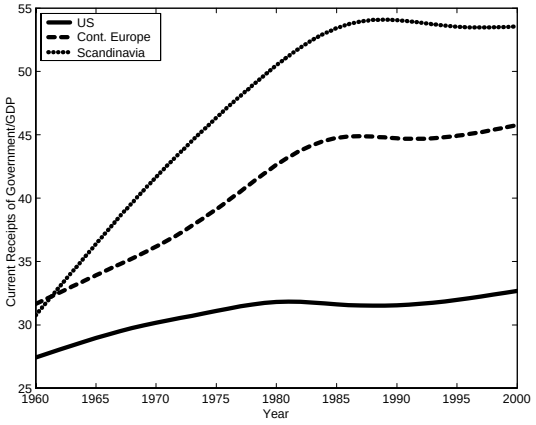

Figure 3.1: Current Receipts of Government/GDP

from about .45 in the early 1970s to about .60 in the early 1990s. Using the Mendoza et al. numbers for 1990, the average effective tax rates in the US, Continental Europe and Scandinavia are .33, .52 and .57 respectively. This leads one to conclude that tax rates in Scandinavia are somewhat higher than those in Continental Europe.[7]

Given the data limitations in obtaining long time series for effective marginal tax rates and the difficulties inherent in deriving these measures, it is also of interest to consider other series that may proxy for changes in effective tax rates. One such proxy is the share of total resources controlled by the government. To pursue this we examine the behavior of current receipts of government relative to GDP, which is available from the OECD as far back as 1960.[8] The data used here comes from various issues of the OECD publication Historical Statistics.[9]

Figure 3.1 plots this series for each of the three sets of economies, and displays four features worth noting.

First, this plot largely confirms the earlier conclusions based on the 1990 data on average tax rates, namely that tax rates are on the order of about 5% higher in Scandinavia than in Continental Europe. Second, government receipts were basically the same in both European regions in 1960, at which point they were modestly higher than in the US. Third, government receipts have increased dramatically in both European regions since 1960, but even more so in Scandinavia than in Continental Europe. Fourth, there has been little change in these series since the late 1980s.

Having looked at relative changes in tax rates over time across the three regions we

[7] It is worth noting that several of the European countries, perhaps most notably Sweden, have reduced marginal tax rates since 1990. An important issue is how long it takes for individuals to perceive tax changes as permanent and adjust their behavior accordingly.

[8] Analysis of the series for total outlays of government relative to GDP yields similar findings.

[9] This data is available for 1960 and then 1968 through 2000. I linearly interpolate to get the values for 1961-1967. Given that the analysis is focused on trends this should not raise any issues.

now ask whether these changes can account for the observed changes in aggregate hours of work. On the positive side, relative tax rates increase in both European regions relative to the US, leading us to expect that hours of work should decrease in both regions relative to the US. However, on the negative side it should be apparent that our simple model faces two difficulties. First, in 1960 there are higher tax rates in Europe than the US, but hours worked are higher in Europe. While this is a challenge for a tax-only story, Rogerson (2005) shows how this pattern can be accounted for by the fact that Europe lags the US in terms of development in 1960 in a model with non-homothetic preferences.

But the second, and more serious difficulty is that whereas tax rates increase by more in Scandinavia than in Continental Europe, the hours worked decrease by less in Scandinavia than in Continental Europe. Put somewhat differently, if taxes are the main cause of the differences in hours worked in the US and Continental Europe in 2000, then the model implies that there must be some other very significant factor that explains why Scandinavians are working so much compared to Continental Europeans. Or conversely, if taxes are the main reason why Scandinavians work less than Americans, then there must be some other very significant factor that explains why Continental Europeans work so much less than Scandinavians. The next section argues that a richer model of government tax and spending programs can potentially account for hours worked differences across all three sets of economies.

4. A Closer Look at Taxes, Government Spending and Hours of Work

The benchmark model of Section 3 assumed that all government revenues are rebated lump sum to the household. While this simple abstraction may be sufficient for capturing much the effect of government tax and spending levels on hours of work, I argue here that it may also abstract from some dimensions that are empirically important.

