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OVERTIME IN FINLAND

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The study is about the incidence of overtime hours in Finland. The investigation uses individual-level data from the manufacturing industries from 1989 to 1995. The results show that the hours of overtime divided by the number of total hours decline as an employee ages. The overtime hours decline in wage per straight-time hours and in straight-time hours. Males and newcomers tend to work more overtime, but leavers work less overtime. The overtime hours are definitely more frequent in the population of small establishments. The degree of tightness in regional labour markets had no overall impact on the incidence of overtime from 1991 to 1995. There are strong industry effects. (JEL: J22)

1. Introduction

Despite the persistent unemployment in Europe, there are also a great number of employees that perform overtime hours. This same discrepancy is evident in Finland, where the unemployment rate has been at a high level despite the recovery from the great slump of the early 1990s.[1] At the same time, there has been a rise in overtime hours in Finland. The total hours of work consist of two major components. The so-called standard hours are determined by binding collective agreements. On the other hand, the overtime hours are determined at the individual level of the economy. Thus, the hours of overtime can vary from individual to individual for a variety of reasons.

However, the underlying empirical incidence of overtime hours has not been focused upon by labour market research in Europe.[2] The aim of this study is to characterize the incidence of overtime hours in Finland by using unique individual-level data from manufacturing industries from 1989 to 1995. The study also sheds light on the incidence of overtime induced by the heterogeneity of establishments. In addition, the study considers the impact of the degree of tightness in regional labour markets on overtime hours. This empirical investigation fills therefore a gap in the existing Finnish literature on working-time issues.

The study appears in six parts. The first part of the study clarifies the key conceptual questions and provides selected theoretical consid-

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[1] *Kiander and Vartia (1996) provide a description of the great slump of the early 1990s.*

[2] *Contensou and Vranceanu (2000) provide an elaboration of working-time issues.*

erations of the issue of overtime hours. The most important elements of overtime regulation by the Finnish institutions are also discussed. The second part provides a brief snapshot of earlier empirical investigations into the issues of overtime hours in Europe. Thus, the motivation of the selected variables in the estimated overtime equation is based on previous literature on the incidence of overtime hours at the individual level. In addition, an elaboration is focused on the available Finnish studies on the hours of work in the manufacturing industries. The third part provides a description of the individual-level data. The fourth part includes a characterization of paid overtime hours in a nutshell by illustrating the distributions of the most important variables and by applying a kernel-density estimation. The fifth part provides an analysis of the incidence of overtime hours by applying regression techniques. In particular, the study includes a consideration of establishment characteristics on the incidence of overtime hours at the individual level, which has been a largely neglected issue in the earlier literature on overtime hours. The last part concludes.

2. Background

The appearance of overtime hours can be explained by following Bauer and Zimmermann (1999). Firms use overtime hours (in other words, the intensive margin of labour utilization in contrast to the extensive margin of labour utilization), because of the presence of the quasi-fixed cost of employment, i.e. hiring and training costs and various employee benefits that are related to employment but not to performed working hours. In practice, firms can utilize overtime hours in different ways. There are two major types of overtime. The so-called transitory overtime hours are compensated for with free time for the employees involved. In this case, overtime hours are often used in order to increase the flexibility of a firm's operations. On the other hand, there are definite overtime hours which are not compensated for with free time. These definite overtime hours can further be divided into paid and unpaid overtime.

The literature usually focuses only on the paid definite overtime hours. This study is not an exception, because there is no information on the number of unpaid overtime hours in the Finnish manufacturing industries. The focus of the study on the incidence of the overtime hours of manual workers means that the exclusion of unpaid overtime hours is not a severe problem. This is due to the fact that, among manual workers, there are hardly any incentives to perform unpaid overtime hours. Bell *et al.* (2000) provide various reasons for performing unpaid overtime hours. The reasons (for example, the conjecture that unpaid overtime work represents a form of gift exchange à la Akerlof) point out that the incidence of unpaid overtime should be much more common among non-manual workers. However, the information compiled by Statistics Finland (1995) indicates that there was an increase in unpaid overtime hours during the great slump of the early 1990s.

Employers usually pay a substantial overtime premium. Hart and Ma (2000) provide a recent theoretical investigation into the presence of an overtime premium. The model indicates that the wage premium serves to achieve contract efficiency within the framework of asymmetric information. The result is based on the notion that with both extensive and intensive margins of labour utilization, the wage rate alone cannot be set to achieve both optimal separation and optimal worker utilization. Thus, the presence of an overtime premium provides an additional instrument that can solve the problem.

The productivity of performed overtime hours is an important element that affects the demand for overtime hours by firms. Ilmakunnas (1994) provides empirical evidence about the productivity of overtime hours for the Finnish manufacturing industries based on national accounts. The results indicate that the productivity of overtime hours is about the same as that of standard hours.

There is a potential role for establishment characteristics in the incidence of overtime hours. In particular, small establishments should use more overtime hours. This observation would be consistent with one of the well-known stylized features in the industrial organisation literature, which states that the variance of

growth rates in employment, sales or some other key measures of economic activity tend to decline with the size of an establishment (see Caves, 1998). Thus, small establishments should utilize more overtime, because they encounter more volatility in demand and production.

The institutional setup of the Finnish labour markets is relevant for the regulation of working time and for the overtime compensation schemes. Labour market policy is the result of a close and long-term interplay between organised agents and the government. In fact, Finland provides an example, par excellence, of a corporatist political and economic system (see, for example, Vartiainen, 1998). The regulation of working time in Finland is therefore based on the Working Hours Act, which is prepared on a tripartite basis (Santamäki-Vuori and Parviainen, 1996). This means that representatives of employers, employees and government are involved in the reforms of the Working Hours Act. The Working Hours Act is a general law, supplemented in many sectors by more specific acts. Under the Act, there are upper limits of 8 regular working hours per day and 40 per week.[3] According to the Working Hours Act, overtime comprises the time in excess of the regular hours, on either a daily or weekly basis. If the latter is used, overtime on individual days is not counted. Employees must also be paid extra for overtime hours in Finland. The (minimum) premium for daily overtime is 50% for the first two hours and 100% for each following hour. The premium for weekly overtime is 50%, irrespective of the number of hours.

3. Previous related studies

There are some empirical investigations into the issues of overtime hours. In particular, Green and McIntosh (2001) provide evidence on the intensification of labour effort in Europe. This snapshot of the existing literature is focused on the studies that look at the incidence of overtime hours at the individual-level of the economy.

