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PROFIT SHARING IN FINLAND:

EARNINGS AND PRODUCTIVITY EFFECTS**

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ABSTRACT: The aim of this paper is to examine profit sharing using Finnish linked employer-employee data in 1996-2000. The use of profit sharing is predicted by the share of the highly educated, R&D and capital intensity, business risk, firm size and the desire to have some stability in the skilled workforce. The probability that an employee is included in a profit sharing plan is higher for educated, R&D employees, white-collar employees and men. Individuals in profit sharing plans have 3-13% higher wages after controlling for the observable characteristics of the employees (3% for white-collar and 13% for blue-collar employees). They also have quicker base wage growth. The productivity effects are 6-13% when the composition of the workforce is controlled for.

Keywords: compensation methods, wage differentials, productivity, linked employer-employee data
JEL Classification numbers: J32, J33, J53, C23

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TIIVISTELMÄ: Tässä tutkimuksessa tarkastellaan tulospalkkausta, käyttäen suomalaista yhdistettyä työnantaja-työntekijäaineistoa vuosilta 1996-2000. Tulospalkkauksen käyttöä selittää korkeasti koulutettujen osuus, T&K- ja pääomaintensiivisyys, liikeriski, yrityskoko ja koulutetun työvoiman alhainen vaihtuvuus. Tulospalkkaa saavat todennäköisimmin korkeasti koulutetut, T&K-työntekijät, toimihenkilöt ja miehet. Tulospalkkaa saavilla toimihenkilöillä ansiot ovat noin 3% korkeammat ja työntekijöillä noin 13 % korkeammat, kun havaittavat henkilökohtaiset ominaisuudet on vakioitu. Heidän palkkakasvu on myös ollut nopeampaa. Tuottavuusvaikutukset ovat noin 6-13% kun työvoiman rakenne on otettu huomioon.

Asiasanat: palkitsemismenetelmät, tuottavuus, palkkaerot, yhdistetty työnantaja-työntekijäaineisto
JEL Classification numbers: J32, J33, J53, C23

1. Introduction

Profit sharing has increased considerably in popularity in Finland during the late 1990s. This can be explained by a rapid and substantial change in the business environment of the firms. Ruigrok et al. (1999) find that changes in the environment have led to corporate restructuring that has meant in the Northern Europe organisational delayering and decentralisation of strategic and operational decision-making. Whitfield and Poole (1997) argue that these changes have resulted in a new way of organising employment. It includes team-working and employee involvement in decision making. As a result of these changes contingent pay has also emerged.

The change in the business system in Finland has been very rapid and dramatic. The key features of this change have been the transition from credit based financial system to a capital market based and liberalisation of foreign ownership in 1993. These factors have changed the corporate governance system in Finland, which has had its implications to the compensation methods also. (Tainio and Lilja 2002)

We study profit sharing in the Finnish labour market in 1996-2000 using detailed employee data in manufacturing from the Confederation of Finnish Industry and Employers and linking it to the financial statements of the respective firms. The main themes of this paper are the determinants of profit sharing at the individual level and how profit sharing affects the earnings of the employees and productivity of the firms.

The reasons for using profit sharing are twofold. First of all, it may increase productivity through the alignment of incentives and employment stability and, secondly, it offers the firms flexibility (Kruse 1996).

Employers often advocate profit sharing, owing to greater flexibility in wage expenses. Kruse (1996) suggests, among others, that firms experiencing large variability in the business environment benefit from profit sharing. In an economic downturn the wage expenses are cut in a natural way. Weitzman (1985) has argued that profit sharing offers flexibility at the macroeconomic level, curing stagflation. In the EMU countries wage flexibility is especially important, as the traditional methods of economic policy are not applicable and low inflation may cause rigidity of real wages.

Profit sharing may increase productivity through the alignment of incentives of the employers and the employees. Kruse (1996) discusses situations where profit sharing is likely to work well as an incentive scheme. Alignment of incentives is especially important when output is difficult to measure and supervision of employees is costly. This is likely to be the case with highly educated, R&D employees, in capital-intensive firms and in large firms. For employees in R&D-intensive firms profit sharing is a feasible compensation scheme as co-operation is crucial and individual incentives are not applicable. It can also be argued that in large firms rent sharing is one form of efficiency wages that prevents shirking, see Oi and Idson (1999). It would then seem that large firms would benefit from using profit sharing as they can decrease the monitoring costs. There is, however, a contradictory argument concerning the firm size and profit sharing. It is well known that group incentives do not necessarily work well in large organisations, owing to free rider effects, see e.g. Kandel and Lazear (1992). However, horizontal monitoring (FitzRoy and Kraft 1987) or peer pressure (Kandel and Lazear 1992) may decrease this effect.

The desire to have some stability in the workforce participating in profit sharing is also an argument for the use of it. The data in Azfar and Danninger (2001, Figure 1 on p. 624) supports the view that separations and quits are lower in profit sharing firms when tenure is 7 years or more. The job mobility of younger employees remains high. Chelius and Smith (1990) also find evidence that employees whose compensation is partly in the form of profit sharing experience higher employment stability. However, their results are only marginally significant. Kraft (1991) finds that profit sharing decreases the dismissals made by firms.

Profit sharing can be expected to affect wages. There are two reasons for this. First of all, it is documented to affect productivity and, second, it makes the employees' earnings more risky. One would expect that increased productivity would lead to higher earnings and that employees would want some kind of risk premium when a profit sharing plan is introduced, assuming that they are risk averse. The theoretical models on these issues offer interesting results. Jerger and Michaelis (1999) have shown that the total earnings will not be higher when changing from wage the system to profit sharing even under the assumption of risk averse employees (when they exhibit constant relative risk aversion). Gottfries and Sjöström (1995) also find that under uncertainty and assuming risk averse employees in an optimal contract setting the total compensation will be constant, no matter what the contingencies are. This is intuitive, as in their model the firm is risk neutral and the employees are risk averse. Then there is no reason to let the employees bear the risk. None of these models have addressed the possibility of productivity effects and their effects on wages. These models thus imply that profit sharing might not affect the employees' total compensation.