4.1. Four Types of Government Spending Programs

This subsection considers four different ways in which government revenues may be spent and contrasts the effects of these spending programs on hours of work for a given tax rate. While each of these programs is somewhat stylized, I argue below that they capture important aspects of real world programs. The first program is the program analyzed in Section 3, and corresponds to the case in which all tax revenue is rebated as a lump-sum transfer. It should be noted that there are several variants of this program which are identical from the perspective of their implications for hours of work. Specifically, the outcomes for allocations are identical independently of whether the government transfers purchasing power to individuals, buys goods at the market price and transfers these goods to individuals, or hires workers and produces output using the economy's technology and then transfers the output to individuals. Examples of this first type of program might include items such as education and health services.

The defining feature of the first program is that government revenue is used to provide the consumer with something that is a perfect substitute for private consumption. The defining feature of the second program is the opposite case: government revenue is used to provide something which at the margin has no impact on the marginal utility of a unit of private consumption. Again, there are several variations on this which are equivalent from the perspective of equilibrium hours worked. For example, it does not matter if the government uses the tax revenue to purchase the consumption good at the market price and then throws it away, or uses the tax revenue to purchase a good that is of value to the consumer but does not affect the marginal utility of private consumption, or hires workers at the market wage to produce something that is of no value to consumers. Military expenditures are often thought to be a good example of this type of spending.[10] But it is possible that much public sector employment fits this description.[11]

The two programs just described have the feature that the transfer that a given individual receives from the government is not affected by any decisions that the individual takes, in particular, how much they choose to work. The next two programs consider the case in which the transfer that an individual receives is explicitly or implicitly affected by how much he or she works. The third program assumes that the government subsidizes consumption at the margin.[12] In our formulation of this program we assume a per unit subsidy of s. We note that in the single good model being used, a marginal subsidy to consumption is equivalent to a marginal subsidy to working. Relevant examples of such programs include subsidized child care or elderly care, or child care transfers that are conditional on working.

The fourth program that we consider is modelled as a marginal subsidy to leisure. In particular, we assume a per unit subsidy on leisure that we denote by b (for benefit). Many government spending programs implicitly provide a marginal subsidy to leisure, since they stipulate that the benefit is conditional on the individual not working, or that the benefit will be reduced in response to any labor income. Relevant examples include some components of social security, unemployment insurance, traditional welfare programs, and disability.

Table 2 summarizes the four different types of programs.

[10] In fact, Prescott (2004) did distinguish between military and nonmilitary spending in his analysis.

[11] Of course, it is possible that adding unnecessary bureaucracy will also have negative effects on productivity, though we do not consider that margin here.

[12] In this case the transfer implicitly depends on how much the individual works because any income that is earned must be spent on consumption in this model, and hence the more an individual works the larger is the transfer that they receive.

Table 2		
Program	Description	Examples
1	Lump-sum transfer	education, health care
2	Wasteful spending	military, unnecessary public employment
3	Subsidy to leisure	UI, disability, SS
4	Subsidy to work	child care for working mothers

A simple intuitive analysis serves to illustrate why the nature of government spending programs matters in addition to the marginal tax rate on labor income when assessing the effects on hours of work, and to motivate the above taxonomy of spending programs. From the perspective of an individual's labor supply decision, there is a natural three-way classification of spending programs: those where the amount received by the individual is independent of how much they work, those in which the amount that the individual receives is negatively influenced by how much they work, and those in which the amount that the individual receives is positively affected by how much they work. Intuitively we expect that varying the form of the transfer would impact on the amount of work that the individual chooses to do. While Programs 1 and 2 both correspond to a case where the amount received by the individual is unaffected by how much they work, they differ because under Program 1 the individual receives a positive transfer while under Program 2 they effectively receive a zero transfer. This also turns out to be an important dimension.

For each program it is straightforward to derive an equation that completely characterizes the equilibrium value of h. As we did earlier for Program 1, one simply derives the first order condition for the household and then substitutes the government budget constraint into this equation. For completeness we repeat the equation that corresponds to Program 1:

$$(1-\tau)u_1(h,1-h) = u_2(h,1-h) \tag{4.1}$$

As noted, Program 2 is equivalent to a program in which the government simply buys consumption at the market price and then throws it away. The derivation is therefore like that for Program 1, except that we now set $T = 0$, and we obtain:

$$(1-\tau)u_1((1-\tau)h,1-h) = u_2((1-\tau)h,1-h) \tag{4.2}$$

For Program 3, the individual budget equation is now $(1-s)c = (1-\tau)h$. The government budget equation is $sc = \tau h$. In equilibrium it must be that $c = h$, and hence the government budget equation will imply $s = \tau$. The household's first order condition is:

$$[\frac{1-\tau}{1-s}]u_1(\frac{1-\tau}{1-s}h,1-h) = u_2(\frac{1-\tau}{1-s}h,1-h) \tag{4.3}$$

Substituting the equilibrium condition $s = \tau$, this reduces to:

$$u_1(h, 1-h) = u_2(h, 1-h) \tag{4.4}$$

Note that the tax rate no longer appears in this expression. In fact, this is the same expression that one would obtain in an economy with no government.