The unregulated UK labour markets provide an interesting opportunity to investigate the incidence of overtime hours. Bell and Hart (1999) provide an analysis of the incidence of overtime hours in the UK by applying individual-level data on male non-managerial workers. The results can be summarized as follows. The straight-time wage exerts a negative influence on overtime incidence, which is consistent with an income effect. An increase in overtime hours at the individual level as the wage per straight-time hours rises would be consistent with the notion of the substitution effect. Straight-time weekly hours are also negatively related to the incidence of overtime hours. The number of overtime hours rises with age up to the late 40s before declining. Thus, there is an inverted U-profile. Central and local government workers work significantly fewer weekly overtime hours compared with the private sector workers, which is in line with the notion that various production fluctuations are more frequent in the private sector of the economy.[4] In addition, the results indicate that collective bargaining agreements succeed in reducing straight time while raising overtime hours with respect to uncov-

[3] *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 (1995) shows that average hours of work in advanced OECD countries fell from around 3000 hours a year in 1870 to between 1500 and 2000 hours a year by 1990. Evans, Lippoldt and Marianna (2001) note that the long-term decline in average annual hours has slowed down in almost all the OECD countries in recent years. Hunt (1998) provides an international comparision of standard hours for full-time manufacturing workers in selected industrialized countries. The shortest standard weekly hours are performed in Western Germany, where standard weekly hours consists of 36.4 hours.*

[4] *This notion is a tautology in the case of Finland, because the output of the public sector is defined as a sum of hours by Statistics Finland. The other reasons for the low share of overtime hours within the public sector may include tight labour contracts and tight budget ceilings, which do not allow paid overtime hours. Overtime hours could be used even in the total absence of fluctuations in production, due to the fixed costs of hiring and training new employees. Fluctuations may increase the utilization of overtime hours without increasing the total working time if overtime hours are compensated for with time off instead of increased earnings. The latter case corresponds to the so-called transitory overtime hours that are used to increase the flexibility of a firm's operations.*

ered workers.[5] This feature enchances the covered/uncovered wage differential in the UK. Green (2001) reports that the dispersion of working hours has indeed recently increased in the UK. Thus, working hours have been concentrated in fewer households.

Bell *et al.* (2000) observe that the quantitative significance of both paid and unpaid overtime is greater in the UK with respect to Germany. They present overtime hours equations by applying the Tobit estimating procedure. The results indicate that paid overtime is more common among manual workers. In addition, the study includes company size as a potential factor in explaining overtime hours. Based on *a priori* reasoning, it would be expected that larger firms would more typically formalise their work arrangements. This is done in an effort to reduce various transaction costs associated with operations. Larger firms should therefore use more paid overtime hours, but fewer unpaid overtime hours due to more formal work arrangements. However, the empirical results by Bell *et al.* (2000) are mixed in this respect and do not provide solid evidence for the hypothesis that the share of paid overtime hours is higher among large firms.

A well-known empirical regularity says that overtime hours rapidly adjust to the scale of economic activity.[6] Hart (2001) provides an elaboration of overtime hours based on a panel of 28 local labour markets for the period 1926–1938. The results reveal that the British engineering industry adjusted to the severe falls in demand during the 1930s by cutting the hours of work. Kalwij and Gregory (2000) investigate the issue of overtime hours in Great Britain during the period from 1975 to 1999. The study indicates that as in a number of other countries the incidence of overtime indeed shows a distinct procyclical movement during the period of investigation. The easiest way to capture this feature of overtime hours is simply to introduce year dummies into the estimated overtime equations.[7]

Working time issues have been debated in Germany. Thus, there are studies of overtime hours with German data. Bauer and Zimmermann (1999) provide a detailed elaboration of overtime hours in Germany by applying individual-level data. The estimated overtime equations are similar Tobit specifications, as in the investigation by Bell and Hart (1999). The results reveal that individuals working in small firms have a higher probability of working overtime hours. Levels of skill play an important role in the incidence of overtime hours. In particular, skilled blue-collar workers are more likely to work overtime than unskilled blue-collar workers.[8] Bauer and Zimmermann (1999) also note that the share of overtime has declined sharply in Germany during the past few decades. Bell and Freeman (2001) argue that workers choose hours of work in order to gain promotions and advance in the distribution of earnings. The more unequally distributed U.S. earnings therefore generate more overtime hours than the German earnings distribution.

The earlier empirical research on working time issues has mainly focused on one feature of the overtime hours in Finland. Thus, Holm and Kiander (1993), and Ilmakunnas (1995) conclude that reductions in standard working time have had a slight employment-increasing effect, but no effect on overtime hours. This means that there has been no rise in the share of paid overtime hours within the Finnish manufacturing industries during the past few decades (Figure 1).[9] In other words, in the long run

[5] *The consideration of collective agreements on the incidence of overtime hours in the Finnish manufacturing industries is not possible, because the binding collective agreements cover the whole of the manufacturing industries in Finland.*

[6] *Overtime hours are sometimes used as a leading indicator of economic activity. Golden and Glosser (1994) observe that the length of the average working week in the U.S. manufacturing industries has become less associated with the business cycle over the past few decades.*

[7] *The following analysis of overtime hours within the Finnish manufacturing industries does not incorporate macroeconomic indicators, because the focus of the study is on the incidence of overtime hours at the individual level.*

[8] *The consideration of education of workers on the incidence of overtime is not possible due to the fact that the data does not contain an education code at all. However, it can be argued that education is not important in the incidence of overtime hours owing to the homogeneity of the labour force within the Finnish manufacturing industries.*

[9] *Figure 1 implies that the average for the variable OVERTIME from 1989 to 1995 is 3.3%. In contrast, the applied version of the individual-level data implies that the*

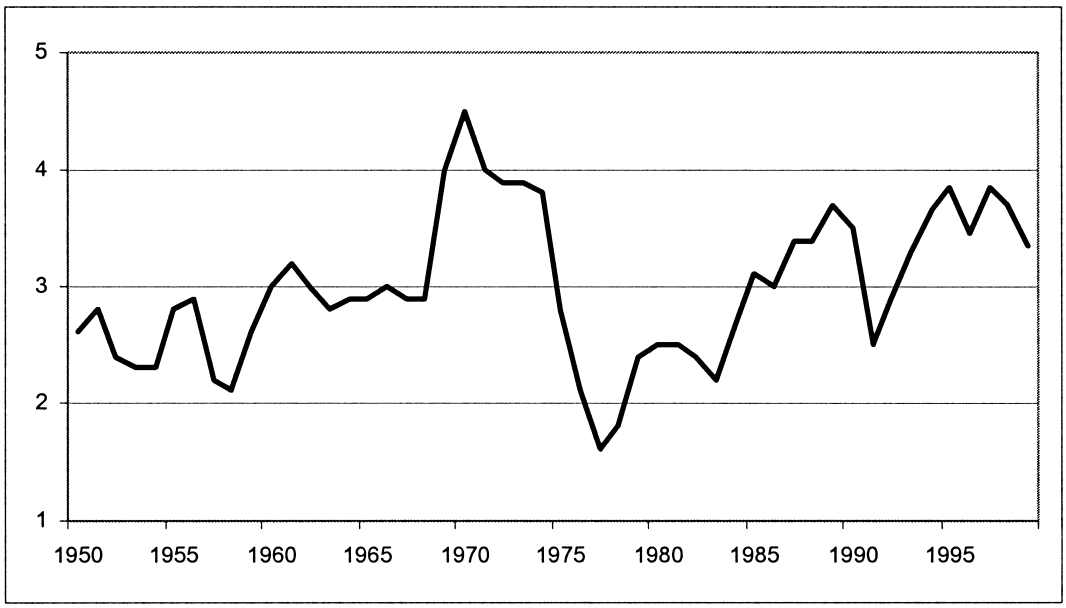

Figure 1. A share of overtime hours with respect to the total working time in the Finnish manufacturing industries from 1950 to 1999 (%) (Source: The Confederation of Finnish Industry and Employers).