It has also been suggested that profit sharing is a form of risk sharing and used to moderate the base wage, see e.g. Koskela and Stenbacka (2001) and Jerger and Michaelis (1999). Piekkola and Kauhanen (2002) adapt the model of Koskela and Stenbacka to analyze profit sharing's effects on the base wage and skill premium for the skilled employees. The wage moderation argument does not change and profit sharing is also used as a substitute for the skill premium. If the wage moderation argument holds, one would expect that the growth of the base wage would be slower for the employees included in a profit sharing plan. Based on these arguments it is clear that theoretical arguments do not offer clear predictions on profit sharing's effect on wages.

Section 2 provides the empirical analysis of the determinants of profit sharing and it's effects on productivity and earnings. Section 3 concludes.

2. Empirical analysis

We use data on individual employees from the Confederation of Finnish Industry and Employers. After analysing hourly wages as shown in Appendix A, the individual data is linked to the financial data of the respective firms. Table 1 presents some summary figures.

Table 1. Shares of Employees/Firms With Profit Sharing

	1996	1997	1998	1999	2000
Employees	**0.16**	**0.23**	**0.36**	**0.35**	**0.40**
not R&D related work	0.16	0.15	0.21	0.20	0.26
R&D related work	0.02	0.30	0.44	0.44	0.47
Vocational or lower	0.16	0.22	0.32	0.32	0.37
Vocational college or higher	0.13	0.38	0.52	0.56	0.61
Firm size <50	0.05	0.11	0.03	0.06	0.08
50<Firm size <100	0.04	0.06	0.10	0.09	0.11
Firm size>500	0.17	0.24	0.37	0.36	0.41
Observations	134942	200034	173884	237934	225417
Firms	**0.16**	**0.31**	**0.41**	**0.42**	**0.48**
Share of blue-collar	0.38	0.30	0.36	0.37	0.40
Share of white-collar	0.34	0.48	0.62	0.61	0.65
Manufacturing	0.18	0.36	0.46	0.45	0.50
IT sector	0.20	0.30	0.31	0.46	0.48
Construction	0.06	0.10	0.24	0.26	0.37
Business Services	0.14	0.35	0.44	0.42	0.56
Observations	979	1088	1136	1111	956

It is seen that the share of manufacturing firms using profit sharing has substantially increased and in 2000 half of the firms applied it and 40 percent of the employees entered the scheme. These figures are probably somewhat downward biased, as we know only those firms that have actually paid and those persons who received profit shares, instead of having information on firms that have a profit sharing plan.

R&D intensity was a factor that is likely to be connected with profit sharing since measurement of output in these firms is difficult and co-operation is important. There seems to be a clear difference in the frequency of profit sharing between the ones in R&D- related work and others. However, the pace of growth of profit sharing has been faster for those in non-R&D related work, at least from the year 1997 onwards. It has to be noted that in the year 1996 there are only a few R&D employees in the data. Disregarding that year does not change the empirical results presented.

Firm size does not give clear predictions theoretically, but it is seen from Table 1 that only 10 percent of the employees in smaller firms with fewer than 100 employees enter the scheme compared with the nearly 40 percent in the firms with over 500 employees. It is also seen from the column indicated by the share of blue-collar employees that only about 40 percent of the employees do actually obtain profit sharing in firms where the scheme is applied. The comparable figure for white-collar employees has risen from 34 percent to 65 percent. It is clear that profit sharing is clearly a group incentive scheme in Finland that is not necessarily applied to all employees.

Profit sharing can also be expected to vary largely over industries. (Only 25 percent of all the observations are outside manufacturing so that only some non-manufacturing industries are shown here.) It is seen in Table 1 that this is actually the case, but the industries have been

converging. Construction exhibits a smaller share of companies with profit sharing, but has been catching up with the other industries. Business services have the most companies with profit sharing. The need for group incentives can be associated with the most extensive evolution of skill-biased technical change e.g. related to computer use (Author, Katz and Krueger, 1998).

Methods

The logit models are used to describe the probability of profit sharing as a function of the independent variables. This is given formally in equation (1).

$$(1)\ \Pr\{y_{it}=1\} = F(\beta' x_{it})$$

where $F = \frac{e^{\beta' \mathbf{x}_{it}+\alpha_i}}{1+e^{\beta' \mathbf{x}_{it}+\alpha_i}}$ in the panel estimation and $F = \frac{e^{\beta' \mathbf{x}_{it}}}{1+e^{\beta' \mathbf{x}_{it}}}$ in the pooled model. The estimated function is non-linear and thus the maximum likelihood estimation is used. In F the term α_i is the individual fixed effect, β is a vector of the coefficients to be estimated and x is a vector of the independent variables. The individual fixed effect captures heterogeneity in profit sharing and also the effect of all time-invariant variables. In the logit estimations the pooled results are more valid for variables with little within variation, such as participation into R&D work, the share of the highly educated and the white-collar dummy.

