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Determination of Average Working Time in Finland

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Abstract. This study explores the determination of average working time in the context of a Nordic welfare state. The study is focused on the Finnish case. The issue is explored by using data from six industries from 1960 to 1996. The main empirical result is that both an increase in labour productivity and a widening of the tax wedge have contributed to a decline in average working time in Finland. These observations are consistent with the predictions of a theoretical model that is based on the notion of equilibrium working hours.

1. Introduction

Europe's high unemployment trap has generated a great number of ambitious plans to solve the dilemma. One of them is known as 'work-sharing' (see, for example, Contensou, Vranceanu, 2000). The idea has also been put into practice in many OECD countries, where the average annual working time has been reduced either by contracts or by legislation.[1] The issue of work-sharing is debated in Europe, but little is known about the underlying economic fundamentals that have contributed to a decline in average working time during the past few decades.

There have indeed been certain interesting long-term trends in average working time across industrialized countries. Voth (2000) observes that there was a sharp increase in the length of average annual working time during the early stages of industrialization in England. This trend was reversed during the late 1800s. Maddison

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(1995) shows that average hours of work in advanced OECD countries fell from around 3,000 hours a year in 1870 to between 1,500 and 2,000 hours a year by 1990. Evans *et al*. (2001) note that the long-term decline in average annual hours has slowed down in almost all OECD countries in recent years.

In this study we focus on the determination of average working time in Finland. Economic development in Finland has been rapid since the Second World War. Rising productivity has definitely been the most important driving force of economic growth, as in most other industrialized countries (see, for example, Hjerppe, 1989). Along with the rapid growth in the post-war era, the public sector expanded, the tax wedge increased and average annual working time was gradually reduced. Nowadays, Finland is one of the Nordic welfare states, characterized by high labour taxes and a short average annual working time compared with the USA. These broad features of economic development mean that it is especially interesting to investigate the decline of average working time tied in with rising productivity and increasing labour taxes at the same time, which constitute the key elements of the Nordic welfare states. Thus, the following study aims to provide a coherent picture of these underlying elements of economic progress.

A standard microeconomic theory of individual labour supply suggests that labour supply and, hence, average working hours should decline when real incomes rise.[2] In reality, individuals tend to supply the prevailing number of standard hours. In Finland, and in other Nordic countries, the standard hours are not decided on an individual or firm basis but instead collectively, either by binding collective agreements or by legislation. However, it can be argued that pressures for such agreements will grow when the individual demand for leisure increases and that the pressures are reflected in collective bargaining over standard hours. In fact, an application of the representative agent framework can be motivated by noting that the following investigation is focused on the determination of average working time during the past few decades. Namely, the case can be made for the view that in democratic societies the demand for different types of working time arrangements is aggregated without serious biases in the long term. The underlying differences in preferences of individuals with respect to leisure can therefore be omitted and the issue can be elaborated by using the representative agent framework.

Thus, in this study we use a simple model of individual labour supply to capture the effects of productivity growth and labour taxation. It is assumed that the real labour cost equals labour productivity and

that the desired leisure increases with total incomes. There is a public sector in the model which produces public goods and gives income transfers to households. This feature is motivated by noting that the study is about the determination of average working time in a Nordic welfare state. The public sector has a binding budget constraint and hence it has to finance its expenditure by taxing labour input. The effects of payroll taxes and income taxes are identical in the model.

The aim of this study is therefore to elaborate the economic fundamentals that have contributed to a decline in average working time at the aggregate level in the case of Finland. The empirical investigation is conducted through the use of a panel data set consisting of six industries, from 1960 to 1996. The main empirical result of this study is that both an increase in labour productivity and a widening of the tax wedge have contributed to a decline in average working time. The study appears in five parts. The next section presents a simple model of labour demand and wage setting which tries to illuminate some basic feedback mechanisms between productivity, the tax wedge and average working time. The third section contains a short description of the data set along with an international comparison of annual hours, and provides a justification for the choice of variables. The fourth section reports the empirical results from a number of panel data estimations. The last section concludes with a few remarks.

2. The model

Consider a simple model of individual labour supply. We first assume that firms are on their labour demand curves, and hence the labour cost is equal to the marginal product of labour, or

$$(1 + s)W = Q, \qquad [1]$$

where W is the hourly wage and payroll tax is denoted by s. For simplicity we assume that in the long run the marginal product of labour (Q) is equal to the average product of labour. Hence Q can be interpreted as average labour productivity, which increases with time-dependent technical progress, $A(t)$, and capital–labour ratio (K/N):

$$Q = A(t)F\left(\frac{K}{N}\right). \qquad [2]$$

For simplicity we take the capital stock here as an exogenous constant. The workers are assumed to get utility from consumption of goods and of leisure. For simplicity we assume that there is no saving. Hence the utility function of the workers is given by

$$V = V(C, L) = V[WH(1 - t) + G, T - H], \quad [3]$$

where the income tax rate is denoted by t. The income consists of after-tax labour income and the money value of a bundle of public goods and income transfers provided by the government (G). The number of hours worked is H, and T is the number of total hours. Public expenditure is determined by a political process which is treated as exogenous.