the time path of actual working hours closely follows that of standard hours working, at least in the case of the Finnish manufacturing industries. This is due to the fact that a permanent increase in overtime is a far too expensive way to adjust labour input from the point of view of firms.

However, there is one earlier study that applies detailed individual-level data in the elaboration of overtime hours in the Finnish economy. Asplund (1995) has investigated the underlying incidence of overtime hours in Finland from 1980 to 1993 by applying the same individual-level data covering the manufacturing industries as in this study. However, the article by Asplund (1995) does not include tabulation of the estimation results concerning the incidence of overtime hours at the individual level. The unreported results are said to be based on various specifications of Tobit and Probit regressions. The main focus in the investigation by Asplund (1995) is on the underlying sectoral composition of overtime hours and the individual characteristics in the incidence of overtime hours. The results based on the individual-level data indicate that there are some key factors that explain most of the incidence of overtime hours within the Finnish manufacturing industries. These factors are, by nature, rather similar to the variables applied in the empirical studies by other countries' data. These variables include age (i.e. young employees tend to work more overtime hours than older ones) and gender (i.e. men tend to work more overtime than women). The results also reveal that newcomers tend to work more overtime than the rest of the personnel within manufacturing firms. In addition, there was a sharp decline in overtime hours during the great slump of the 1990s in Finland. However, the study by Asplund (1995) does not include the elaboration of establishments' characteristics (such as the size of the establishment) as a potential element of the underlying incidence of overtime hours

average for the variable OVERTIME is 2.7% for the same period (see Appendix). This discrepancy is due to the fact that the applied individual-level data covers only the last quarter of each year from 1989 to 1995. According to Skans (2001), the share of overtime hours was on average 2.85% for daytime workers within Swedish manufacturing industries during the second quarter from 1989 to 1992 and 3.7% for 2-shift workers.

in the manufacturing industries in Finland. The effect of establishment size on the incidence of overtime hours is an interesting question to address, because Hohti (2000) has recently discovered that there was an episode of convergence in the actual average working hours across the size categories of establishments within the Finnish manufacturing industries from 1990 to 1994.

4. The data

The empirical investigation is based on yearly observations from 1989 to 1995. The data covers the manufacturing industries in the Finnish economy. This narrow focus of the study on the manufacturing industries is dictated by the availability of data. It is a major drawback, due to the well-known empirical regularity, that in the modern industrial economies the contribution of manufacturing industries to GDP has declined considerably during the past few decades. Thus, the modern economies have strongly tended to draw away from the manufacturing industries toward the service sectors. This stylized fact of structural change in the composition of economic activity applies to Finland.

However, despite this apparent erosion in the relative strength of the manufacturing industries, manufacturing still represents a more important role in the Finnish economy compared with most of the European countries. In addition, non-manufacturing industries represent other forms of less stable labour relations such as part-time work and various temporary employment contracts (see Kauhanen, 2000), which can be considered to be substitutes for the implementation of overtime hours from the point of view of firms.

The individual-level data is from the records of the Confederation of Finnish Industry and Employers (*Teollisuus ja Työnantajat*, TT). Approximately 5 600 companies are members of the Confederation. These companies employ nearly 470 000 persons. The member companies account for more than 75% of the nation's industrial value added and export income. The data is based on the fact that each year TT conducts a survey among its member employers and gathers detailed information on paid wages, salaries and the hours of work of employees (see Kettunen and Marjanen, 1992; Kettunen and Vartiainen, 1993; Vartiainen, 1993; Asplund, 1994). The sample contains all the workers who are employed in a firm that is affiliated to TT. Year 1990 was chosen as the base year and within each firm the workers were put in order according to their mean pay and every 15th worker was then selected for the sample. Longitudinal data was then created from 1990 onwards and backwards by applying unique personal codes that identify the workers of the manufacturing industries in Finland. The applied version of the data covers the situation during the last quarter of each year from 1989 to 1995. Thus, the data does not contain, for example, students that work only during the summer vacations. The data contains 56 135 observations.

The individual-level data is originally from 1980 to 1995. However, in this analysis of the incidence of overtime hours it is important to take into account the characteristics of establishments, which are available only from 1989 onwards. Thus, the applied version of the data in the following elaboration is from 1989 to 1995. In addition, it is important to stress that the data is not complete linked employer-employee data, because it contains only the size of establishment and the share of women in the establishment.

The applied variables of the analysis are summarized in Table 1. The Appendix provides the selected descriptive statistics for the most important variables in the estimated overtime equations. In the following analysis of the incidence of overtime hours an effort is made to explain a share of overtime hours in the total hours of work at the individual level (OVERTIME). The share of overtime is, by definition, a variable bounded by [0, 1]. However, the upper bound of the variable is reached if and only if an individual does not perform standard hours of work at all, which is in practice out of the question owing to the overtime regulations in the Finnish manufacturing industries.

Most of the selected variables are (almost) self-evident. The variable WAGE does not include any earnings from overtime hours, be-

Table 1. Descriptions of the selected variables.