Earnings and productivity effects are estimated using the random effects and fixed effects models as given in (2).

$$(2)\ y_{it} = \boldsymbol{\beta}\mathbf{x_{it}} + \upsilon_i + \varepsilon_{it}$$

where, in addition to the notation introduced previously, ε_{it} is a classical error term and υ_i has two possible interpretations. In the fixed effects model it is a fixed parameter for each individual and in the random effects model it is also time–invariant but it has a distribution from where it is randomly drawn for each individual. The variables that tend to be quite stable might be better estimated through random effects, which takes the cross-section nature of the data also into account. Also, for these variables measurement error might be a large component of the variation. (See e.g. Johnston and DiNardo 1997, 391-401)

Estimations on the determinants of profit sharing

In the regressions regarding who is included in a profit sharing plan, logit models are used owing to the dichotomous nature of the dependent variable. The dependent variable, the profit sharing dummy for the year *t*, is based on the profit shares paid out in the year *t+1*. This is because the profit shares are generally paid out once a year at the beginning of the year based on the profits of the previous year. The decision to use profit sharing thus has actually been made in the previous year. These estimations include pooled estimation and fixed effects panel estimation explaining whether a person receives a share of the profits or not. The random effects estimator is not used, as the estimation has to be done by quadrature, which was found to be unstable. There is also a regression concerning the share of the profit sharing payments in relation to the base wage. This is estimated using the Tobit model because of the large share of zeros (See e.g. Maddala 1983, chapter 6).

Table 2 Estimates of the Determinants of Profit Sharing

	Fixed Effects Logit		Fixed Effects Logit Blue-Collar		Fixed Effects Logit White-Collar		Pooled Logit		Tobit profit share/ wage	
Variable	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Marginal Effect**	**S.E**	**Coefficient**	**S.E**
Within Firm 80^{th}-20^{th} Log Wage	-0.101	(0.013)*	-0.260	(0.023)*	-0.066	(0.018)*	-0.017	(0.001)*	-0.001	(0)*
Regular Hourly Earnings	0.452	(0.084)*	0.346	(0.104)*	-0.057	(0.207)	0.137	(0.004)*	0.000	(0)*
Female							-0.022	(0.002)*	-0.007	(0)*
Seniority (years)	-0.004	(0.005)	0.018	(0.01)	-0.017	(0.006)	0.004	(0)*	0.001	(0)*
Vocational and Voc. College	-0.072	(0.083)	0.458	(0.209)	-0.475	(0.098)*	0.035	(0.003)*	0.005	(0)*
University Degree	0.355	(0.08)*	0.104	(0.452)	0.157	(0.085)	0.000	(0.004)	0.005	(0)*
White-Collar Worker	0.767	(0.09)*					0.154	(0.003)*	0.021	(0)*
R&D Related Work	-0.055	(0.273)			-0.145	(0.296)	0.068	(0.008)*	0.008	(0.001)*
Share of Highly Educated	-1.172	(0.244)*	-5.243	(0.431)*	1.095	(0.361)	0.114	(0.015)*	0.026	(0.002)*
Mean seniority (years)	-0.249	(0.008)*	-0.390	(0.014)*	-0.166	(0.01)*	-0.002	(0)*	-0.001	(0)*
Firm R&D Dummy	1.494	(0.08)*	1.320	(0.133)*	1.202	(0.104)*	0.122	(0.005)*	0.011	(0)*
Churning Low Educated	-0.202	(0.125)	1.941	(0.252)*	-1.126	(0.165)*	-0.179	(0.01)*	-0.059	(0.001)*
Churning Highly Educated	-0.701	(0.062)*	-0.049	(0.086)	-1.178	(0.097)*	-0.064	(0.006)*	-0.008	(0.001)*
Capital Intensity	1.223	(0.076)*	3.381	(0.129)*	-0.174	(0.102)	0.071	(0.003)*	0.011	(0)*
Net Profits per Capita	0.023	(0.001)*	0.018	(0.001)*	0.027	(0.001)*	0.007	(0)*	0.000	(0)*
Equity Ratio Fair	0.767	(0.055)*	1.630	(0.109)*	0.093	(0.071)	-0.076	(0.003)*	-0.015	(0)*
Equity Ratio Good	0.984	(0.065)*	1.303	(0.12)*	0.630	(0.088)*	-0.114	(0.003)*	-0.011	(0)*
Business Risk	10.190	(0.453)*	26.280	(0.772)*	-1.323	(0.607)	0.590	(0.017)*	0.098	(0.002)*
50<Firm size <100	-0.653	(0.225)	-1.515	(0.343)*	-1.581	(0.377)*	0.123	(0.009)*	0.028	(0.001)*
100<Firm size <500	-0.146	(0.23)	-1.564	(0.389)*	-1.027	(0.37)	0.296	(0.008)*	0.044	(0.001)*
Firm size>500	-0.628	(0.235)	-2.670	(0.397)*	-1.073	(0.378)	0.338	(0.006)*	0.053	(0.001)*
No. Observations/Groups	73117	24253	41352	12564	30603	11491	330014		501772	
LR Chi2 / D.F.	4976	27	4930	25	1933	26	53329	26	57168	25
Predicted right% /Pseudo R^2	55.0		59.6		52.8		68.5	0.12		

Note. The dependent variable is the individual profit sharing dummy at date t based on actual payments at date t+1 (respectively for the profit share/wage in the last column). Regressions include year dummies and five industry dummies. The base for employment size is plants with fewer than 50 employees. * Significant at 99.9% confidence level

The results of the regressions for the profit sharing dummy are presented in Table 2. It reports marginal effects for the pooled regression and coefficients for the fixed effects model. These cannot be directly compared. The number of observations is quite large and thus the confidence level is fixed at 0.1%.