Under Program 4, the individual budget constraint is $c = (1-\tau)h + b(1-h)$, and the government budget constraint is $\tau h = b(1-h)$. The first order condition for the household is

$$(1-\tau-b)u_1((1-\tau-b)h + b, 1-h) = u_2((1-\tau-b)h + b, 1-h) \tag{4.5}$$

Feasibility implies that $(1-\tau-b)h + b = h$, and the government budget constraint implies that $b = \tau h/(1-h)$. Substitution then gives:

$$(1 - \frac{\tau}{1-h})u_1(h, 1-h) = u_2(h, 1-h) \tag{4.6}$$

A few comments are in order. Although the expression for Program 2 includes τ, it is easy to show that if preferences are consistent with balanced growth then hours are actually independent of τ and are the same as would occur in the competitive equilibrium without government. A similar result holds for Program 3, with two differences. First, the fact that hours are the same as in the competitive equilibrium without government holds independently of whether preferences are consistent with balanced growth. Second, not only is the time allocation the same as in the competitive equilibrium with no government, but the consumption allocation is identical as well. Under Program 2, if resources are thrown away then the consumption allocation (and hence welfare) is different, even though the time allocated to work is the same.

Lastly, it is of interest to contrast the expressions for Program 1 and Program 4. These expressions are similar except that the τ on the left hand side is divided by $1-h$ for Program 4. Since h is positive, it follows that Program 4 is like Program 1 except that the effective tax is higher. The reason that the level of the effective tax depends on h is that to translate a subsidy on leisure to a tax on labor one must know the ratio of labor to leisure.

The above analysis considered each spending program in isolation. It is very straightforward to generalize the above analysis to consider a situation in which all four programs are present. Given that we assume a proportional tax on labor income, we can simply attach a tax rate τ_i to each program i, for $i = 1, 2, 3, 4$, and assume that each program operates with its own budget constraint. Specifically, we require that $T = \tau_1 h$, $sc = \tau_3 h$, and $b(1-h) = \tau_4 h$. Carrying out an analysis similar to that above, one obtains:

$$(1 - \tau_1 - \tau_2 - \frac{\tau_4}{1-h})u_1((1-\tau_2)h, 1-h) = u_2((1-\tau_2)h, 1-h) \tag{4.7}$$

If one picks preferences consistent with balanced growth then u_2/u_1 is linear in consumption and hence the $(1-\tau_2)$ term can be factored out from inside the utility function to yield:

$$(1-\tau_1-\tau_2-\frac{\tau_4}{1-h})u_1(h,1-h)=(1-\tau_2)u_2(h,1-h) \tag{4.8}$$

This expression tells us that there is an interaction between the various programs. Previously, we noted that with balanced growth preferences, if all spending corresponded to Program 2, then there was no effect of tax rates on hours of market work. This is no longer true if either τ_1 or τ_4 is positive, since it is easily seen that the $(1-\tau_2)$ term will not cancel on both sides in this case. In fact, as we see in the next section, for empirically plausible values of τ_1, the effect of τ_2 on hours of work is substantial.

4.2. Quantitative Assessment

This subsection reports the results of some calculations carried out to explore the quantitative significance of allowing for differences in government spending programs. As before, I assume preferences are given by:

$$\alpha\log(c)+(1-\alpha)\frac{(1-h)^{1-\gamma}}{1-\gamma}.$$

We begin by contrasting the outcomes under Program 1 and Program 4, which basically amounts to repeating the exercise carried out in Section 3 for Program 1. I focus on the case of $\gamma=1$ and in each case I calibrate the value of α so that when $\tau=.4$ the equilibrium entails $h=1/3$. The calibrations under Program 1 and Program 4 will therefore have different values of α. Table 3 shows the results for relative hours as we increase taxes within each spending program.