Variable	Definition/measurement
Individual-level characteristics:	
OVERTIME	Hours of overtime divided by the number of total hours
AGE	Age of an employee
AGE^2	AGE squared
WAGE	A log of the wage of an employee divided by the straight-time hours
$WAGE^2$	WAGE squared
TIME	Straight-time hours
$TIME^2$	TIME squared
GENDER	1=female, 0=male
NEWCOMER	Employee that was not in the industry one year previously, 1=newcomer, 0 otherwise.
LEAVER	Employee that leaves the industry between this year and the next, leaver=1, 0 otherwise.
EXPERIENCE	Total number of years in which the worker appears in the applied data from 1980 to 1995. The variable provides a crude measure of the professionality of an individual in the manufacturing industries.
METROPOLITAN	The collective agreement stipulates slightly higher pay in the metropolitan areas where the costs of living (such as housing) are presumably higher; a person is living in the metropolitan area=1, 0 otherwise.
Establishments' characteristics:	
SIZE	Size of establishment measured by the number of employees
$SIZE^2$	SIZE squared
WOMEN	Share of women in the establishment
Additional regional variable:	
UN	The regional unemployment rate (%) is for the 85 Finnish subregions (the so-called NUTS4–level of the European Union).
Dummy variables:	
INDUSTRIES	5-1, attached to employees based on the union code of an employee.
YEARS	7-1, from 1989 to 1995
OCCUPATIONS	428-1, based on the classification of occupations by Statistics Finland (1987).
REGIONS	281-1, based on the counties in Finland

cause then it would be an endogenous variable in the overtime equation. The variable NEWCOMER captures the new employees in the industry and the variable LEAVER captures the employees that leave the industry. It can be argued that the newcomers and the leavers are more "volatile persons" that represent more loose matches between employees and establishments.[10] The newcomers want to signal their high level of ability to their employers by extending the hours of overtime. Theory suggests that overtime is a credible signal, because it is costly to the employee in terms of lost leisure. Altonji and Paxson (1988; 1992) interpret the variable that indicates a quit in the hours equation as an indication of the underlying feature of labour markets that there are various hours restrictions within jobs induced by employers. This means that the desire to reduce or increase hours could not be acted upon in the current match.

[10] *Lazear (1998) argues that firms like to hire risky workers in order to cash option values. Risky workers have some additional value from the point of view of firms because a better-than-expected worker can be kept and a worse-than-expected can be forced out of the match via layoff. This feature of the optimal hiring policy is due to the fact that incomplete information between employer and employee means that the underlying quality of a new match will reveal itself only through experimentation. In particular, firms in growing industries should prefer young, high variance workers and be characterized by high worker turnover rates.*

The applied variable EXPERIENCE is a crude measure of how attached an employee is to the population of manufacturing establishments in Finland. The variable EXPERIENCE is calculated covering the whole period from 1980 to 1995. The applied variable is an imperfect and also downward biased measure of genuine labour market experience, because it does not capture at all employees' experience outside the manufacturing industries in Finland.

There is an additional regional variable from 1991 to 1995, namely, the regional unemployment rate (UN). In principle, there are two basic hypotheses concerning the effect of the regional unemployment rate on the incidence of overtime hours. The first hypothesis is based on the notion that the regional unemployment rate can be considered to be a proxy variable for local demand conditions. In other words, strong local demand for products of manufacturing industries could deliver a low level of unemployment and a high level of hours of overtime at the same time. However, this hypothesis is not on solid foundations, because most of the manufacturing industries are not selling their final products to the region in which they are located. The second hypothesis, which is more appealing, stipulates that the regional unemployment rate is an indicator of the degree of tightness in regional labour markets. In other words, a low level of regional unemployment could then be associated with a shortage of labour resources and deliver a strong demand for overtime hours at the establishment-level of the economy.

The applied data contains no industry classification as such. However, by using the code that delivers the information about the attachment of the employee to the collective agreements it is possible to create good proxies for the industry dummies. The industries of this study are as follows: (i) metal industries, (ii) textile industries, (iii) apparel industries, (iv) manufacture of wood and wood and cork products, and (v) manufacture of paper and paper products. Thus, the study includes a large number of dummy variables. These variables are attached to the industries, occupations, regions (i.e. counties) and years (because of the fluctuations of overtime hours due to business cycles during the 1990s). The occupation dummies are not included in the following estimations due to their poor performance in the overtime equations.

5. *The characterization of overtime hours at the individual level*

This section of the study provides a brief characterization of overtime hours at the individual level by illustrating the distributions of the most important variables and by applying a kernel-density estimation. The main stylized features can be summarized as follows. The first fact concerns the notion that for most of the employees overtime hours represent only a small part of the total hours of work. This observation is evident in the figure showing the underlying distribution of overtime hours (Figure 2). This stylized feature means that the hours of overtime are an extremely flexible part of total working time at the individual level, because there is a large scope for the increase of paid overtime hours.

In other words, according to the data, overtime compensation from 1989 to 1995 covers on average only about 1.8% of the total salary of manual workers in the Finnish manufacturing industries.[11] Thus, it seems reasonable to relate the incidence of overtime hours to various measurable characteristics held by individuals and establishments. The limited use of overtime means that there must be certain underlying economic fundamentals that give rise to the utilization of overtime hours and determine the distribution of overtime among individuals. This feature of overtime hours also means that the various reforms of taxation that affect the supply of hours of work should have a large impact on overtime hours.

The distributions of the share of the overtime hours at the individual level tend to give support to the notion that the share of overtime is

[11] *The unreported results show that overtime compensation divided by overtime hours is higher in the smaller plants in the Finnish manufacturing industries. Bauer and Zimmermann (1999) investigate the determination of overtime compensation in Germany.*

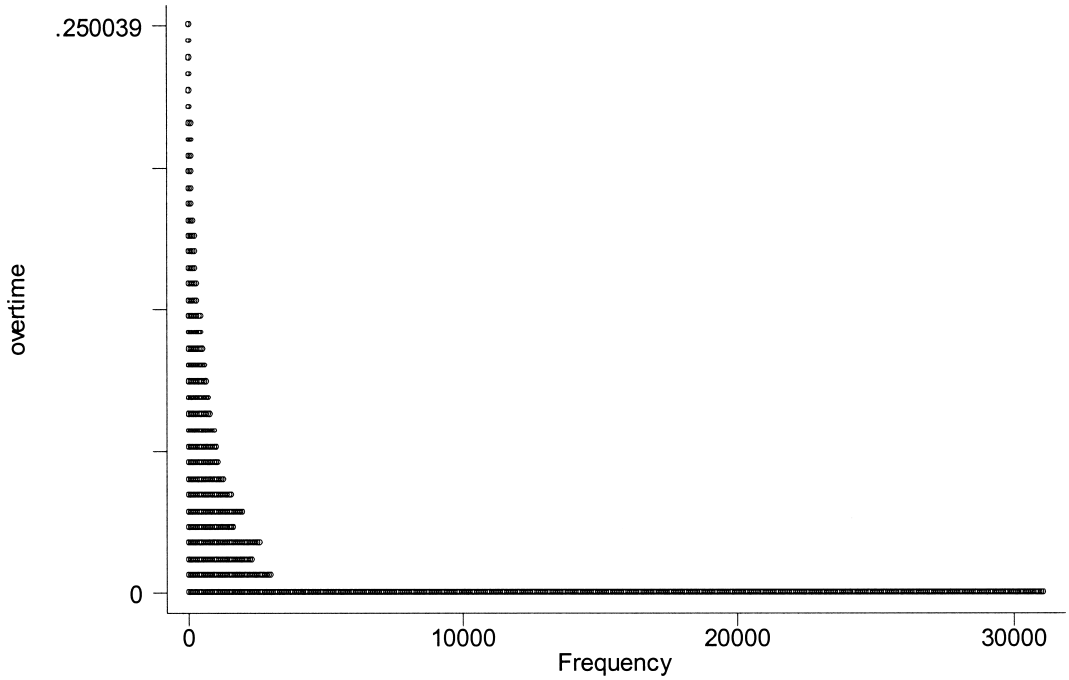

Figure 2. The distribution of OVERTIME from 1989 to 1995. The distribution is cut off at 0.25, which eliminates 406 observations.

negatively related to the age of an employee within the Finnish manufacturing industries (Tables 2a–2b). This pattern seems to be in contrast with a number of earlier empirical studies on the incidence of overtime hours that have found an inverted U-shape relation of overtime hours in terms of age in the European labour markets. However, Graversen and Smith (1998) document the inverted U-profile in terms of age for Danish men, but are unable to find it for Danish women.