Employee variables

It is often thought that higher-ranking employees are the targets of profit sharing plans as evidenced also by the current over 60 percent participation rate (see the row "vocational college or higher" in Table 1). It is seen from the fixed effects estimation in Table 2 that profit sharing is targeted for those with a university degree but this is not supported by the pooled estimation where the coefficient is not significant, although it is positive. A one-level rise in the education category increases the probability of profit sharing by approximately 4% in the pooled estimation; the effect is thus quite small. On the other hand, white-collar employees have a 15 percent higher probability for profit sharing in the pooled estimation, which is also supported by the panel estimation. In the separate panel estimation for the white-collar employees, those with vocational or vocational college education also have a significantly smaller probability for profit sharing.

The employee R&D dummy also seems to have a reasonable marginal effect and an expected sign in the pooled estimation. (In R&D-related work the share of the highly educated is 56% instead of 10% in other groups.) The insignificance in the panel estimations is most probably due to the low within variation.

Booth and Frank (1999) suggest that performance related pay is connected to the employees' unobserved qualities. Their cross-section estimates support this as they find no evidence that it would be more common for the highly educated. This finding relates to the fact that variable pay systems are more generally used for blue-collar employees and quite the opposite holds for profit sharing. Finally, it should also be noted that the data excludes top officials (CEOs and managing directors) that may enjoy a different kind of scheme, where the education level may also play only a marginal role.

Regular hourly earnings have a positive effect for blue-collar employees and are insignificant for white-collar employees. Thus, the overall effect is positive (row 1 in Table 2)

Seniority seems fairly unrelated to profit sharing as positive effects are found only in the pooled estimation. It is possible that this is due to the fact that there are similar reasons for using seniority wages and profit sharing (see Lazear 1998 p. 292-293). Seniority wages work well as a motivator when output measurement is costly as is the case with profit sharing. Seniority wages are also good in environments where co-operation is important, which also holds for profit sharing. Thus, it can be expected that these methods of payment are partly substitutable. Piekkola and Kauhanen (2002) also find a negative relation between seniority wages and rent sharing.

Firm variables

When the share of the skilled workforce is sufficiently high, there are two reasons for the use of profit sharing. First of all, measurement of output of the highly educated is likely to be more difficult, making group incentives feasible. Second, it may affect the cost structure. The

higher wage bill leads to a more inflexible cost structure and thus increases business risk The effects on profit sharing, however, are not clear when one is comparing white-collar and blue-collar employees. It is seen that a large share of highly educated employees encourages the adoption of profit sharing in the pooled estimation and is very close to being significant for the white-collar employees. It is also seen that the measure of business risk is not significant for the white-collar employees, while being positive for the blue-collar employees. Business risk and thus the desire to obtain flexibility in the cost structure is an important factor in determining the use of profit sharing for blue-collar employees. The unimportance of business risk for white-collar employees indicates that group incentive reasons (with difficulty to measure output) are the main determinants for the adoption of profit sharing for white-collar employees.

The difference between the 80^{th} and 20^{th} percentiles of regular hourly earnings is used as a proxy for the possibilities of promotion in the firm, but may also reflect other factors such as piece-rate payment systems. It is assumed, in any case, that firms with a larger wage variation measured in this way exhibit a more hierarchical structure. Conyon et al. (2001) argue that in hierarchical firms there is less need to use profit sharing as the employees are motivated by the chance of a promotion. All the specifications here support this view.

The mobility of the workforce (measured by churning) decreases the probability of profit sharing for the white-collar employees and the effect is opposite for the blue-collar employees. This is a variable where the theory offers no clear predictions. Many studies argue that profit sharing decreases mobility of the workforce rather than vice versa, see e.g. Azfar and Danninger (2001) and Chelius and Smith (1990). It might be the case here too that the causation of the negative correlation is from profit sharing to mobility. Still, our results suggest that the stability of the highly educated workforce is important for the adoption of profit sharing.

The firm R&D dummy is significant and the coefficient is positive in all models even after controlling for the share of the highly educated, wage expenses, and employee turnover. In R&D-related work, co-operation is important and individual output is hard to measure. This implies that piece-rate systems are not feasible but group incentives such as profit sharing are. Hence, R&D use profit sharing to align the incentives of the employers and the employees (see Kruse, 1996).

Under capital-intensive production technology, alignment of company and employee interests is important, as the misuse of capital is a concern (Kruse 1996). Indeed, capital intensity has a significant coefficient here except for the white-collar employees. The marginal effect in the pooled estimation is about 7%. It is plausible that capital is not a significant predictor of profit sharing for the white-collar employees as they are not likely to be operating machinery of the firm.

The financial factors offer the expected results. It is seen that a good equity ratio notably increases the probability of profit sharing; however, in the pooled estimation the sign is different.

It cannot be taken for granted that all the schemes under the name of profit sharing are necessarily linked to the profits. It is seen that higher net profits per capita increase the firm's willingness to use profit sharing, although the effect is not very large. One standard deviation increase in profitability raises the probability of profit sharing by 0.4%. This supports the profit sharing nature of the dependent variable. There is, however, one complication with the

interpretation of the financial variables. Our data tell only profit shares paid out. It does not show the companies that have a profit sharing plan, but have not paid profit shares, as the goals have not been achieved. This is very likely to influence the estimates.

Firm size seems to be an important predictor of profit sharing. The indicator variables are coded so that the companies with fewer than 50 employees are the reference group. In the pooled estimation in large firms with over 500 employees profit sharing is around 34 percent more common than in the smallest firms. This is roughly in line with Table 1 showing that in the year 2000 around 40 percent of employees in the largest firms with over 500 employees enter a profit sharing scheme against less than 10 percent in firms with fewer than 50 employees. All this is against the argument that group incentives do not work as well in larger firms because the employees, numbering *N*, bear the full cost of effort provision but reap only *1/N* of the benefits. On the other hand, larger companies have larger monitoring costs and substitute profit sharing for these costs. This offsets the effect of diluted personal incentives.

