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RENT SHARING

AND EFFICIENCY WAGES

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ABSTRACT: The aim of this paper is to examine firm performance and the compensation of work: rent-sharing and efficiency wages using linked employer-employee Finnish data in 1987-1992. Rent splitting is generally 2% of quasi rent. Firm-level compensations also include longer term contracts such as seniority payments that are shown to interact negatively with quasi rent. Skilled workers with university education have three times higher rent sharing than others, whereas firm-specific wages such as seniority payments are not higher. Rent sharing is made efficient by the raising wage level, total factor productivity and the profitability of the firms. Firm-specific longer term wage arrangements have more ambiguous effects.

KEY WORDS: wages, compensation policy, productivity, industry differentials
JEL Classification numbers: J21, J31, J50, C22

1. Introduction

This paper considers in a Nash bargaining framework rent splitting and efficiency wages and applies the model to the Finnish labour market 1987-1992 using linked employer-employee data similar to Piekkola, Hohti and Ilmakunnas (1999). Haaparanta and Piekkola (1999) show with large firm data that rent sharing is less than 2% of quasi rent. The liquidity constraints, measured similarly as in Nickell and Nicolitsas (1999), also affect wage formation and explain nearly half of mass unemployment receiving a peak in 1994. In this study, the Nash bargaining framework under bankruptcy risk is adapted from Haaparanta and Piekkola (1999). We add to the model Solow-type efficiency wages, implying a mark-up in the rent sharing (see Solow, 1981, Nickell, 1994). Alternatively, firm-specific compensations can be interpreted as seniority payments that relate to longer term wage contracts and firm performance.

Abowd and Allain (1996) show that French workers have substantial bargaining power, about 40 percent of quasi rent on average over all industries using export and import prices as instruments. We adapt a similar fixed effects model, where person fixed effects are first estimated following Abowd, Kramarz and Margolis (1999). We show that rent sharing in Finnish manufacturing is more modest at around 2 persent of quasi rent. The result is not inconclusive, however, as the overall estimate of rent sharing is not significantly lower than in many other studies (see Blanchflower, Oswald and Sanfey, 1996, Hildreth and Oswald, 1997, and Oswald, 1997). One expects that the weaker relation in Finland is explained by centralised bargaining, leaving less room for firm-specific payments. Holmlund and Zetterberg (1991) show in country comparisons that the elasticity of firm (industry) wages with respect to firm (industry) revenue per employee is negatively related to the standard Calmfors and Driffill (1988) index of the centralisation of wage bargaining; the lowest industry estimation, around zero, is found for Finland. We show that rent sharing is indeed lower in large firms, where centralized bargaining

is more binding. Centralised wage bargaining leaves more room for firm-specific wage formation in smaller firms and for the skilled. Skilled workers with university degree education enjoy three times higher rent splitting than the rest.

In addition to rent splitting, we assess separately average firm-specific wage compensations over the years, such as seniority payments. These are shown to interact non-positively with quasi rent. Hence, firm-specific compensations, such as seniority payments, cannot be interpreted as raising worker effort in short run. Firm-specific payments among the highly skilled significantly decreased during the recessionary period of 1991-1992. This can be one reason why firm-specific wages are not higher than for others. It is also evident from Piekkola, Hohti and Ilmakunnas (1999) that the seniority wages from longer tenure are not increasing in education level, only from the first years at service.

We can conclude that the skilled labour force is characterized by large human capital investment, requiring large initial payments and performance-related payments, as outlined in Becker (1975), and also by sorting models explaining large general experience related payments relative to seniority payments that are increasing over time, see Roy (1951) and Rosen (1972). The long-run relative increase in demand for the highly skilled in Finland since 1970 has lead to greater compensation from education or to higher average rent sharing but not to higher firm-specific wages (see Pajarinen, Rouvinen and Ylä-Anttila, 1998). Rent sharing is efficient due to increasing total factor productivity and the profitability of the firms. The labour market behaviour of unskilled is more easily explained by job search and information models, where skill is acquired and maintained within the firm, see Jovanovics (1979). Rent sharing is modest and firm-specific compensations raise productivity only when related to wage moderation.

Section 2 provides a basic rent-sharing model allowing for firm-specific payments to raise effort. Section 3 describes our data sources and methods. Section 4 lays out the econometric specification. Section 5 discusses the results. Finally, we conclude in section 6.