Stewart and Swaffield (1997) provide an explanation for an inverted U-shape pattern of overtime hours with respect to age, which is based on the notion that over a third of manual workers in the UK would prefer to work fewer hours at the prevailing wage than they do. The inverted U-profile of overtime hours can therefore be rationalized as a result of deviations between desired and actual hours, i.e. employees are forced to work more hours than they want to because of institutional forces, job insecurity etc. Steward and Swaffield (1997) further argue that the fact that the age profile of desired hours is not matched by that in actual hours means that employers set constraints of hours above employee preferences. Ilmakunnas (1997) provides evidence that there exist a great number of disparities in desired and actual hours of work even in Finland.[12]

The share of the overtime hours at the individual level seems to be positively related to the variable WAGE (Tables 3a–3b). The distributions suggest that the overtime hours tend to rise at the individual level as the wage per straight-time hours rises, which is consistent with the notion of the substitution effect. Graversen and Smith (1998) observe the positive association for Danish workers between overtime hours and wage per straight-time

[12] *Clark (1998) and Evans, Lippoldt and Marianna (2001) report that the disparity between actual and desired hours is common across OECD countries. Torp and Barth (2001) report that full-time workers typically want shorter working hours and part-time workers want longer working hours. Hunt (1998) observes that the gap between actual and desired hours has been narrowed by reductions in standard hours in Germany.*

Table 2a. The distribution of share of overtime hours across AGE groups.

AGE groups	15–30	31–45	46–65
Mean	0.03090	0.02870	0.02375
25th percentile	0	0	0
50th percentile	0	0	0
75th percentile	0.04270	0.03797	0.02970
95th percentile	0.13805	0.13514	0.11688
Number of observations	12 223	28 266	18 945

Table 2b. The distribution of share of overtime hours across AGE groups for the population of employees who have performed overtime hours.

AGE groups	15–30	31–45	46–65
Mean	0.06171	0.05974	0.05418
25th percentile	0.01887	0.01805	0.01613
50th percentile	0.04308	0.04043	0.03670
75th percentile	0.08444	0.08309	0.07523
95th percentile	0.18036	0.17684	0.15777
Number of observations	6 054	12 885	7 258

hours. Finally, the share of the overtime hours seems to be negatively related to the size of the establishment (Tables 4a–4b). Thus, there is preliminary evidence that the employees in the population of small establishments tend to work more overtime than the rest of the workers in the manufacturing industries in Finland.[13]

The distribution of straight-time hours reveals additional features. Thus, Figure 3 depicts the kernel-density estimate of straight-time hours from 1989 to 1995.[14] The applied variable TIME does not match the definition of so-called standard hours stipulated by the collective agreements in the Finnish manufacturing industries. The reason is that the data covers manual workers that have worked only a part of the last quarter from 1989 to 1995. Thus, the data contains, for example, workers that have had sick leaves during the period of the sample. The temporary employment contracts associated with Christmas holidays are an additional reason for the fact that the variable TIME does not correspond to standard hours during the last quarters.

6. The results

Because the share of overtime is, by definition, a censored variable bounded by [0, 1], it is convenient to estimate a Tobit specification following the recent empirical studies by Bauer and Zimmermann (1999), and Bell and Hart (1999) as follows:

$$(1)\quad \text{OVERTIME}_i = \begin{cases} \beta'\mathbf{X}_i + \varepsilon_i & \text{if} \quad \beta'X_i + \varepsilon_i > 0 \\ 0 & \text{if} \quad \beta'X_i + \varepsilon_i \leq 0, \end{cases}$$

where the dependent variable OVERTIME_i refers to the share of overtime hours with respect to the individual i, $\mathbf{X}_i$ is a vector of explanato-

[13] *The impression is biased by the fact that the turnover in terms of entry and exit is much higher among small plants. Naturally, overtime hours are observed only in the case that it is a number above zero. In addition, it can be argued that the result according to which there is a decline in the share of overtime hours in the size establishment is based on simple arithmetics, because it is not possible for small establishments to make proportionately small changes in the number of their personnel. However, this discreteness of adjustment of labour input in the population of small establishments does not make the feature less interesting and it must also be noted that the distinction between paid and unpaid overtime hours complicates this simple pattern.*

[14] *The Epanechnikov is the applied kernel density estimate. It has the property that it is the most efficient in minimizing the mean integrated squared error. DiNardo and Tobias (2001) provide a survey of nonparametric density and regression estimation.*

Table 3a. The distribution of share of overtime hours across WAGE groups.

WAGE groups	7.65–8.5	8.51–9.0	9.1–11.8
Mean	0.01298	0.03351	0.13677
25th percentile	0	0	0.00472
50th percentile	0	0.00645	0.10420
75th percentile	0.01220	0.05048	0.22628
95th percentile	0.07356	0.14113	0.39098
Number of observations	22 769	30 224	887

Table 3b. The distribution of share of overtime hours across WAGE groups for the population of employees who have performed overtime hours.

WAGE groups	7.65–8.5	8.51–9.0	9.1–11.8
Mean	0.03814	0.06147	0.17814
25th percentile	0.01124	0.02041	0.06813
50th percentile	0.02778	0.04511	0.15744
75th percentile	0.05328	0.08811	0.26121
95th percentile	0.11111	0.16901	0.41304
Number of observations	7 751	16 475	681

Table 4a. The distribution of share of overtime hours across SIZE groups.

SIZE groups	1–20	21–100	101–200
Mean	0.02793	0.02735	0.02344
25th percentile	0	0	0
50th percentile	0	0	0
75th percentile	0.03562	0.03793	0.03226
95th percentile	0.13636	0.12453	0.10972
Number of observations	30 779	21 533	3 756

Table 4b. The distribution of share of overtime hours across SIZE groups for the population of employees who have performed overtime hours.