In the panel estimations the effect of the firm size is identified through the shifts of employees to firms of different size. There are clear differences between the white-collar and blue-collar employees. The blue-collar employees are more likely to be included in a profit sharing scheme when entering a small firm, while this seems to be insignificant for the white-collars. However, there are only a very few employees that change the size class and thus the estimates are not very reliable.

The reference industry is manufacturing covering 75% of the workforce in the sample. In the pooled model all the other industries (Gas, electricity and water; Construction; IT and Other) are statistically significantly different from the reference industry and the coefficient is positive except for construction, which has a negative sign (not reported). These are plausible results. It can be supposed that especially in the IT industry the production technology is interdependent and work is organised in teams. Both are factors that promote the use of profit sharing.

The last column explains profit shares relative to average earnings. For those obtaining income from a profit sharing scheme, the average figure is 3% of annual income. It is seen that the signs of the coefficients are similar compared with the ones in regressions exploring the determinants of profit sharing. These results are consistent with the survey of the Confederation of Finnish Industry and Employers (1999). The proportion of profit shares relative to earnings is most often determined by hours worked and the base wage. It is thus logical that the highly educated with the longest working hours have the largest profit shares.

Productivity estimations

It has been argued that profit sharing can increase productivity through the alignment of the incentives of the employer and the employees. This is accentuated when the measurement of individual output is difficult. Also, sorting can influence productivity. Above, it was seen that firm and employee characteristics related to difficulties in the measurement of personal output do predict the use of profit sharing. It is then interesting to investigate whether the productivity effects are found from the data. The estimations are made by using fixed effects and random effects estimators. The Cobb-Douglas production function is used for simplicity. The shares of female employees, highly educated, white-collar employees and the R&D status of the firm are used to control for differences in productivity arising from these factors. This is important as these are likely to be linked with productivity and omission of these variables would lead to an omitted variables bias. There are two profit sharing dummies used. The first is the one that tells whether the firm had a profit sharing scheme in the year *t* (the measure is

based on the actual profit sharing payments in the year *t+1* as explained earlier) and the second gives the presence of a scheme the year before (it is thus based on the profit shares paid out in the year *t*). This is used because the productivity effects can have some lag and also the actual payments may also have direct productivity-increasing effects.

Here both random and fixed effects are reported even though the correlation between the explanatory variables and the individual error term is quite large. Table 3 shows the productivity effects of profit sharing. The dependent variable is the value added.

Table 3 shows that profit sharing increases productivity. The dependent variable is the value added. It is seen that the profit sharing affects positively productivity both in fixed effect and random effect models. The productivity effects are quite large, being around 6-13% altogether. These results are in line with previous studies, see e.g. Conte and Sveinars (1988), FitzRoy and Kraft (1987) and Kruse (1992). However, it has to be taken into account that some unobservable variable related to profit sharing might also affect productivity. Conte and Sveinars (1988) find that the productivity effect of profit sharing might be linked to employee participation in decision making. After controlling for this factor, the productivity effects of profit sharing that they find disappear. The results of Doucouliagos (1995) that are based on numerous studies support this view.

Table 3 Productivity Effects of Profit Sharing

	Fixed effects		**Random effects**	
Variable	**Coefficient**	**S.E**	**Coefficient**	**S.E**
Log Capital	0.029	(0.017)*	0.157	(0.007)***
Log Average Employment	0.736	(0.028)***	0.782	(0.012)***
Within Firm 80^{th}-20^{th} Log Wage	0.006	(0.005)	0.017	(0.004)***
Share of Female	-0.150	(0.076)**	-0.350	(0.045)***
Share of Highly Educated	0.036	(0.125)	0.214	(0.104)**
Share of White-Collar	0.013	(0.044)	0.083	(0.037)**
Firm Profit Sharing Dummy	0.032	(0.016)**	0.082	(0.015)***
Firm Profit Sharing Dummy $_{t-1}$	0.030	(0.016)*	0.051	(0.015)***
Firm R&D Dummy	0.050	(0.044)	-0.019	(0.039)
No. Observations/Groups	3491	1163	3491	1163
R-square: within/between	0.313	0.901	0.295	0.926
R-square: overall	0.892		0.917	

Note. The dependent variable is ln value added. * Significant at 90% confidence level, ** Significant at 95% confidence level, *** Significant at 99% confidence level.

It also seems that wage dispersion within the firm increases productivity. This can be a result of the hierarchical structure of wages and/or piece-rate payment systems. Lazear (2000) finds that variable pay increases productivity and wage dispersion. In the fixed effects model it seems that the composition of the workforce does not affect productivity. The only exception being the share of female employees. In the random effects model it seems that the firms with a higher share of female employees are less productive and that the share of the highly educated and higher share of white-collar employees positively affects productivity. The insignificance of the variables in the fixed effects estimation can be a consequence of the low within variation in these variables. R&D activity seems to be insignificant for productivity. Finally, it has to be noted that the coefficient of capital is quite low in the fixed effects estimation, and the random effects model yields a more plausible estimate. This might be due to measurement error in the variable, which is probably larger in the fixed effects estimation. It is not rare to find such low values for the coefficient of capital, see e.g. Griliches and Regev (1995).