2. A Model of Rent-Sharing and Seniority Payments under Financial Constraints

The model estimated in this paper leans on Brown and Ashenfelter (1986), Abowd (1989), Abowd and Kramarz (1993), Abowd and Lemieux (1993), Nickell (1994), Abowd and Allain (1996) and Haaparanta and Piekkola (1999). We consider bargaining over wages encompassing elements from trade union approaches (starting from Dunlop, 1944, Leontif, 1948, and MacDonald and Solow, 1981) and from efficiency wages (following Solow, 1981). The negotiations on labour input are assumed to take place only when the firm is shedding labour (for the differences in shedding or hiring workers, see Layard R., Nickell S. and R. Jackman, 1991). We model bankruptcy risk as in Haaparanta and Piekkola (1999), simplifying loan negotiations by assuming that banks do not use their monopoly power. The negotiations take place at the firm-level (the empirical evidence here indicates rent sharing is higher for the educated and in smaller firms, and is not easily explained by central bargaining). Employees may negotiate directly or the system is based on labour unions and union representatives in firms.

The employees bargain with a profit-maximising firm with a standard neoclassical production function $F(K,e(W_e),L))$ augmented by effort with $\varepsilon_e^F \equiv (\partial F/\partial W_e)(\partial W_e/\partial W) = F_{We}\,\psi$, where $F_{We} \equiv \partial F/\partial W_e$ is the marginal productivity of efficiency wages (through the adjustment in effort) and $\psi \equiv \partial W_e/\partial W$ is the firm-specific pay contingent on general wage shifts. Letting W denote wages, L labour input, r the interest rate on loans and K capital input, the profit constraint in the financing is equal to $\varepsilon[CF]$-rK, where ε is a shock on cash flow, $CF \equiv F(\mathrm{K},e(W_e),L) - WL$. The stochastic term ε is assumed to follow a uniform distribution in the range $\varepsilon \sim U(\underline{\varepsilon},\bar{\varepsilon}), \bar{\varepsilon} > 0$. The changes in the borders $\underline{\varepsilon},\bar{\varepsilon}$ can reflect changes in product market competition and shifts in demand and technology that are carried over to cash flow shocks since wages/employment adjust with a lag. The uncertainty is resolved after

the wage and financing decisions are made. It is assumed that the necessary condition for the firm to survive is $\varepsilon\ [CF] > rK$, i.e. the cash flow is enough to finance the investment. The probability that the firm runs into bankruptcy is $p\left\{\varepsilon < \frac{rK}{CF}\right\} \equiv B \equiv \frac{BR - \underline{\varepsilon}}{\bar{\varepsilon} - \underline{\varepsilon}}$, where $BR \equiv rK / CF$ is the borrowing ratio. A heavy indebtedness close to the upper bound of the cash flow (rK close to $\bar{\varepsilon} CF$) signals a threat of bankruptcy.

Let x measure the expected alternative income of people that depends on the average wages in the year. Employees' expected income if an agreement is reached in negotiations is $WL(1-B) + ax(\bar{L} - L) + xLB - x\ \bar{L} = (W - x)L(1-B)$, where $\bar{L}$ is the number of workers in the firm at the beginning of the negotiations, L is the number of workers actually employed in the firm in the current period and W is the negotiated real wage. If the firm succeeds, the profits PR are given by the average of the upper and lower bound of the expected cash flow when the firm does not run into bankrutcy less capital expenses, yielding $0.5(\bar{\varepsilon} CF + rK) - rk$. This can also be written as $0.5(\bar{\varepsilon} CF - rK) = 0.5(1-B)(\bar{\varepsilon} - \underline{\varepsilon})CF$, i.e. the average of the upper and lower limit of the cash flow. Without an agreement the firm does not earn any income or under bankruptcy the reservation profits are zero (the bank bears the losses). The Nash bargaining solution is then obtained by maximising the following:

$$\underset{w,L}{Max}\ (1-B)\left[WL - xL\right]^{\alpha} PR^{1-\alpha}, \tag{1}$$

where α is the bargaining power and x is the opportunity income of employees. Define quasi rent as

$$\frac{q}{L} = \bar{\varepsilon}\left(\frac{F}{L} - x\right) - r\frac{K}{L}. \tag{2}$$

The first-order conditions for wages and employment are from Appendix A written as

$$W = \hat{\alpha}\frac{q}{L} + x, \tag{3}$$

where $\hat{\alpha} \equiv \dfrac{\alpha}{\bar{\varepsilon} - (1-\alpha)\varepsilon_e^F + BR}$, $\varepsilon_e^F \equiv (\partial F / \partial W_e)(\partial W_e / \partial W)$ and $BR \equiv rK / CF$ emerges from the rise in bankruptcy risk when wages/employment is increased and cash flow decreases relative to borrowing expenses. Financial constraints can be eased through lower wages, decreasing the borrowing ratio BR. We can see from (3) that rent splitting may arise both as a result of the higher negotiation power of employees, α, or because of higher wages inducing higher effort, ε_e^F. Efficiency wages affect the rent-splitting parameter $\hat{\alpha}$ positively but at a decreasing rate of the level of α. A positive product market shock (higher $\bar{\varepsilon}$) raises rents although not necessarily rents per worker. As Nickell (1999) spells out the problem using a standard model with a Cobb-Douglas production function and constant elasticity of wage demand, product market shocks do not alter quasi rent per worker and, hence, rent splitting. In our framework, a positive product market shock, first, decreases the rent splitting parameter $\hat{\alpha}$ if raises expected cash-flow accruing to firm owners. This effect would be absent if the shock encompasses sales rather than cash flow. In addition, since the shock affects cash flow rather than profits, the expected cash-flow $\bar{\varepsilon}(F - xL)$ rises relative to borrowing expenses that, in turn, raises rent splitting. We can see that the product market shock can have significant effects on rent splitting under rigid wages so that the sales shocks are carried over to cash flow shocks.