Table 3		
Hours Relative to $\tau=.40$		
τ	Program 1	Program 4
.40	1.00	1.00
.45	.94	.92
.50	.88	.83
.55	.82	.75
.60	.75	.67
.65	.68	.58

Under Program 4, which corresponds to leisure being subsidized, the elasticity of hours with respect to the tax rate is more than 25% larger than it is under Program 1. Recall that hours worked in Continental Europe relative to the US are currently approximately 2/3, and that tax rates in Continental Europe are about 20 percentage points higher than in the US. The above calculations suggest that if we interpret all

spending to correspond to Program 1, then taxes can account for about three-quarters of the differences in hours of work, while if we interpret all spending to correspond to Program 4, then taxes can account for virtually the entire difference.

In the above calculation, it is assumed that all spending in both the US and the other country corresponds to the same program type. It is also of interest to consider the case where the marginal increases in spending in one economy relative to another are of a different type. For example, suppose as above that we interpret all spending in the US to reflect Program 1 and calibrate α accordingly. Now, however, suppose that when we consider an economy with a higher tax rate, we assume that the entire increase in tax rates is being used to finance subsidies to leisure rather than lump-sum transfers. The effect of this combination cannot be read directly from Table 2 since in that table the value of α is different for the different columns. However, it turns out that this effect is very small and the results are virtually identical to those in the second column of Table 2.

Next we consider economies with higher taxes than the US, and examine the effect of having these higher tax rates reflect different combinations of expansions in consumption subsidies or resources thrown away versus subsidies to leisure. This exercise assumes that the US spending consists entirely of lump-sum transfers and that the other economy has a lump-sum transfer program that is the same size in terms of the tax rate used to finance it.[13] For this exercise I assume that the alternative economy has a tax rate that is 25 percentage points higher than the US rate, which is meant to capture the magnitude of differences between the US and Scandinavia. The results are in Table 3.

Table 3

Effects of Variations in Spending

Programs 3 and 4			Programs 2 and 4		
τ_3	τ_4	h/h^{US}	τ_2	τ_4	h/h^{US}
.00	.25	.58	.00	.25	.58
.05	.20	.67	.05	.20	.62
.10	.15	.75	.10	.15	.66
.15	.10	.83	.15	.10	.71
.20	.05	.92	.20	.05	.77
.25	.00	1.00	.25	.00	.84

The first three columns examine the case where the incremental taxation involves differing mixes of Programs 3 and 4, while the last three columns consider the case where the incremental taxation involves differing mixes of Programs 2 and 4. I begin with the first case. To focus the discussion it is useful to consider whether changes in this mix can account for the fact that Scandinavia has both higher tax rates and higher hours worked than Continental Europe. It was noted earlier that if Continental Europe

[13] The results are unaffected by assuming that the benchmark system is a combination of programs as opposed to being entirely a lump-sum transfer program. This changes the calibrated value of α, but this has virtually no effect on the quantitative effect of given marginal changes in tax rates and spending.

had all of its incremental taxation associated with financing subsidies to leisure, then a tax rate that is 20 percentage points higher than in the US would in fact account for the fact that Continental Europe has hours of work equal to roughly 2/3 of the US value. The first three columns of Table 3 indicate that if Scandinavia used 60 percent of its incrementally higher taxation to finance subsidies to consumption with the rest going to subsidize leisure, then the model would be able to account for relative hours of work in both sets of economies. With this spending composition, Program 3 spending would amount to approximately 23% of overall government spending, or roughly 15% of total consumption.

Next I consider the case in which the incremental taxation takes the form of Programs 2 and 4. Looking at the last three columns, we see that this case would require a larger compositional differential in order to reconcile hours of work in both sets of economies, with more than 80 percent of the incremental spending going toward activities that do not benefit the consumer, or more generally, do not affect the marginal utility of private consumption. This would require that Program 2 spending would amount to roughly 30% of total government spending. These last three columns also reveal the extent to which there is an interaction effect between spending programs. As noted previously, if there were no other spending programs in place, then with log-log preferences there would be no effect on hours associated with Program 2. If this were true in the presence of other programs then the last entry in the final column of Table 3 would be equal to 1.00. However, as one can see, the entry in this position is .84, implying an elasticity of hours worked with respect to τ_2 of more than .5.