Table 4 Estimates of The Determinants of Average Hourly Wages

Dependent Variable	Fixed Effects		Fixed Effect Blue-Collar		Fixed Effect White-Collar		Fixed Effects Men		Fixed Effects Women	
Variable	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**
Profit Sharing $_{t-1}$	0.080	(0.002)*	0.131	(0.003)*	0.032	(0.001)*	0.084	(0.002)*	0.068	(0.003)*
Within Firm 80^{th}-20^{th} Log Wage	-0.019	(0.001)*	-0.010	(0.001)*	-0.026	(0)*	-0.017	(0.001)*	-0.024	(0.001)*
Seniority (years)	-0.001	(0)*	-0.003	(0)*	0.001	(0)*	-0.001	(0)	-0.002	(0.001)*
Vocational and Voc. College	0.077	(0.007)*	0.188	(0.018)*	0.055	(0.003)*	0.076	(0.008)*	0.071	(0.015)*
University Degree	0.035	(0.007)*	0.334	(0.035)*	0.015	(0.002)*	0.045	(0.008)*	0.005	(0.013)
White-Collar Worker	0.050	(0.008)*					0.033	(0.009)*	0.129	(0.017)*
R&D Related Work	-0.016	(0.017)			-0.020	(0.006)*	-0.029	(0.02)	0.009	(0.032)
Share of Highly Educated	0.475	(0.018)*	0.444	(0.034)*	0.442	(0.008)*	0.436	(0.022)*	0.612	(0.032)*
Mean seniority (years)	0.001	(0)	0.003	(0.001)*	0.000	(0)	0.001	(0.001)	0.002	(0.001)
Firm R&D Dummy	-0.001	(0.006)	0.007	(0.012)	0.007	(0.003)	0.005	(0.007)	-0.028	(0.012)
Churning Low Educated	0.034	(0.007)*	0.017	(0.013)	0.031	(0.003)*	0.026	(0.008)*	0.047	(0.012)*
Churning Highly Educated	0.004	(0.004)	-0.010	(0.006)	0.029	(0.002)*	-0.001	(0.005)	0.015	(0.007)
Capital Intensity	-0.035	(0.004)*	-0.073	(0.006)*	0.046	(0.002)*	-0.028	(0.005)*	-0.051	(0.007)*
Net Profits per Capita	0.000	(0)*	-0.001	(0)*	0.000	(0)*	0.000	(0)*	-0.001	(0)*
Equity Ratio Fair	0.019	(0.003)*	0.047	(0.005)*	-0.028	(0.002)*	0.013	(0.004)*	0.029	(0.006)*
Equity Ratio Good	0.030	(0.004)*	0.061	(0.006)*	-0.020	(0.002)*	0.028	(0.005)*	0.030	(0.007)*
Business Risk	-0.394	(0.024)*	-0.686	(0.038)*	0.206	(0.013)*	-0.331	(0.028)*	-0.538	(0.043)*
50<Firm size <100	0.003	(0.01)	-0.014	(0.016)	0.021	(0.005)*	-0.001	(0.011)	0.016	(0.019)
100<Firm size <500	0.011	(0.01)	0.009	(0.017)	0.012	(0.005)	0.008	(0.012)	0.021	(0.02)
Firm size>500	0.048	(0.011)*	0.050	(0.018)	0.041	(0.005)*	0.040	(0.013)*	0.077	(0.021)*
No. Observations/Groups	501972	190805	316094	129397	185878	63950	372958	142770	129014	48035
R-square: overall	0.11		0.06		0.07		0.13		0.09	

Note. The depedent variable is the average hourly wage that includes all taxable compensations per actual working time. The table reports coefficients and standard errors. Regressions include year dummies and five industry dummies. The base for employment size is plants with fewer than 50 employees. * Significant at 99.9% confidence level.

Wage Estimations

The wage estimations include a fixed effects model for the whole data and separate estimations for blue-collar and white-collar employees and also for men and women. The fixed effects specification was chosen based on the Hausman test. The profit sharing dummy used is the one which reflects the profit sharing status of the person in the previous year. It is done this way as the profit shares are actually paid out at the beginning of each year and thus the effect on wages comes from the profit sharing in the previous year. This is also supported by the estimations done with the current profit sharing dummy. In these estimations there is a much less significant relationship between the wages and current profit sharing than that found here. The results are reported in Table 4.

The effect of profit sharing on average hourly wages (which include all non-regular pay such as profit sharing) seems to be significant and positive. However, when the even higher productivity effects are taken into account, profit sharing might actually moderate wages effectively.

Firm size and education are positively related to the hourly earnings. On the whole profitability has also a positive effect, but for the blue-collar employees and women it has a negative effect. Also, the wage dispersion within a firm seems to have a significant negative effect. It is also curious to find that R&D-related work does not seem to have any effects on wages. Following human capital models such as Pakes and Nitzan (1983), young R&D-related employees in R&D firms will expect high wages in the future, also in the form of profit sharing, and starting wages can be moderate. A surprising finding is the sign of the capital intensity. One would expect it to be positive, but here it is found to be negative. However, in the random effects specification the sign is positive (not reported). Thus, the negative coefficient might be explained by either measurement error or low within variance of the variable.

The mobility of the workforce seems to have a negative effect on the wages of all employees. However, as discussed earlier, it is hard to say anything on the causality in this respect.

Wage growth estimations

These estimations include fixed effects estimations for the whole data and separately for the white-collar and blue-collar employees. The dependent variable is the difference of log wages multiplied by 100, i.e. an approximation of the percentage change in wage from period t to period $t+1$. The wage measurement used here differs from the one in the wage estimation in the respect that it does not include the profit sharing payments. It can be thus viewed as the base wage. The profit sharing indicator used is the same as in the wage estimations. The estimation results are in Table 5.

It is seen in the first column that the persons in a profit sharing scheme have had quicker growth of the base wage. For the blue-collar employees the coefficient is positive and significant, suggesting that profit sharing accelerates the wage growth. It must be noted that the effect on wage growth is quite small, being only about 0.6 %. It is interesting to note that for the white-collars the wage growth seems to have been slower for the ones in profit sharing plans.