Substituting equation [1] for equation [3] yields

$$V = V\left(\frac{QH}{\Theta} + G, T - H\right), \quad [4]$$

where $\Theta = (1 + s)/(1 - t) \geqslant 1$ is a measure of the tax wedge.

The government covers its expenditure by taxing employers and employees. Hence its budget constraint is given by

$$G = (s + t)WH = \frac{\Theta - 1}{\Theta} QH = \frac{\Theta - 1}{\Theta} Y, \quad [5]$$

where Y is the aggregate output per capita.

Let us use the following logarithmic specification of the utility function to derive the comparative statics results:

$$V = \log\left(\frac{QH}{\Theta} + G\right) + B(QH)\log(T - H), \quad [6]$$

where B is the weight of leisure. We assume that B is an increasing function of aggregate output:

$$B = B(QH), \quad B' > 0. \quad [7]$$

The optimal labour supply can now be derived from the first-order condition of utility maximization:

$$\frac{\partial V}{\partial H} = B'Q(-\log L) + \frac{Q}{QH + G\Theta} - \frac{B}{T - H} = 0. \quad [8]$$

The effect of increased productivity on individual working time can be derived by differentiating the first-order condition:

$$\frac{\partial^2 V}{\partial H \partial Q} = -B' \log L - B'' H \log L - \frac{B' H}{T - H} + \frac{\Theta(G - G_\Theta Q)}{(QH + G\Theta)^2}$$

$$= -B' \log L - B'' H \log L - \frac{B' H}{T - H} < 0, \qquad [9]$$

since $G - G_\Theta Q = 0$. Whether this expression is negative or positive is an empirical question. Theoretically, it depends on the sign and the size of B'. However, it is clear that the average productivity has a negative effect on working time when the total output per worker is sufficiently low. In fact, expression [9] is always negative if we assume that equation [6] can be maximized by treating $B(QH)$ as given, because this leads to dropping the first terms on the RHS of equations [8] and [9]. Thus, it is evident that an increase in average productivity yields a decline in average working time.

In addition, it is interesting to examine the corner solutions of the maximization of [6] concerning B, which is the weight of leisure in the utility function of the representative agent. If $B = 0$, then an increase in productivity has no effect at all on the determination of average working time. This result means that if the following empirical investigation shows that working time declines as productivity rises, there is, in fact, empirical evidence for the view that people put more weight on leisure as they get richer.

Similarly, it can be clearly shown that an increase in the tax wedge also reduces the working hours:

$$\frac{\partial^2 V}{\partial H \partial \Theta} = -\frac{(G + \Theta G_\Theta)}{(QH + G\Theta)^2} < 0. \qquad [10]$$

The size of this effect increases with the size of the public sector. If $B = 0$, then an increase in the magnitude of the tax wedge still leads to a decrease in average working time.

Remembering that the average productivity consists of technical progress and capital intensity, one can write:

$$H = H\left(A(t), \frac{K}{N}, \Theta\right);$$

$$\frac{\partial \mathrm{H}}{\partial \mathrm{A}(t)}, \frac{\partial H}{\partial (K/N)} < 0 \text{ for } QH < Q^*H^* \text{ and } \frac{\partial H}{\partial \Theta} < 0 \text{ for all } \Theta. \quad [11]$$

Or, in words, the equilibrium working time depends on productivity and the tax wedge.

3. The data

An international comparison indicates that there are certain interesting differences in the evolution of standard annual hours across industrialized countries that need to be addressed (see Table 1). A well-known stylized feature of international patterns is the fact that the level of average working time is lower in Europe compared with the USA. There has been a decline in annual hours for full-time manufacturing workers in most EU countries. In contrast, there has been essentially no reduction in annual hours in the USA.[3] This comparison reveals that Finland definitely belongs to the group of European countries in which there has also been a substantial decline in annual hours from 1984 to 1995. Thus, the following empirical investigation is able to contribute to the

Table 1. Standard annual hours for full-time manufacturing workers in selected countries, 1995 (Hunt, 1998)

Country	Standard annual hours	Percentage change, 1984–95
Finland	1,716	−5.9
Denmark	1,672	−7.9
Sweden	1,808	0.0
Norway	1,725	−6.7
Western Germany	1,602	−9.0
France	1,755	−1.6
Portugal	1,882	−7.1
UK	1,762	−1.3
USA	1,896	−0.1

discussion on the reasons for these large disparities across countries from the perspective of a Nordic welfare state.