When the firm is hiring new workers, employers do not bargain on employment and the solution for L is given by:

$$F_L \equiv W \tag{4}$$

When the firm is shedding workers, employers also bargain on employment and the solution for L is, from Appendix A, given by:

$$F_L \equiv \mu W + (1-\mu)x,$$

$$\mu = \frac{\varepsilon_e^F}{\frac{\alpha}{1-\alpha}\frac{PR}{(W-x)L} + \varepsilon_e^F} \tag{5}$$

The marginal product of labour F_L is from (4) equal to bargained wages when employees do not bargain on labour and from (5) to the weighted average of bargained wages and opportunity income when employees bargain on employment. In the bargaining solution, the weight on bargained wages approaches zero and the weight on opportunity income unity as efficiency wages become negligible. The opportunity cost is lower and employment higher than without employment negotiations (or no effect with zero profits). When the firm is shedding labour, the reduction in employment is then potentially reduced by the greater willingness of employees to negotiate over employment. The qualitative implications of the model are unchanged as the decrease in employment is only mitigated. It is also interesting to note that the rent sharing parameter α has ambiguous employment effects given the positive relation to the wedge $W - x$.

3. The Empirical Formulation

We have used data on individual employees from the Employment Statistics. This is a large data base that combines various registers kept by Statistics Finland and other authorities. We matched the sample of 1815 firms, which represent fairly well the Finnish manufacturing sector, to firms in the sample of Financial Statistics held by Statistics Finland. The initial employee data cover 1,064,289 observations in the period 1987-1992. The data used in the analysis cover 216,181 observations from 3,682 firm-year combinations (for a fuller description of the data, see Piekkola et al. 1999). We consider only firms with information on total factor productivity, giving 3,367 firm-year combinations. Annual employment (employment at the end of December), L_{jt}, is the

reported average number of salaried and hourly employees at firm j over the course of the calendar year. The average real compensation (wage) in firm j, W_{jt}, is wages excluding social security payments (a difference to Abowd and Allain) divided by the GDP deflator at the 2-digit level (1990=1.00). The difference in consumer and producer prices enters as a separate variable. Real value added per worker (part of quasi-rent) is defined as value added divided by the same GDP deflator. The basic model is

$$\ln(w_{ijt}) = \theta_i + \psi_j + \beta x_{it} + e_{ijt}, \tag{6}$$

where the wage is explained only by time varying person characteristic experience and time dummies, hence βx_{it} contains time dummies and experience. The subscript j refers to the firm, and θ_i is the individual fixed effect and ψ_j the firm-specific payment and e_{ijt} represents a statistical error term. The estimation proceeds by first estimating an equation, where the wage is explained in addition to experience, also by variables Z which include interactions of person average and firm characteristics (interactions of average experience, seniority, firm size (average number of workers) and industry dummies). The model is estimated in deviations from the individual means to purge the person fixed effects. The subsequent error term also includes, in addition to the original error e_{ijt}, the projection of the firm effects on the interaction variables. In the firm level estimations, the model includes the estimated person fixed effects and the firm effect $\psi_j = \phi_j + \gamma_j seniority + \gamma_{2j} seniority^2$ includes a firm intercept ϕ_j, seniority slope γ_j and seniority slope squared γ_{2j}.

In this paper, we consider person effects, average experience and average firm-specific payments over the years, while seniority slope effects are not separately assessed. One reason for this is the low number of observations in many firms so that the measure of seniority

slope is not accurate in Piekkola, Hohti, Ilmakunnas (1999). Firm-level compensations are even considered in three education groups: less than three years vocational education with subscript *l* (75 percent of the workforce), middle educated with subscript *m* (20 percent of the workforce) and skilled personnel with higher institution education with subscript *u* (5 percent of the workforce). Furthermore, seniority payments are higher for the initial working career only. The average seniority payment at margin is close to zero, albeit with substantial variation.