These results are similar to those of Azfar and Danninger (2001). Their estimates are around 3% but it must be noted that they use the total wage as the dependent variable. The explanation they offer is that profit sharing increases employment stability and thus encourages the accumulation of firm-specific human capital. These investments can be thought to increase wages.

Table 5 Estimates of the Wage Growth

	Fixed Effects		Fixed Effects Blue-Collar		Fixed Effects White-Collar	
Variable	**Coefficient**	**S.E**	**Coefficient**	**S.E**	**Coefficient**	**S.E**
Profit Sharing $_{t-1}$	0.622	(0.14)*	2.188	(0.23)*	-0.773	(0.107)*
Within Firm 80^{th}-20^{th} Log Wage	-1.270	(0.064)*	-3.533	(0.107)*	1.397	(0.047)*
Seniority (years)	0.076	(0.027)	0.177	(0.048)*	0.091	(0.02)*
Vocational and Voc. College	-2.861	(0.458)*	-3.763	(1.308)	-0.038	(0.267)
University Degree	-6.376	(0.461)*	-11.419	(2.894)*	-0.931	(0.247)*
White-Collar Worker	0.021	(0.54)				
R&D Related Work	-0.079	(1.378)			0.720	(0.748)
Share of Highly Educated	61.633	(1.314)*	119.896	(2.293)*	18.379	(1.006)*
Mean seniority (years)	0.034	(0.036)	-0.122	(0.062)	-0.099	(0.027)*
Firm R&D Dummy	7.987	(0.42)*	12.479	(0.773)*	2.008	(0.293)*
Churning Low Educated	-3.231	(0.589)*	-10.940	(1.099)*	2.184	(0.416)*
Churning Highly Educated	4.147	(0.284)*	4.800	(0.427)*	2.516	(0.252)*
Capital Intensity	-6.466	(0.346)*	-5.827	(0.57)*	-6.573	(0.275)*
Net Profits per Capita	-0.045	(0.004)*	-0.104	(0.007)*	-0.020	(0.002)*
Equity Ratio Fair	1.170	(0.247)*	2.183	(0.376)*	2.397	(0.218)*
Equity Ratio Good	-0.207	(0.311)	0.748	(0.48)	2.027	(0.268)*
Business Risk	-26.078	(2.058)*	-21.195	(3.273)*	-28.854	(1.716)*
50<Firm size <100	0.439	(0.789)	1.029	(1.253)	-2.208	(0.645)*
100<Firm size <500	-3.784	(0.836)*	-3.081	(1.324)	-7.018	(0.7)*
Firm size>500	-2.269	(0.856)	0.124	(1.349)	-6.785	(0.722)*
No. Observations/Groups	329963	176192	206072	117060	123891	60694
R-square: within/between	0.07	0.01	0.09	0.01	0.18	0.00
R-square: overall	0.02		0.02		0.02	

Note. The dependent variable is the change in the logarithmic regular hourly earnings multiplied by 100, i.e. an approximation of the percentage change. The table reports coefficient and standard error. Regressions include year and seven industry dummies. The base for employment size is plants with fewer than 50 employees. * Significant at 99,9% confidence level.

Employees in R&D firms tend to experience quicker wage growth. Interestingly, the level of profits seems to be negatively correlated with wage growth for both the white-collar and blue-collar employees. It is also seen that wage growth is slower in capital intensive firms. The wage variation within firm accelerates wage growth for the white-collar employees but the effect is the opposite for the blue-collars.

3. Conclusions

Profit sharing is used in Finnish firms as theory predicts. Firms where the measurement of individual output is difficult or costly are more likely to use it and employees whose output is difficult to measure are the main targets. Those firms are likely to be characterised by a high share of highly educated and R&D intensity. The employees are most likely to be highly educated, white-collar and R&D employees. In large firms the monitoring costs are higher and thus they benefit from profit sharing. In capital-intensive firms the misuse of capital is a concern and consequently the alignment of incentives is important. Firms that face business risks with an inflexible cost structure, i.e., they are vulnerable to changes in the economic environment, are more likely to seek flexibility in profit sharing. Low within firm wage variation may be a sign of a less hierarchical firm where the chance of promotion is low. It may also reflect the absence of any other performance-related pay systems. Both of the factors encourage the use of profit sharing. The empirical estimations support all these hypotheses.

The earnings of the employees included in a profit sharing plan are on the average 8% higher than those not included (3% for white-collar and 13% for blue-collar employees). The increased productivity and increased risk of the earnings explain this. The productivity estimations show that profit sharing firms are on the average around 6-13% more productive. The growth of the base wage is also increased by profit sharing on the whole, the effect being around 0.6%.

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5. Appendix A. The Linked Employee-Employer Data

The data are linked employer-employee data. The two parts of the data are separate and were grouped for this study. The data form an unbalanced panel with a relatively short time dimension.

The financial data comes from Balance Consulting Oy and it includes 11 000 Finnish firms. The financial data includes a detailed income statement, a full balance sheet and numerous key ratios for corporate analysis.

Labour data is from the Confederation of the Finnish Industry and Employers. The data covers years the 1996-2000 and includes both blue- and white-collar employees. The white-collar employees receive salaries and the blue-collar workers are remunerated on an hourly basis. There are approximately 2.1 million person-year observations of which 1.3 million are blue collar and 0.8 million white-collar employees. The data include a rich set of variables covering compensation, education and profession.