4.3. Discussion

The above analysis illustrates that the connection between τ and h is highly dependent on how the government revenues that are generated by the tax τ are spent. If they are used to finance a subsidy to consumption, as in Program 3, then there will be no effect of τ on h. Similarly, with balanced growth preferences, this same result will occur if the government uses all of the revenue to finance something which has no impact on the marginal utility of either the consumption good c or leisure, as in Program 2. We note specifically for future purposes that in this model with only one good, it does not matter if the government offers a lump-sum transfer of purchasing power (Program 1) or a lump-sum transfer of the consumption good. And finally, if the revenue is spent subsidizing leisure, as in Program 4, then the effect on h will be larger than if the tax proceeds are rebated in a lump-sum fashion.

The description of different methods for transferring tax revenue back to households has been both simple and abstract. In the real world there are a large number of programs that accomplish this task of transferring tax revenue back to households, and these programs are usually described by many details regarding the circumstances under which revenue is transferred and how large the transfer is. As a result it is probably often

the case that a given program does not necessarily fit completely with any one of these variations, but is better captured as a combination. But, as noted earlier, it is easy to list programs that display the general characteristics of the programs just analyzed. For example, unemployment insurance programs, social security programs and traditional welfare programs all involve a transfer of resources that is conditional upon not engaging in market work and hence implicitly involve marginal subsidies to leisure. Governments subsidize a variety of consumption activities, either explicitly or through the tax code. And there are many in-kind or cash transfers that are not necessarily linked to time devoted to market work, such as education, health and sometimes housing.

In view of this it is of interest to ask whether differences in how governments spend tax revenues may be significant in reconciling the tax and market work patterns documented in Section 2. One prominent difference in spending patterns between the economies of Scandinavia and those of continental Europe is that government spending in the former countries on family services is much larger. In particular, Scandinavian governments spend much more money on child care and elderly care. According to Ragan (2005), government spending on these services is roughly 8% of total spending on consumption, as opposed to roughly 2% in continental Europe. While the differences in spending on family services is substantial, it is somewhat less than what would be required to reconcile the differences in hours of work in Scandinavia and Continental Europe. The results in Table 3 suggested that 60% of the tax revenue from the 25% higher taxes would have to go to these types of services, which would correspond to a share of 15% of total consumption.

The government employment channel is also potentially significant. According to the numbers from Algan et al. (2002), in 2000 the ratio of government employment to total population aged 15-64 was 15% in the US, 18% in continental Europe and 28% in Scandinavia. The difference in employment to population ratios in Scandinavia and Continental Europe is approximately 10% and hours per worker in employment are roughly equal, so that if all of the additional government employment in Sweden were wasteful this alone would account for much of the difference. However, given that much of the additional government employment is associated with services provided by the government such as child care and elderly care, this extreme scenario also seems somewhat unlikely. But given that the family services component seems to account for about half of the difference, it follows that if half of the additional government employment (or about one-sixth of total government employment) were wasteful, that the combination of features could account for the differences between Scandinavia and Continental Europe.

Based on these calculations, I conclude that the mechanisms explored in this section can perhaps go much of the way to reconciling the tax rates and hours of work in Scandinavia and continental Europe. More definitive quantitative conclusions will require a more detailed assessment of the differences in composition of government spending vis-a-vis the taxonomy offered in this section, which I leave for future work. The next

section considers a multi-sector model of time allocation that allows us to understand the sectoral differences documented in Section 2.

5. A Multi-Sector Model

In this section I extend the previous model along two key dimensions. First, I distinguish between two different market activities: the production of family services (i.e., child care and elderly care) versus the production of all other goods and services in the market sector.[14] Second, I distinguish between two uses of time not devoted to market work: leisure and the production of family services. A key assumption is that the output of family services in the home sector is highly substitutable with market produced family services. This model allows for a richer description of government policy, and in particular allows us to incorporate one of the key distinguishing features of government spending programs in Scandinavia relative to other countries: these countries devote a much larger share of government spending to caring for children and the elderly. In the model developed here, even if the government uses all tax revenues to fund lump-sum transfers, it matters whether the transfer is in the form of general purchasing power or in terms of units of family services, assuming that these transfers must be consumed by the individual that receives them.

After developing the model I report the findings from some illustrative calculations. Two main conclusions emerge. First, this setting can yield quantitatively significant effects associated with government spending on family services. Second, this model also sheds light on why the employment differences between Continental Europe and Scandinavia are dominated by differences in service sector employment.