The average person effect $\theta_{ljt}, \theta_{mjt}, \theta_{ujt}$ in the three education groups for firm *j* at time *t* is reconstructed using information on the firm's plants in the manufacturing industry, hence persons working in the firm outside manufacturing are not considered. The average experience effect $\kappa_{ljt}, \kappa_{mjt}, \kappa_{ujt}$ is the average of general experience received in the working career in each education level. Average quasi-rent is measured by

$$q_{jt} \equiv v_{jt} - rent_{jt} - \kappa_{kjt} - 0.03k_{jt}, \tag{7}$$

where v_{jt} is value added, $rent_{jt}$ is rents, k_{jt} is real capital per worker, obtained by aggregating plant level investment for eight years assuming 15% depreciation, and in $\kappa_{kjt} \equiv b_l\kappa_{ljt} - b_m\kappa_{mjt} - b_u\kappa_{ujt}$ b_l, b_m, b_u are the shares of each education group in the total workforce of the firm and $\kappa_{ljt}, \kappa_{mjt}\kappa_{ujt}$ are the respective average experience levels. As can be seen, rent expenditures $rent_{jt}$ are considered as close to material costs and subtracted from value added. This lowers the decrease in quasi-rent in the recessionary period and raises the explanatory value of the model.

In the co-operative Nash game described by equations (1) through (4), the rent splitting parameter, $\hat{\alpha}$, depends on the employee/union power α and efficiency wage relations.

However, the efficiency wage effect is the firm average of the firm-specific compensations estimated in Piekkola, Hohti, Ilmakunnas (1999) that can also relate to longer-term wage contracts. The potential heterogeneity of bargaining power, depending on liquidity constraints, is modeled as

$$\gamma = \alpha_0 + \alpha_1 q_{jt}\left(q_{jt} - \overline{q_t}\right) + \alpha_2 q_{jt}\left(\psi_{jt} - \overline{\psi_t}\right) + \alpha_3 q_{jt}\left(BR - \overline{BR_t}\right) \qquad (8)$$
$$+ \alpha_4 q_{jt}\left(marksh_{jt} - \overline{marksh_t}\right),$$

where an overbar on the variable indicates a sample average over firms j and years t. The parameter α_1, as in Abowd and Lemieux, allows for heterogeneous bargaining power as a function of the size of the quasi-rent per worker, the parameter α_2 as a function of efficiency wages and the parameters α_3 and α_4 allow for heterogeneity related to liquidity constraints and product market conditions. The basic parameter α_0 may be interpreted as the bargaining power at the population average values of quasi-rent per worker, efficiency wages and product market conditions. If average efficiency wages are of minor importance, then $\alpha_2 = 0$ and similarly for α_3 and α_4. Substituting equation (8) into equation (4) yields the basic estimating equation for the wage rate. This leads to writing our estimated wage equation as

$$W_{jt} = \beta_{k0} x_{k0} + \beta_{k1} \kappa_{kjt} + \beta_2 (\psi_{jt} - \overline{\psi_t}) + \gamma q_{jt} / l_{jt} + \varepsilon_{jt}, \qquad (9)$$

where $x_{k0} = \left(1 + \theta_{kjt} - \overline{\theta_{kt}}\right)\mu_{kt}$, k=l,m,u, is the opportunity income on the basis of industry wage level and personal characteristics in each education group and b_k, $k = l,m,n$ are the respective shares (excluding time varying experience), κ_{kjt} measures the average experience level of

employees in the firm as defined in (7), ψ_{jt} relates to the efficiency wages, estimated as deviations from yearly average means and ε_{jt} is a statistical error uncorrelated with either W_{jt} or q_{jt}. The first term relates to opportunity income effects (unlike Abowd and Allain, 1996, we do not use aggregate firm effects as one part of opportunity income). In x_{k0}, the term μ_{kt} is the average real wage in the firm sample in year t (all observations in the initial data satisfying the minimum wage requirement) and the terms θ_{kjt}, $\overline{\theta_{kt}}$, $k=l,m,u$, are the average person effects in year t, the former in firm j. The effects of borrowing constraints are left unexamined because of the short time span of the data, so that exogeneity cannot be ensured with sufficient lags.

The market share of each firm is measured relative to all manufacturing industries at the two-digit industry level (TOL88). Export and import price indices are similarly evaluated at the two-digit level for Finnish exports and imports. The estimated wage equation also includes year, industry and regional dummies. Table A.1 in the Appendix shows the summary statistics for the firm-level variables used in our statistical analyses. We can see that the industry average of quasi-rents is approximately five times higher than in Abowd and Allain (1996) (1 FIM $\approx$ 1.1 FRF). In contrast to total profit, quasi-rents per worker after deducting rents have not been on a declining trend even in the recession. This indicates the importance of the heavy increase in interest payments as the important cause for the profit decrease. We can see that the borrowing ratio doubled in the recession so that around 65 percent of cash flow went to capital expenditures from borrowing (even before the devaluation at the end of 1992).

Finally, consumer prices have risen relatively more than producer prices on average in the period, see table B.1 in Appendix B. We can see from tables 2 and 3 that the real wage effect is statistically insignificant, except in the difference instrument estimation. We conclude that wage earners have not been on average compensated for the relative rise in consumer inflation.