The number of observations drops to 1.75 million after calculating the regular hourly earnings, as explained later. The large reduction in the number of observations is due to missing or inconsistent information. Around 800 observations are also dropped after this in a wage regression, where a person is dropped if the observed wage is not within five standard deviations of the predicted value, using work experience up to the fourth power and 23 education dummies and gender as explanatory variables. After the labor and financial data are linked the number of person-year observations falls to about 0.97 million. This reduction comes from two sources. First of all, when company ID number from the register of the Confederation of Finnish Industry and Employers is attached to employees about 0.37 million person-year observations are lost. This means that the company did not have a company ID number in the register. These are likely to be small companies. A second reduction comes from linking the financial data to the labor data. If an individual is not allocated to some company, the record is deleted from the data. Those companies that are not matched are small companies that are not present in the financial data. The loss of person-year observations is of similar magnitude as from the first source leading to the count of 0.97 million. These reductions mean that smaller companies are under-represented in the final data. There remains 0.74 million observations after keeping only the longer tails from observations of individuals with missing data on some year in 1996-2000.
The firm level data are formed from these 0.97 million observations. It includes about 5600 observations, which means that there are approximately 1000 companies.

The variables

Firm level variables

The firm profit sharing dummy: Tells whether the firm has a profit sharing plan in the year *t*. It is based on the profit shares paid out in the year *t+1*. This measure does not provide any information on the nature of the profit sharing plan.

The firm R&D dummy: If a firm has over five percent of its employees with R&D related work then the firm is classified as an R&D company.

Capital intensity: The natural logarithm of the ratio of capital to labor, where the capital is measured by the accounting values of the land, machinery and buildings. The accumulation method is not used due to the shortness of the time dimension of the data.

Employment: Average employment during the year obtained from the financial data.

Higher educated employees/Employees: The share of employees with a bachelor's degree (lower university and non-university degrees) or higher.

Net Profits: Profit before extraordinary items and appropriations and after taxes in real terms.

Equity ratio: is used to measure the firm's ability to answer for its commitments in the long run. The equity ratio is used as an indicator variable with three classes. The classes are suggested by the Committee for Corporate Analysis in Finland. It is classed as good if it exceeds 35%, fair if it is between 20% and 35% and bad if it is below 20%.

Business risk: It is measured by the ratio of labor expenses and fixed assets. Labor expenses include wages and social security payments. The reasoning behind this measure is that if labor expenses are large compared with the fixed assets the firm's cost structure is not very flexible and this means that the firm is vulnerable to changes in the economic environment.

Churning: measures excess employee mobility, equal to separations when jobs are created and to hirings when jobs are lost. (See Davis, Haltiwanger and Schuh, 1996, for evaluation of churning.)

IT-industry: It includes the manufacturing of computers, telecommunications, and software engineering and database management.

Employee-level variables

Profit sharing dummy: Tells whether an employee is included in a profit sharing plan in the year *t*. It is based on the profit shares paid out in the year *t+1*. Like the firm profit sharing dummy it does not provide any information on the nature of the profit sharing plan.

Regular hourly earnings: We measure income per actual working time, which includes overtime hours. Regular hourly earnings are the sum of time and piece wages per actual working time for the blue-collar employees. For the white-collar employees it is the regular monthly earnings divided by the working time.

Average hourly earnings: This includes all taxable compensations per actual working time. Wages of white-collar employees use comparable monthly and total taxable compensations divided by the regular weekly working time (multiplied by 4.33333).

The person R&D status: This is obtained from the data and is available for the white-collar employees.

Seniority: Duration of a job measured in years.

Key figures of the data

The variables mostly concerning the firm level are obtained from the firm data and variables concerning employees are calculated from the employee data. As seen from Table 1, about ¾ of the companies are in manufacturing, the average number of personnel being a little over 420. However, the range is quite large, from 2 to 44808. The average turnover is €88 million. The companies are thus fairly large by Finnish standards.

R&D activity is found in 18% of the companies and on the average 1,7% of personnel work in R&D. White-collar employees form 43% of the work force. There are 7% highly educated in the sample. The average age is 40 and seniority 12 years.

Table A1 Summary Statistics

Employee level variables					
Variable	Obs	Mean	Std. Dev.	Min	Max
Employee PS dummy	624458	0.406	0.491	0	1
Log Average Hourly Wage	622364	2.476	0.316	1.320	4.278
Log Regular Hourly Wage	622364	2.572	0.351	1.827	5.446
Sex	624458	0.270	0.444	0	1
Seniority	624458	12	10.795	0	49
White Collar	624458	0.438	0.496	0	1
Employee R&D dummy	624458	0.017	0.129	0	1
Age	624458	40	10.656	15	64
Firm level variables					
Variable	Obs	Mean	Std. Dev.	Min	Max
Sales[1]	5269	88871.640	500543	129.337	13800000
Log Value Added[1]	5248	8.528	1.547	2.216	15.147
Net Profits per Capita[1]	4956	11.388	45.331	-505.895	1224.501
Average Employment	4963	425	1824.308	2	44808
Log Capital [1]	4957	3.172	1.523	-3.680	9.263
Manufacturing	4476	0.753	0.431	0	1
Firm PS dummy	5269	0.358	0.479	0	1
Firm R&D dummy	5269	0.185	0.388	0	1
Highly Educated%	5269	0.070	0.113	0.000	0.807
Mean White-Collar	5269	0.278	0.325	0	1
Churning Low Educated	5269	0.149	0.240	0	2
Churning Highly Educated	3186	0.151	0.317	0	2
Equity Ratio	5190	2.332	0.760	1	3
Business risk	4893	0.562	0.260	0.008	0.999
Firm Size Indicator	5269	3.861	1.489	2	6

1) in €1000

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