The determination of average working time in Finland is studied by dividing the economy into six main sectors.[4] The sectors are agriculture, forestry and logging (SIC95: A-B), manufacturing (SIC95: C-E), construction (SIC95: F), the wholesale and retail trades (SIC95: G), transportation (SIC95: I) and public activities (SIC95: L-N).[5] The study is based on yearly observations from 1960 to 1996.

A short description and the source of the variables is provided in Table 2. Through the use of a panel data estimation, average working time is explained by labour productivity, the tax wedge and gross capital formation. The decline in hours per worker is evident in all sectors from 1960 to 1996. However, it is important to note that an interesting variation also exists in the behaviour of hours per worker across the sectors. This variation is naturally masked in the aggregate data. An important feature of the data set is that the sectoral variation in a tax wedge variable is totally generated by one component of the tax wedge, namely by 'social security contributions/wages'. The reported results are robust with respect to this specification.

The study also contains a potential weakness, because it is not possible to obtain disaggregated data on standard hours and

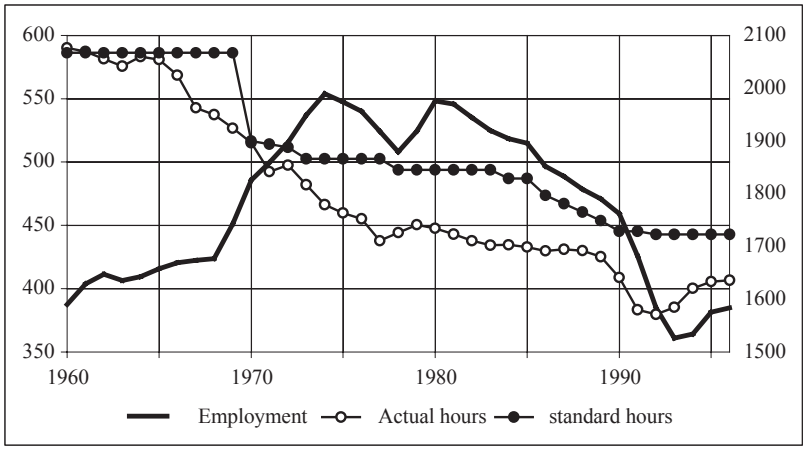
Table 2. Description of the variables and their sources. 'Direct taxes/household income' ($TAXW1$) and 'Indirect taxes/consumption expenditures' ($TAXW2$) are *not* sectoral variables. The sectoral variation in the tax wedge ($TAXWEDGE = TAXW1 + TAXW2 + TAXW3$) is totally generated by 'Social security contributions/wages' ($TAXW3$)[a]

Variable	Source
Value added in basic values (Q)	National Accounts
Direct taxes/household income ($TAXW1$)	National Accounts
Indirect taxes/consumption expenditures ($TAXW2$)	
Social security contributions/wages ($TAXW3$)	
$TAXWEDGE = TAXW1 + TAXW2 + TAXW3$	
Performed working hours (WH)	National Accounts
Employed persons (NI)	National Accounts
Gross capital formation (K)	National Accounts

[a] Layard *et al.* (1991) prefer this specification.

overtime covering the whole period from 1960 to 1996. This means that we have to use data on *actual* average working hours.[6] However, this is not a major problem, because — as noted by Holm and Kiander (1993) and Ilmakunnas (1995) — in the long run the time path of actual working hours closely follows that of standard hours, at least in the case of Finnish manufacturing.[7] Figure 1 illustrates the evolution of standard hours and actual hours per worker in Finnish manufacturing industry from 1960 to 1996. The permanent gap between standard hours and actual hours per worker is mainly due to sickness and parental leave. The rapid fall in actual hours per worker during the great slump of the early 1990s is a consequence of sweeping layoffs. The relationship of standard hours and actual hours per worker in other sectors of the economy is not known, but there is no particular reason to think that firms could use overtime as a long-term arrangement in the other sectors of the economy. The reason is that a permanent increase in overtime is due to the high overtime premiums: a much too expensive way to adjust labour input from the point of view of firms. Thus, the (minimum) premium for daily overtime is 50 percent for the first two hours and 100 percent for each following hour in Finland. The premium for weekly overtime is 50 percent, irrespective of the number of hours.[8]

Figure 1. The evolution of employment (thousand persons, left-hand scale), and standard hours and annual actual average working hours (right-hand scale) in manufacturing from 1960 to 1996



Source: Confederation of Finnish Industry and Employers, and National Accounts.