4. Compensating Work in Finnish Firms

Table 1 reports the model used with instrumenting. We will use export and import prices, opportunity income and the lagged white collar share to explain quasi rent per worker. The use of export and import prices as a measure of international product market conditions follows Abowd and Lemieux (1993).

Table 1. Instrumenting Quasi Rent per Worker

	Quasi-Rent Per Worker		Quasi-Rent Per Worker	
Variable	**Coefficient**	**t-value**	**Coefficient**	**t-value**
Intercept	-516	(0.3)	482	(0.3)
X_l	0.544	(0.8)	0.563	(0.8)
X_m	0.836	(0.5)	1.705	(1.1)
X_u	1.019	(0.6)	1.446	(0.9)
White Collar Share$_{-1}$	76.730	(3.7)		
Export Prices	-26.293	(2.3)	-28.674	(2.5)
Export Prices$_{-1}$	8.715	(0.3)	15.679	(0.5)
Export Prices^2	0.123	(2.3)	0.134	(2.5)
Export Prices$^2_{-1}$	-0.053	(0.3)	-0.089	(0.6)
Opportunity Income, Export Prices	-0.006	(0.9)	-0.007	(1.0)
Opportunity Income, Export Prices	-0.004	(0.2)	-0.010	(0.6)
Opportunity Income, Export Prices	-0.008	(0.5)	-0.009	(0.6)
Opportunity Income, Export Prices	76.730	(3.7)	-28.674	(2.5)
Import Prices	-32.984	(1.1)	-32.660	(1.0)
Import Prices-1	68.495	(1.3)	62.789	(1.2)
Import Prices2	0.145	(1.0)	0.144	(1.0)
Import Prices2-1	-0.331	(1.2)	-0.299	(1.1)
Root Mean Squared Error	146.11204		146.535	
R^2	0.046		0.004	

The reported results are least squares coefficients, dummies include 4 year dummies. The interaction term is the product of opportunity income and export prices.

It is seen from table 1 that export prices are surprisingly negatively related to the quasi rent per worker and do not explain the large variation in quasi rent, as in Abowd and Allain (1995). It also transpires that quasi rent is increasing in white collar share and person fixed effects are minor. Rent sharing would appear particularly high for low educated when the interest rate is used as an instrument (not reported). This seems to capture the sensitivity of wages to general economic conditions rather than to the firm's compensation system. We rely on instrumenting following column 1 in Table 1 that includes the white collar share as an instrument.

Table 2 summarises the results for wage formation.

Table 2. Wages As a Function of Efficiency Wages and Rent Sharing

	Level		Difference Instrument		Difference	
Variable	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**
Intercept	60	(9.8)	-5	(1.5)	-1	(1.8)
Opportunity $Wage_l$	0.49	(29.2)	0.27	(14.6)	0.14	(3.4)
Opportunity $Wage_m$	0.38	(25.0)	0.29	(12.8)	0.27	(13.0)
Opportunity $Wage_u$	0.52	(34.2)	0.54	(22.4)	0.52	(22.5)
$Experience_l$	-5.86	(27.9)	-1.74	(14.0)	-0.89	(1.8)
$Experience_m$	-0.20	(4.2)	0.05	(1.2)	-0.16	(1.9)
$Experience_u$	-0.09	(2.4)	0.08	(2.2)	-0.02	(0.3)
Firm-Specific Wage	0.33	(2.5)	-0.92	(1.4)	0.23	(0.8)
White-Collar Share	-2.74	(1.3)	11.48	(1.9)	0.61	(2.1)
Market Share	-5.91	(3.7)	3.39	(1.1)	-0.25	(0.1)
Quasi-Rent/L	0.0194	(8.6)	-0.00004	(3.5)	0.0044	(1.4)
Quasi-Rent/L, Quadratic/100	-0.0001	(0.7)	0.0065	(0.9)	-0.0002	(0.8)
Quasi-Rent/L/100, Firm-Specific Wage	-5.9	(3.7)	3.4	(1.1)	-0.3	(0.1)
Quasi-Rent/L/100, Market Share	-0.0361	(1.8)	-0.0313	(0.6)	-0.0334	(1.0)
Consumer price-Producer price	-2.74	(1.3)	11.48	(1.9)	0.61	(2.1)
Sample size	3367		2159		1481	
Coefficient Degrees of Freedom	54		22		16	
Root Mean Squared Error	12.863		22.387		9.508	
R^2	0.7046		0.5349		0.372	

The reported results are least squares coefficients, dummies include 7 firm-age, 5 firm-size, 11 regional, 15 industry and 5 year dummies. The quadratic term is the product of quasi-rent and the deviation of it from its mean. The interaction terms are the products of the quasi-rent and the deviation of the other interaction terms from their mean. The instruments are given in Table A.1 column 1.