I begin by describing the extended model. For simplicity I assume functional forms from the outset. The representative household now has preferences given by:

$$\alpha_c \log(c) + \alpha_f \log(f) + \frac{(1-\alpha_c-\alpha_f)}{(1-\gamma)}(1-h)^{1-\gamma} \tag{5.1}$$

where c is consumption of a general purpose good similar to the previous case, f is the consumption of family services that we will interpret to be care for children and the elderly, and $(1-h)$ is leisure. As before there is a linear technology, normalized to have unit marginal product, that uses labor to produce output. I will interpret this output as market output and write the production function function as $y = h_m$, where h_m is the time devoted to producing this good and y is the amount of (market) output produced. This output y has two uses. Similar to before, it can be converted one for one into the consumption good c. However, it can also be used as an input into the production of family services f. Household time is the other input into the production of family

[14] A richer model would include a larger set of consumption goods and services. In particular, it would be of interest to explicitly consider other services (e.g., restaurants) which have good nonmarket substitutes but which are not subsidized in any way by Scandinavian social policies. I leave this fuller analysis for future work.

services, and we write the production function as

$$f = [am^{\rho} + (1-a)h_f^{\rho}]^{1/\rho},$$

where m is the input of the market output and h_f is the input of household time. The motivation for this specification is that I want to capture the fact that family services may be provided through the market or the home. Since m is produced using market time one can also think of this relation as specifying that family services are produced using two different time inputs–market time and nonmarket time. As we will see, central to the analysis is the extent to which individuals can substitute among these two inputs into the production of family services. Because of this I have chosen a constant elasticity of substitution production function.

The government taxes labor market income at rate τ, but I now allow for two possible uses of this government revenue. As before, one use will be to fund a lump sum transfer T. In what follows this can be thought of either as a transfer of purchasing power or as a transfer of the all-purpose consumption good c. However, the other use will be to fund a lump sum transfer of the market input into the provision of family services, which I will denote by G. The household seeks to maximize its utility function above subject to the constraints:

$$c + m = (1-\tau)h_m + T \tag{5.2}$$

$$f = [a(m+G)^{\rho} + (1-a)h_f^{\rho}]^{1/\rho}$$

$$m \geq 0, c \geq 0, h_m \geq 0, h_f \geq 0, h_m + h_f \leq 1$$

As we will see later, it will be particularly significant to note the non-negativity constraint on m, which is to say that the government transfer of G is irreversible–it cannot be sold in the market and turned into the consumption good c. The government budget constraint in this economy is

$$T + G = \tau h_m \tag{5.3}$$

5.1. Household Problem

It is instructive to consider the household problem taking the government policy parameters as given. Substituting the constraints into the household's objective functions yields the following first order conditions for h_m, h_f, and m respectively, assuming an interior solution:

$$\frac{\alpha_c(1-\tau)}{c} = (1-\alpha_c-\alpha_f)(1-h_m-h_f)^{-\gamma} \tag{5.4}$$

$$\frac{\alpha_f(1-a)}{f^\rho}h_f^{\rho-1} = (1-\alpha_c-\alpha_f)(1-h_m-h_f)^{-\gamma} \tag{5.5}$$

$$\frac{\alpha_c}{c} = \frac{\alpha_f}{f^\rho}a(m+G)^{\rho-1} \tag{5.6}$$

Combined with the budget constraint and the production function for f we have five equations in five unknowns. The interpretation of these conditions is straightforward. The first equation says that at the margin the value of time spent working in the market is equal to the value of leisure. Similarly, the second equation says that at the margin, the value of time spent providing family services is also equal to the value of leisure. And the third equation says that at the margin, the household equates the value of spending on the consumption good with spending on market inputs into family services.

5.2. Quantitative Assessment

I do not carry out a general analysis of government policy in the context of this model. Instead, my goal is simply to carry out some calculations which are suggestive regarding the quantitative significance of the mechanism studied. I begin by redoing the calculations carried out previously, but in the context of the new model. Specifically, I calibrate the model to US data assuming that the US has government policy characterized by $\tau = .40$ as before, and $G = 0$, then produce a table equivalent to that of Table One in which τ is varied while maintaining $G = 0$. We then consider how changes in G affects those results.