4. The results

Since the data cover all main sectors in Finland, it is convenient to set up a fixed-effects model in order to investigate the determination of average working time in Finland, as follows:

$$\text{Log}(WH/NI)_{\text{it}} = \nu_{\text{i}} + \mu_{\text{t}} + b_1 \text{ Log}(Q/NI)_{\text{it}} + b_2 TAXWEDGE_{\text{it}} + b_3 \text{ Log } K_{\text{it}} + e_{\text{it}}, \qquad [12]$$

where WH stands for performed working hours, NI for employment, Q for value added in basic values, K for gross capital formation and ν_{i} is an industry factor. It captures all the industry-specific characteristics (such as the labour intensity of production) that remain stable over time. μ_{t} includes all factors that are common to industries and tend to vary over time (such as interest rate hikes, recessions and the changes in taxation, etc.).

The estimation results are reported in Table 3. The main result is that an increase in labour productivity and a widening of the tax wedge have both contributed to a decline in average working time in Finland.[9] These observations are therefore consistent with the earlier theoretical elaboration. The results are also in line with common sense. This is due to the fact that a rise in labour productivity over time means that people get richer and as a consequence they demand more leisure. Reductions in working time are therefore one way of distributing increased prosperity. On the other hand, a widening of the tax wedge over time has meant that for workers it is more attractive to take the fruits of increased

Table 3. The estimation results of the fixed-effects model for average working time in Finland, from 1960 to 1996 (dependent variable: average working time). The estimated model includes the year dummies and a constant

Variable	Coefficient	*t*-statistics
Log (Q/NI)	−0.034	−2.38
$TAXWEDGE$	−0.392	−3.57
Log K	0.013	1.73
R^2	0.86	
$F(39,177)$	27.17	
Number of observations	216	

productivity as an increase in leisure. As a crude conjecture, one might conclude that capital deepening could in principle via various substitution effects lead to a decline in average working time. However, the estimation results are not in line with this view in the case of Finland.

5. Concluding remarks

The determination of average working time in Finland was studied by means of annual data from six industries from 1960 to 1996. As a starting point for the empirical investigation we formulated a simple model of average working time determination. The basic idea of the model is that higher incomes and higher taxes induce working time reduction in the context of a Nordic welfare state. The main empirical result is that both an increase in labour productivity and a widening of the tax wedge have indeed contributed to a decline in average working time in Finland. These observations are therefore consistent with the predictions of a theoretical model that is based on the notion of equilibrium working hours and provide a coherent explanation for the decline in average working time in Nordic welfare states during the past few decades.

Notes

[1] In German manufacturing industries a 35 hour week was adopted in the 1980s as a result of negotiations between unions and employers. In France, a 35 hour week has been legally enforced in order to alleviate the high level of unemployment. Hunt (1998) provides a detailed discussion of work-sharing across industrialized countries.

[2] See, for example, Pencavel (1986).

[3] Bell and Freeman (2001) argue that workers choose hours of work in order to gain promotions and advance in the distribution of earnings. This means that the more unequally distributed US earnings generate more hours than the German earnings distribution.

[4] Unfortunately, it is not possible to include in an empirical investigation variables that capture the composition of the labour force in Finland. This is due to the fact that the study takes a long-term view on average working time from 1960 to 1996 based on National Accounts. Employment Statistics by Statistics Finland, which includes detailed information about the composition of the labour force, was created in 1987. Thus, the motivation for an application of the representative agent framework can be strengthened by the fact that the empirical part of the study cannot take into account the composition of the labour force in Finland. This means that an application of the representative agent framework in

the theoretical part of the study is indeed consistent with the following empirical investigation of the study.

[5] SIC refers to Standard Industry Classification.

[6] In other words, we use actual average working hours as a proxy variable for standard hours.

[7] However, an application of Johansen's (1995) procedure reveals that the log of standard hours and the log of actual working hours per worker in Finnish manufacturing are not co-integrated variables. This result is not generated purely by the observations from the great slump of the early 1990s. Jacobson and Ohlsson (1996) have investigated the long-run relationship of standard hours and actual hours per worker in the case of the Swedish private sector from 1963 : 1 to 1993 : 4. They concluded that the log of standard hours and the log of actual hours per worker are co-integrated variables.

[8] Santamäki-Vuori and Parviainen (1996) provide a detailed description of the Finnish labour markets.

[9] The results are almost identical in the case of the random-effects model with respect to reported ones.

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