The results are similar in both magnitude and precision to the results of other specifications that do not involve unrestricted time and industry effects. Large time varying changes during the recessionary period have contributed significantly to the difference estimation results, and the

estimation with instrumenting better captures the (moderate) rent splitting. Level and difference estimation with instrumenting produce fairly similar results. It is seen that rent splitting (α_0, the coefficient on quasi rent per worker variable) is around 0.02 (negligible with instrumenting). The rent sharing is one-tenth that in Abowd and Allain (1995) as regards all French industries. However, the elasticity 0.03 is close to that obtained in other studies, see Hildreth and Oswald (1997), Oswald, (1996) and Nickell (1999) (Quasi rent per worker is on average 180 thousand FIM and wages 113 thousand FIM.). Table 3 analyses wage formation separately in the three education groups.

Table 3. Wage Formation and Education Level

Dependent Variable	w		w_l		w_m		w_u	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	60	(9.7)	1	(0.2)	-18	(2.5)	194	(6.4)
Opportunity $Wage_l$	0.49	(29.2)	1.00	(89.8)				
Opportunity $Wage_m$	0.38	(25.0)			1.08	(91.3)		
Opportunity $Wage_u$	0.52	(34.2)					0.63	(8.0)
$Experience_l$	-5.84	(27.7)	-11.33	(85.5)				
$Experience_m$	-0.19	(3.9)			-14.28	(76.1)		
$Experience_u$	-0.10	(2.5)					4.42	(13.4)
Firm-Specific $Wage_l$	0.6	(1.4)	0.0	(0.3)				
Firm-Specific $Wage_m$	-26.2	(2.8)			4.4	(1.8)		
Firm-Specific $Wage_u$	0.9	(0.4)					-1.6	(1.6)
White-Collar Share	25.13	(14.3)	3.39	(3.8)	5.26	(2.9)	-45.99	(4.8)
Market Share	0.19	(2.0)	0.08	(1.5)	0.00	(0.0)	-1.20	(2.6)
Quasi-Rent/L	0.0197	(8.2)	0.0028	(2.1)	0.0048	(1.7)	0.0469	(4.0)
Quasi-Rent/L, Quadratic/100	-0.0002	(0.8)	0.0001	(0.5)	0.0002	(0.8)	0.0015	(1.4)
Quasi-Rent/1000, Firm-Specific W_l	-0.3	(1.2)	1.09	(0.9)				
Quasi-Rent/1000, Firm-Specific W_m	3.5	(2.4)			4.18	(0.3)		
Quasi-Rent/1000, Firm-Specific W_u	0.1	(0.7)					2.49	(0.3)
Quasi-Rent/L/100, Market Share	-0.04	(1.8)	0.00	(0.1)	0.01	(0.6)	0.06	(0.6)
Consumer price-Producer price	-275.69	(1.3)	-86.74	(0.7)	133.82	(0.6)	465.25	(0.5)
Sample size	3367		3361		3054		2443	
Coefficient Degrees of Freedom	58		50		50		50	
Root Mean Squared Error	12.877		7.656		15.033		62.586	
R^2	0.7043		0.6305		0.8092		0.2669	

Rent sharing is, using OLS and a difference instrument estimations, three times higher for skilled personnel with higher institution education, at around 6 percent (OLS estimation reported). We even find rent sharing insignificant for other groups. It also appears that in firms with a high white collar share rent splitting is higher, although not so for the highly educated in Table 3. The

firm-specific wages over the years are ambiguously related to total wage compensations and interact non-positively with the quasi rent variable. We can deduce from this that firms-specific compensations, e.g. in the form of seniority payments, are related to longer-term wage contracts and the economic performance of firms. This contrasts with our Nash bargaining model, where efficiency wages work in the same way as market power of employees in raising the rent splitting parameter. Firm-specific wages are also higher in larger firms (not reported). Rent sharing is instead higher in small firms. Following Nickell (1999) loosely, one possible explanation is that in large firms high monopoly rents are a signal that workers are not receiving their share of the firm's success.

We can see from Tables 2 and 3 that the average experience of the workforce is negatively related to wage compensations, the clear exception being the highly skilled with university level education. The negative effect is clearest for the majority of the workforce with less than three years of vocational degree education (75% of the workforce). The result contrasts with the findings in some other countries, see e.g. Troske (1999). We can conclude that the skilled labour force is characterized by large human capital investment requiring large initial payments and performance related payments, as outlined in Becker (1975), and also by sorting models explaining large general experience related payments that are increasing over time, see Roy (1951) and Rosen (1972). Piekkola, Hohti and Ilmakunnas (1999) show that the experience payments wage profile is steeper for the skilled. Moreover, it is apparent from Tables 2 and 3 that opportunity incomes explain a somewhat greater share of wages for the highly educated. Unskilled labour force behaviour is more easily explained by job search and information models, where skill is acquired and maintained within the firm, see Jovanovics (1979).