SIZE groups	1–20	21–100	101–200
Mean	0.06216	0.05581	0.04851
25th percentile	0.01786	0.01778	0.01724
50th percentile	0.04167	0.03904	0.03390
75th percentile	0.08571	0.07818	0.06612
95th percentile	0.18505	0.16117	0.14504
Number of observations	13 829	10 553	1 815

ry variables, β is a vector of the estimated coefficients, and ε_i is a normal distributed error term with mean 0 and variance σ^2.

The estimation results are summarized in Table 5. The results reveal that the hours of overtime divided by the number of total hours decline as an employee ages.[15] The overtime hours tend to decline at the individual-level as the wage per straight-time hours rises. This negative effect from wage per straight-hours to overtime hours is an indication of the income

[15] *The derivation of the estimated equation with respect to the variable AGE reveals the fact that all observations of the data are on the declining section of the estimated parable. This same pattern extends to the variables WAGE and TIME.*

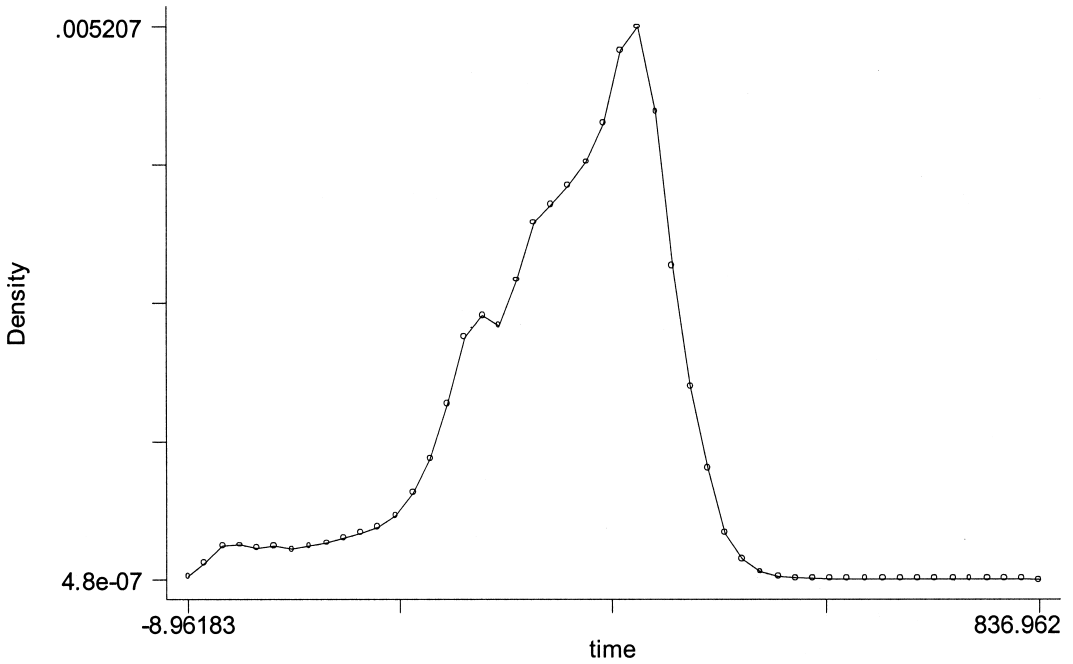

Figure 3. Kernel density estimate for TIME from 1989 to 1995.

effect. However, a specification of the overtime equation that includes regional dummies (reported as Model 2 in Table 5) implies that there is, in fact, an increase in the share of overtime hours as the wage per straight-time rises, which is indeed consistent with a substitution effect. An increase in the straight-time hours gives a mild decline in the overtime hours. The Finnish results are therefore in line with the observations by Bell and Hart (1999) that straight-time weekly hours are negatively related to the incidence of overtime hours in the UK.

The observation that a decline in straight hours would lead (other things being equal) to an increase in overtime hours is not favourable to the conduct of work-sharing in the Finnish manufacturing industries.[16] However, the variation in the variable TIME comes, in addition to negotiated working-time reductions, from part-time work, absence due to sick leaves, holidays etc., and from the inclusion of the employees that are newcomers and leavers during the last quarters.[17]

Males work more overtime.[18] The reason can be the division of labour within families. Thus, families like to extend the hours of work by males, because males typically have higher hourly wage prospects. Females often have looser connections to the labour market in Finland too, at least during their childbearing years, when they, to a larger extent than males, work

[16] *In fact, an increase in paid or unpaid overtime hours can even reverse the supposed positive employment effects of work-sharing. Hamermesh (1993) provides a summary of the empirical studies.*

[17] *The inclusion of year dummies diminishes the variation in the TIME variable that comes from the reductions in standard working hours, because the Finnish manufacturing industries are characterized by binding collective agreements. Calmfors and Hoel (1988) provide a theoretical analysis of the employment effects of reduced standard working hours when overtime is allowed to adjust in firms. Calmfors and Hoel (1988) stress that a reduction in standard working hours may increase the costs per worker in relation to the cost of overtime. Thus, firms substitute overtime for workers. This substitution effect may reduce employment when output is fixed by demand. Hunt (1999) is able to exploit the cross-industry variation in standard hours in order to study the effects of work-sharing in Germany.*

[18] *About 73% of employees are males in the Finnish manufacturing industries.*

Table 5. The results from Tobit regressions (dependent variable: OVERTIME).

	Model 1		Model 2	
	Coefficients	t-statistics	Coefficients	t-statistics
AGE	0.00118	2.33	0.00121	2.41
AGE^2	–0.02087	–3.35	–0.02028	–3.28
WAGE	0.69359	6.96	0.38551	3.89
$WAGE^2$	–2.88209	–4.90	–0.98603	–1.68
TIME	0.00027	11.65	0.00027	11.79
$TIME^2$	–0.00386	–5.12	–0.00388	–5.19
GENDER	–0.00707	–6.98	–0.00621	–6.07
NEWCOMER	0.01700	12.74	0.01620	12.34
LEAVER	–0.00368	–3.01	–0.00353	–2.91
EXPERIENCE	–0.00114	–10.91	–0.00122	–11.41
METROPOLITAN	0.00001	0.08	–0.00331	–0.69
SIZE	–0.00025	–23.86	–0.00026	–15.39
WOMEN	–0.00014	–2.21	–0.00011	–1.75
Constant	2.60830	3.01	–0.31172	–0.36
Dummy variables:				
INDUSTRIES	Yes		Yes	
YEARS	Yes		Yes	
OCCUPATIONS	No		No	
REGIONS	No		Yes	
Log-likelihood	14518.8		15906.1	
Observations	55 896		55 896	
Censored observations	29 776		29 776	

part-time or are out of the labour force (for example, due to maternity leaves).[19]

Newcomers tend to work more overtime, but leavers work less overtime. The results are therefore in line with the notion that newcomers want to signal their high level of ability to their employers by extending the hours of overtime. The observation that leavers work less overtime is in line with the conjecture that a decline in overtime hours could serve as a signal that the employee is about to separate from the current match. The results concerning newcomers and leavers mean that the enormous magnitude of gross worker flows in the economies can perhaps partly be explained by the fact that there are hours restrictions within jobs induced by employers.[20] More experienced employees tend to work fewer overtime hours in the Finnish manufacturing industries. An explanation of this feature of the incidence of overtime hours could be that senior workers tend to work more unpaid overtime, because they occupy higher positions within establishments. The variable METROPOLITAN is not a statistically significant factor to explain the incidence of overtime hours.