The benchmark calibration for the US economy sets $\tau = .40$ and $G = 0$, with T taking on whatever value is needed to balance the government budget. The elasticity of substitution parameter ρ in the production function for family services is set to .8. This value is chosen to reflect that there is substantial substitutability between home and market inputs into the production of family services.[15] The remaining preference parameters are α_c, α_f and α. These values are determined by requiring that the equilibrium match the following statistics: $h_m = 1/3$, $h_f = .08$, and $m/(c+m) = .025$. Given $h_m = 1/3$, the value of h_f is motivated by data from the ATUS for 2003, on the total amount of time devoted to care for family members relative to time devoted to market work. The share of total consumption spending devoted to family services is the same as that used by Ragan (2005), and is chosen to match the corresponding spending share for the US.[16]

[15] There are now several estimates of the parameter ρ. Using macro data, McGrattan et al (1997) find a value slightly greater than .4, while Chang and Schorfheide (2003) find a value of around .5. Using micro data, Rupert et al (1995) find a value around .4, while Aguiar and Hurst (2005) find a value of around .6. I use a value larger than these estimates because of the focus on a narrow set of goods which would seem to exhibit much higher substitutability.

[16] The results are not very sensitive to this value. When this share was calibrated to .05 instead of .025 the results were almost identical.

Table 4 reports the results that are analogous to those in Table 1, except that I now include the effects on a wider range of variables since the model now has several new margins of interest.

Table 4						
Effects of Taxes Relative to $\tau = .4$, With $G = 0$						
τ	h_m	h_f	$h_m + h_f$	m	c	f
.40	1.00	1.00	1.00	1.00	1.00	1.00
.50	.87	1.14	.92	.46	.88	1.03
.60	.73	1.27	.83	.17	.74	1.08
.70	.58	1.38	.73	.04	.59	1.14

Comparing with Table 1 the reader will notice that the effects of a given tax increase on hours of market work is now slightly larger than before. The reason for this is that we have added a home production sector. As is standard in the home production literature, market hours respond more to a given tax change because there is an additional margin of substitution–in addition to substituting from market work into leisure the individuals can now substitute from market work into home work, which in this context means increasing time devoted to the production of family services.[17]

A few simple patterns emerge. As expected, as taxes increase, households substitute away from market activities into other activities. As a result, h_m, c, and m all fall. Both leisure and h_f rise. Although m falls, the overall effect is that f increases.

Next we examine the consequences of changing the mix of government spending. For this analysis I will focus on the $\tau = .60$ case and examine how G influences the equilibrium. As noted earlier, if G is less than or equal to the value of m in the equilibrium with $\tau = .60$ and $G = 0$, then a marginal increase in G will have no effect on allocations or welfare, since the household will simply reduce m one-for-one with the increase in G, and use these funds to purchase c to make up for the decrease in T implied by the government budget constraint. In the equilibrium with $\tau = .60$ and $G = 0$, the value of m is .001. Recall that in the $\tau = .40$ equilibrium the calibrated value of m is .008.

Table 5				
Effects of G When $\tau = .60$, Relative to $\tau = .40$				
	$G = .00$	$G = .01$	$G = .02$	$G = .03$
h_m	.73	.76	.79	.82
h_f	1.27	1.11	.97	.85
$h_m + h_f$	.83	.83	.83	.83
$m + G$	.17	1.21	2.42	3.64
c	.74	.75	.75	.75
f	1.08	1.19	1.24	1.27

[17] Rogerson (2005) considers a home production model in which the home sector provides a good substitute for the market service sector, and also finds that the response of market work to taxes is greater. McGrattan et al (1997) study the effect of taxes on hours of work in the business cycle context.

To fix ideas, think of the first column as representing the continental Europe scenario, though as emphasized earlier in the paper one might want to consider variations on government spending which include a subsidy to leisure. Comparing this column with the other columns allows one to assess how changes in G affect the Scandinavian economies relative to the continental European economies.

We begin by noting the general qualitative patterns. As noted before, the first column shows that when tax rates increase and all revenue is rebated in a lump-sum fashion there is a shift away from market work and market consumption toward nonmarket work, nonmarket consumption and leisure. Non market time spent producing family services increases as does total consumption of family services, though market inputs into the production of family services goes down substantially.

As we increase G we see that time is allocated away from nonmarket work into market work, and that leisure remains almost constant. The increase in G is obviously associated with an increasing input of market inputs into the production of family services. Although the input of nonmarket time into this activity is decreasing, the net effect is still an increase in the total consumption of family services. Note also that consumption of the market good is basically constant. Although individuals are working more and tax rates are the same, the transfer payment T received by households from the government is decreasing in order to allow for the increased spending on family services. By explicitly increasing the use of market inputs in the production of family services the government is directly affecting one of the distortions brought about by higher tax rates in the first place.