Finally, market share has generally worked in the direction of raising wages although there is no clear effect in difference estimations or for the high educated. One plausible

explanation for the latter is that market concentration lowers the chance of obtaining job offers in the same field.

5. Labour Shifts in Finnish Firms

In the manufacturing firms, employment was reduced on average by 4% per year in the recessionary years of 1991-1992, which is relatively modest compared to the sharp improvement in employment by 15% annually in the preceding years.

Table 4. Labour Input As a Function of Opportunity Income and Its Interactions

	Level		Difference Instrument		Difference	
Variable	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient**	**t-value**
Intercept	59.75	(2.0)	0.07	(0.0)	-1.69	(1.1)
Capital/1000	0.13	(24.9)	0.11	(19.3)	-0.03	(4.4)
Opportunity $Wage_l$	0.14	(1.3)	0.25	(1.9)	0.50	(1.9)
Opportunity $Wage_m$	-0.01	(0.1)	0.03	(0.2)	-0.37	(1.9)
Opportunity $Wage_u$	-0.17	(2.1)	-0.01	(0.1)	-0.45	(3.2)
$Experience_l$	-0.48	(0.4)	-3.09	(1.8)	-3.49	(1.1)
$Experience_m$	0.34	(0.8)	0.28	(0.5)	1.17	(1.8)
$Experience_u$	0.37	(1.2)	0.56	(1.3)	-0.53	(0.8)
Firm-Specific $Wage_l$	3.74	(2.3)	3.6	(1.3)	-5.01	(0.1)
Firm-Specific $Wage_m$	-11.58	(0.1)	-427.1	(2.2)	134.04	(0.8)
Firm-Specific $Wage_u$	-9.57	(0.7)	-26.0	(0.9)	7.27	(0.1)
White-Collar Share	16.75	(1.7)	17.66	(1.4)	-28.77	(1.3)
Market Share	10.97	(22.9)	11.47	(15.7)	12.77	(13.7)
Export Share	12.50	(2.8)	13.80	(2.4)	10.08	(1.2)
Quasi Rent/1000	0.009	(5.4)	0.118	(7.3)	0.009	(0.9)
Quasi Rent Quadratic	0.000	(1.6)	0.000	(0.8)	0.000	(1.2)
Quasi-Rent/1000, Firm-Specific W_l	-0.187	(6.7)	-0.104	(2.2)	-0.195	(6.2)
Quasi-Rent/1000, Firm-Specific W_m	0.032	(0.5)	0.045	(0.3)	-0.271	(4.9)
Quasi-Rent/1000, Firm-Specific W_u	-0.002	(0.7)	0.118	(7.3)	0.002	(1.1)
Quasi-Rent/1000, Market Share	-0.187	(6.7)	-0.104	(2.2)	-0.195	(6.2)
Consumer price-Producer price	-0.68	(0.1)	46.48	(2.0)	2.46	(1.0)
Sample size	2376		833		1065	
Coefficient Degrees of Freedom	60		21		21	
Root Mean Squared Error	56.586		67.869		35.510	
R^2	0.8559		0.9145		0.5522	

The reported results are least squares coefficients, dummies include 7 firm-age, 5 firm-size, 11 regional, 15 industry and 5 year dummies. The quadratic term is the product of quasi-rent and the deviation of it from its mean. The interaction terms are the same as before.

Table 5. Labour Input and Edcuation Level

Dependent Variable	Δlabour		$\Delta labour_l$		$\Delta labour_m$		$\Delta labour_u$	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	-1.85	(1.8)	1.09	(0.3)	0.52	(2.4)	0.37	(1.4)
Capital/100	-0.0022	(4.2)	-0.0017	(4.1)	0.0002	(3.3)	0.00	(1.6)
X_l	0.09	(1.4)	0.17	(3.4)				
X_m	-0.06	(0.9)			0.01	(1.4)		
X_u	-0.37	(5.4)					-0.01	(0.5)
$Experience_l$	0.14	(0.5)	-0.02	(0.1)				
$Experience_m$	0.22	(1.8)			0.01	(0.5)		
$Experience_u$	0.12	(1.2)					-0.02	(0.9)
Firm-Specific $Wage_l$	10.44	(0.7)	0.1	(0.2)				
Firm-Specific $Wage_m$	64.97	(0.8)			1.4	(0.1)		
Firm-Specific $Wage_u$	0.16	(0.0)					-7.5	(1.3)
White-Collar Share	-34.40	(2.1)	-42.94	(3.3)	-6.62	(2.6)	1.84	(0.9)
Market Share	12.43	(15.6)	9.28	(14.9)	1.09	(9.0)	1.33	(10.0)
Export Share	6.8	(1.0)	7.4	(1.3)	0.7	(0.7)	1.2	(0.9)
Quasi-Rent/1000	0.013	(1.9)	0.015	(2.8)	0.002	(2.1)	0.005	(3.4)
Quasi-Rent/10000, Quadratic	0.0	(1.4)	0.0	(1.0)	0.0	(0.5)	0.0	(1.8)
Quasi-Rent/1000, Firm-Specific W_l	-0.1	(4.9)	0.0	(3.5)				
Quasi-Rent/1000, Firm-Specific W_m	-0.3	(5.4)			0.0	(2.2)		
Quasi-Rent/1000, Firm-Specific W_u	0.0	(0.3)					0.0	(1.7)
Quasi-Rent/1000, Market Share	0.006	(21.4)	0.005	(21.9)	0.001	(19.1)	0.001	(11.1)
Consumer price-Producer price	2.85	(2.9)						
Sample size	1480		1475		1375		1097	
Coefficient Degrees of Freedom	22		16		14		14	
Root Mean Squared Error	31.12393		23.154		4.72674		5.21201	
R^2	0.5093		0.5552		0.4367		0.3135	