As to the establishment characteristics, the hours of overtime are definitely more frequent in the population of small establishments in the Finnish manufacturing industries.[21] This particular observation is consistent with a stylized feature that was discussed earlier, according to which the variance of growth rates in the measures of economic activity tend to decline with

[19] *Ilmakunnas (1997) provides a recent study on Finnish female labour supply.*

[20] *Davis and Haltiwanger (1999) provide a survey of the literature on gross job and worker flows.*

[21] *The result is somewhat contradictory with the observation by Eriksson and Fellman (1995), according to which operating hours of firms tend to rise in plant size within the Finnish manufacturing industries.*

Table 6. The results from Tobit regressions (dependent variable: OVERTIME). The Model 4 is estimated from 1991 to 1995.

	Model 3		Model 4	
	Coefficients	t-statistics	Coefficients	t-statistics
AGE	0.00123	2.43	0.00130	1.96
AGE^2	–0.02159	–3.45	–0.02229	–2.71
WAGE	0.69170	6.94	0.75799	6.00
$WAGE^2$	–2.87012	–4.87	–3.28671	–4.38
TIME	0.00027	11.63	0.00035	11.69
$TIME^2$	–0.00384	–5.10	–0.00597	–6.21
GENDER	–0.00729	–7.13	–0.00631	–4.93
NEWCOMER	0.01707	12.78	0.02000	11.40
LEAVER	–0.00372	–3.03	–0.00432	–2.62
EXPERIENCE	–0.00112	–10.69	–0.00109	–8.63
METROPOLITAN	0.00022	0.27	–0.00017	–0.16
SIZE	–0.00019	–4.71	–0.00023	–17.89
$SIZE^2$	–0.00092	–1.61	..	..
WOMEN	–0.00019	–2.69	–0.00013	–1.77
UN	..	..	0.00007	0.47
Constant	2.59426	2.99	3.19497	2.89
Dummy variables:				
INDUSTRIES	Yes		Yes	
YEARS	Yes		Yes	
OCCUPATIONS	No		No	
REGIONS	No		No	
Log–likelihood	14520.1		8638.4	
Observations	55 896		36 795	
Censored observations	29 776		20 108	

the size of an establishment. Small establishments therefore utilize more overtime due to the fact that they encounter more volatility in demand and production.

The following focuses more closely on this establishment size effect by using different specifications and illustrating how this effect interacts with economic factors. The estimation results indicate that there is no empirical evidence for the presence of a quadratic effect for the establishment size within the manufacturing industries in Finland (reported as Model 3 in Table 6). Thus, the simple linear specification of the overtime equation captures the effect.

In order to investigate the business cycle effects, the relationship of overtime hours and the size of an establishment were estimated separately for each year from 1989 to 1995 (Table 7). The year 1991 constituted the bottom of the great Finnish slump of the early 1990s measured by the net rate of employment change. The results therefore reveal that the observation that overtime hours decline in the size of an establishment also held during the great depression.

However, the conclusion based on the 95% confidence intervals of the estimated coefficients of the variable SIZE indicates that the effect of establishments' size on overtime hours was slightly milder at the bottom of the slump of the early 1990s than before and after the depression. This feature of adjustment means that the population of small establishments tailored labour input downwards proportionally more via reducing the hours of overtime during the great slump of the early 1990s. This pattern of

Table 7. The results from Tobit regressions (dependent variable: OVERTIME). The Tobit regressions are estimated separately for each year from 1989 to 1995. To save space only the estimated coefficients for the variable SIZE are shown. (The detailed results are available from the author upon request.) The control variables are the same (excluding year dummies) as the ones in Model 1 reported in Table 5.

Variable	Coefficient	t-statistics	Number of observations
SIZE (year = 1989)	–0.00033	–13.59	9 868
SIZE (year = 1990)	–0.00023	–8.62	9 233
SIZE (year = 1991)	–0.00013	–4.31	8 155
SIZE (year = 1992)	–0.00018	–5.78	7 399
SIZE (year = 1993)	–0.00030	–9.71	6 799
SIZE (year = 1994)	–0.00036	–13.57	7 129
SIZE (year = 1995)	–0.00024	–8.20	7 313

overtime hours is consistent with an earlier observation by Hohti (2000) for the Finnish manufacturing industries, according to which there was an episode of convergence in the actual average working hours across the size categories of establishments from 1990 to 1994. An explanation for this feature of overtime is that the hours of overtime are, for small establishments, a natural starting point when downsizing labour input, owing to the smallness of these establishments in terms of aggregate employment when slumps occur. Thus, the stylized feature that paid overtime hours are more common among small establishments does not collapse during times of extreme economic slowdown, and the magnitude of this effect has definitely been procyclical from 1989 to 1995. These observations mean that the small plants seem to react differently to variations in product demand, which mostly varies with time.

The establishments that have less than twenty employees were omitted from the data, but the result according to which overtime hours are more common among small establishments remained.[22] In this case, the estimated coefficient for the variable SIZE is –0.00010 with corresponding t-statistics of –6.92.[23] Thus, the stylized feature according to which overtime hours are more common among small establishments is not driven by the small plants, either.

The overtime equation was estimated separately for the five industries of this study (Table 8). The estimations reveal that overtime hours are more common among small establishments within the metal industries, the manufacture of wood and wood and cork products, and the manufacture of paper and paper products that constitute the major parts of the Finnish manufacturing industries. In contrast, there is no relationship between overtime hours and the size of an establishment at all within the textile industries. In addition, within the apparel industries the hours of overtime are actually more common among larger establishments.

The basic difference between these industries is the fact that the metal industries, the manufacture of wood and wood and cork products, and the manufacture of paper and paper products are more capital-intensive by nature than the textile industries and the apparel industries. Thus, the more flexible working hours in terms of overtime hours are used within these capital-intensive industries in order to take full advantage of establishments' accumulated capital stock in the volatile environment in which small establishments are positioned.

All in all, the estimation results suggest that the preferred estimate of the SIZE effect seems to be around 0.00025. The estimated effect is moderate by its magnitude, because it implies that the average share of overtime hours would be 0.04 percentage points lower in establishments that have 180 employees compared with the establishments that have only twenty employees. The magnitude of the estimated SIZE effect is therefore nicely in line with the distributions of overtime hours across the SIZE groups that were reported in Tables 4a–4b.