Next we focus on the quantitative findings. Of particular interest is the issue of market work. Moving from $G = 0$ to $G = .02$ ones sees that market work relative to the $\tau = .4$ economy increases by about 6%. When going from $G = 0$ to $G = .03$ the equivalent figure is 9%. This is almost the same difference between Scandinavia and Continental Europe seen in the data. When $G = .02$, the time input into the production of family services is roughly the same as it is in the $\tau = .4$ economy, though total consumption of family services is roughly 25%. Total spending on market inputs into the production of family services is almost two and a half times larger in this economy than in the $\tau = .4$ economy.

As noted earlier, government expenditure on family services in Scandinavia is approximately 8% of total consumption expenditures, which is roughly what is implied by $G = .02$. I conclude that the above analysis depicts a mechanism that can potentially help to reconcile much of the behavior of hours of market work and tax rates across the three groups of countries studied. The effects of spending on family services in this model is somewhat larger than in the cases studied in the previous section. The key is that in the current setting transfers of family services yield close to a one-for-one transfer of time spent in non-market production into time spent in market production. Additionally, even when these transfers are relatively small in aggregate terms, they can lead to more market activity in the production of family services than is present in the

US economy. As a result, this instrument can have a relatively large impact on hours of market work.

Although when $G = .03$ we see that the level of market spending on family services is more than twice as large as it is in the benchmark (US) economy, the benchmark economy assumes a tax rate of .40, which creates an incentive for family services to be provided outside of the market. In view of this it is of interest to ask what is the efficient level for the market provision of family services. This can be computed by solving for the equilibrium of the calibrated model when $\tau = 0$. The result is that the level of family services provided in the market would be more than 5 times higher than in the benchmark economy with $\tau = .4$, and nonmarket time devoted to producing family services would be only 40% of its level in the benchmark equilibrium. These implications are distinct from those obtained by Rosen (1996). He argued that Scandinavian social policies led Scandinavians to consume many more of these services than is efficient and thus represented a large welfare loss.

It is of interest to quantify the welfare effects of these policies. The measure of welfare loss is the percentage amount by which c (non-family services consumption) would have to be increased across two situations in order to yield equal utility for the representative household. The welfare loss of having $\tau = .6$ and $G = 0$ relative to the $\tau = .4$ and $G = 0$ benchmark is 14.9%. Keeping $\tau = .6$ but considering increases in G to .01, .02, and .03 lowers this welfare loss to 13.6%, 12.8%, and 12.4% respectively. It follows that some government provision of family services does represent a welfare gain relative to the alternative of simply rebating all tax revenues as a lump-sum transfer, though they only offset a small portion of the overall welfare cost associated with higher taxes.

Finally, it is important to note that the multi-sector analysis of this section and the particular mechanism analyzed also sheds light on why the differences in hours of work between Scandinavia and Continental Europe are so concentrated in the service sector as opposed to being spread across all activities. Since consumption of the general good is approximately the same for all values of G considered, it follows that hours devoted to these other activities are basically the same in Scandinavia and Continental Europe.

6. Conclusion

The main point of this paper is a simple one. In trying to understand the effects of tax rates on hours of market work, it is essential to explicitly consider how the tax revenues are being spent. Different choices regarding government spending lead to different elasticities of hours of work with regard to tax rates. I illustrate the empirical importance of this point by addressing the issue of hours worked and tax rates in three sets of economies: the US, Continental Europe and Scandinavia. While tax rates are highest in Scandinavia, hours worked in Scandinavia are significantly higher than they are in Continental Europe. I argue that key differences in government spending can

potentially account for much of this pattern.

The analysis carried out here suggests an explanation for why it is that the increases in government since 1960 have apparently had much larger effects on hours of work in Continental Europe than in Scandinavia. Although both sets of economies increased taxes to fund much larger government spending, Scandinavia allocated its government spending in a manner that implied much smaller elasticities of hours worked with regard to tax increases.

The analysis carried out here is really only a first step in assessing the quantitative importance of the issues raised. Richer models of government spending programs will be required in order to make further headway. This will probably require richer models on the consumer side, since many programs have important interactions with heterogeneity across consumers, along dimensions of income, age, marital status, and health status.

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