The results further show that the regional unemployment rate has no overall role in the determination of overtime hours (reported as Model 4 in Table 6). In other words, the degree of tightness in regional labour markets had no impact on the incidence of overtime hours from 1991 to 1995. The result can be rationalized by noting that the Finnish economy experienced an extreme economic slowdown during the early 1990s. There was therefore no shortage of em-

[22] *This restriction eliminates 29 722 observations.*

[23] *The specification applies the same control variables as Model 1 that is reported in Table 5.*

Table 8. The results from Tobit regressions (dependent variable: OVERTIME). The Tobit regressions are estimated separately for each industries of the data from 1989 to 1995. To save space only the estimated coefficients for the variable SIZE are shown. (The detailed results are available from the author upon request.) The control variables are the same (excluding industry dummies) as the ones in Model 1 reported in Table 5.

Industry	Coefficient	t-statistics	Number of observations
The metal industries	–0.00026	–19.62	31 085
The textile industries	0.00028	1.10	2 650
The apparel industries	0.00085	3.42	2 356
The manufacture of wood and wood and cork products	–0.00011	–5.70	13 342
The manufacture of paper and paper products	–0.00049	–4.48	6 463

ployees. In fact, the regional unemployment rate has no impact on the incidence of overtime hours even when the overtime equation is estimated separately for the year 1995, which constituted the second year of the recovery from the great slump of the early 1990s measured by the net rate of employment change. Thus, in this case the estimated coefficient for the variable UN is –0.00020 with corresponding t-statistics of –0.64.[24] An additional reason for the fact that the regional unemployment rate had no impact on the incidence of overtime hours is that there was a rapid rise in the pace of interregional migration that started during the early 1990s (see, for example, Pekkala and Ritsilä, 2001), which loosened the constraints given by regional labour markets.

However, an investigation of the interaction of establishment size with the regional unemployment rate reveals an interesting pattern of adjustment in overtime hours. There is, namely, a positive effect from the regional unemployment rate to the share of overtime hours in the population of the small plants that have less than twenty employees (Table 9). The result may arise at least partly due to the fact that the data of this study does not contain variables that capture features such as the profitability of an establishment. The population of the small plants can therefore be more profitable and thus utilize more overtime hours despite the fact that they are located in the regions of the high unemployment rate. Another possible interpretation is that an increase in the regional unemployment rate yields an increase in the perception of job instability that induces workers to extend their overtime in order to signal their commitment to their employer in the population of the small plants. In contrast, there is a negative relationship between the share of overtime hours and the regional unemployment rate in the population of the plants that have more than twenty employees. In other words, these plants indeed utilize less overtime in the regions of a high unemployment rate, which is consistent with an earlier notion that a low level of the regional unemployment rate is associated with a shortage of labour resources and yields a strong demand for overtime hours. The results therefore underline the feature that the small plants react differently to regional labour market tightness.

The share of women in the establishment has a negative effect on the incidence of overtime hours in the Finnish manufacturing industries. All industry and year dummies included are statistically significant ones. Thus, there are strong industry effects. In particular, the incidence of overtime hours is (other things being equal) more frequent in the manufacture of paper and paper products. This notion is in line with common sense, because the manufacture of paper and paper products is characterized by strong fluctuations in demand and the high capital intensivity of production means that labour costs are only a minor part of the total costs for the establishments in this industry.

For the sake of robustness, the overtime equation was estimated from 1980 to 1995 without the establishments' characteristics. The

[24] *The specification applies the same control variables (excluding year dummies) as Model 1 that is reported in Table 5.*

Table 9. The results from Tobit regressions (dependent variable: OVERTIME). The Tobit regression are estimated separately for the population of the small plants (i.e. plants that have less than twenty employees) and for the rest of the plants from 1991 to 1995. To save space only the estimated coefficients for the variable UN (the regional unemployment rate) are shown. (The detailed results are available from the author upon request.) The control variables are the same as the ones in Model 1 reported in Table 5.

	Coefficient	t-statistics	Number of observations
The small plants	0.00064	2.99	19 984
The rest of the plants	–0.00071	–3.21	16 135

period from 1980 to 1995 includes 150 161 observations. All other results remained the same except the feature that the estimation covering the period from 1980 to 1995 does not give statistically significant results for the variable LEAVER. Thus, the applied data covering the period from 1980 to 1995 is not in line with the view that leavers tend to work fewer overtime hours in the Finnish manufacturing industries.

The overtime equation was also estimated by including dummies in regions (i.e. counties) of the Finnish economy. These estimation results (reported as Model 2 in Table 5) are the same as the above except for the notion that the variables WOMEN and WAGE^2 are not statistically significant in this specification of the overtime equation. The inclusion of dummies in regions therefore dispels the notion that the share of women in the establishment delivers a negative effect to the incidence of overtime hours in the Finnish manufacturing industries.

7. Conclusions

The study used individual-level data based on the Finnish manufacturing industries from 1989 to 1995 to address the incidence of overtime hours. The results show that the hours of overtime divided by the number of total hours decline as an employee ages. The overtime hours also decline in wage per straight-time hours and in straight-time hours. The results are broadly in line with those obtained from the empirical studies that use UK data in overtime hours at the individual level. In addition, the estimation results show that males and newcomers tend to work more overtime, but leavers work less overtime.

As to the establishment characteristics, the hours of overtime are definitely more frequent in the population of small establishments. The share of women in the establishment has a negative effect on the incidence of overtime hours in the Finnish manufacturing industries. The degree of tightness in regional labour markets had no overall impact on the incidence of overtime hours from 1991 to 1995, but the impact of the regional unemployment rate on the incidence of overtime hours differed sharply between the population of the small plants (i.e. plants that have less than twenty employees) and the rest of the plants.

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Appendix

Selected descriptive statistics (from 1989 to 1995). The descriptive statistics for the regional unemployment rate (UN) are from 1991 to 1995.

Variable	MEAN	STD	MIN	MAX
OVERTIME	0.027	0.050	0	0.93
AGE	39.5	10.1	15	65
WAGE	8.56	0.27	7.65	11.8
TIME	362.5	101.2	1	827
EXPERIENCE	10.0	4.95	1	16
SIZE	32.3	37.6	1	200
WOMEN	3.34	7.06	0	100
UN	18.3	5.7	4.8	33.4

Aims and scope

The Finnish Economic Papers is published biannually by the Finnish Society for Economic Research (founded 1936) in collaboration with the Finnish Economic Association (founded 1884) and the Economic Society of Finland (founded 1894). The Finnish Economic Papers is an anonymously reviewed journal publishing contributions in all fields of economics. As the journal of the three Finnish economic associations, the specific purpose of the Finnish Economic Papers is to foster research on small open economies.

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