It can be seen from Tables 4 and 5 that the coefficient of quasi rent, also that of the interaction with the borrowing ratio, is positive but not significant in the difference estimation. However, in the difference instrument estimation the coefficient is significant and in Table 5 explains the variation in labour input of the low educated. The quasi-rent effect relates to demand shocks given the long lags in employment adjustment that we are not able to control here.

We can see that the acquisition of market share is associated with labour inflow (as seen from Table 6 later, it also restricts the decline in labour input in the firms shedding workers). An increase in market power has not been used to restrict output, wages and employment. The following table considers labor input in firms that were on average shedding workers (two categories) or hiring workers.

Table 6. Labour Input in Shedding and Hiring Firms

Dependent Variable	Shedding		Middle		Hiring	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	-4.41	(1.8)	-0.67	(1.1)	1.51	(2.1)
Capital/100	0.0011	(1.0)	0.0018	(5.7)	0.0127	(17.0)
X_l	0.14	(1.3)	-0.03	(0.5)	0.17	(3.4)
X_m	0.03	(0.4)	-0.18	(1.9)	0.06	(0.6)
X_u	-0.23	(2.5)	-0.35	(4.2)	-0.37	(6.5)
$Experience_l$	-0.58	(1.1)	0.12	(0.7)	-0.05	(0.3)
$Experience_m$	0.16	(0.8)	0.07	(0.8)	0.13	(1.3)
$Experience_u$	0.08	(0.5)	-0.02	(0.4)	0.08	(1.1)
Firm-Specific $Wage_l$	13.32	(0.7)	-0.41	(0.0)	-12.70	(0.7)
Firm-Specific $Wage_m$	-92.37	(0.7)	26.58	(0.4)	-55.06	(1.0)
Firm-Specific $Wage_u$	19.55	(0.5)	-15.08	(1.2)	18.00	(0.6)
White-Collar Share	-28.27	(3.8)	-12.46	(3.0)	-6.36	(0.4)
Market Share	35.71	(25.7)	-1.46	(2.6)	4.66	(5.1)
Quasi-Rent/1000	0.069	(3.8)	0.010	(3.0)	0.003	(0.4)
Quasi-Rent/10000, Quadratic	0.00000	(14.7)	0.00000	(2.8)	0.00000	(2.0)
Quasi-Rent/1000, Firm-Specific W_l	-1.17000	(2.6)	-0.39033	(4.2)	0.04288	(0.2)
Quasi-Rent/1000, Firm-Specific W_m	5.10000	(5.8)	0.13905	(0.6)	-1.86000	(4.5)
Quasi-Rent/1000, Firm-Specific W_u	-0.32035	(12.2)	0.00751	(1.3)	-0.57494	(5.3)
Quasi-Rent/1000, Market Share	-0.0085	(11.0)	0.0013	(3.0)	0.0070	(11.6)
Export Share	687.5	(0.7)	168.9	(0.3)	-163.3	(0.3)
Consumer price-Producer price	1.12	(0.6)	1.86	(1.7)	-0.12	(0.1)
Sample size	419		563		496	
Coefficient Degrees of Freedom	22		22		22	
Root Mean Squared Error	32.177		10.237		13.494	
R^2	0.7977		0.232		0.8615	

We have not reported the finding that the doubling of the borrowing ratio from 0.3 to 0.6 lowered labour input on average by 0.6 persons, which is one percent of the workforce. The figure is likely to have been higher in the years 1993-1994, which were not considered, when the decrease in employment was greatest. The negative effect of liquidity constraints is concentrated in the firms shedding workers. It is also seen that quasi rent is a significant variable for firms shedding workers. This shows it to be strongly related to the negative demand shocks during the recessionary period.

6. Wage Compensations and Productivity

Productivity estimates in the short time span considered are characterised by the difficulty to separate the productivity improvement from economic fluctuations that were particularly severe in the period. Further, in productivity estimates in Table 7 we have used generalised least squares to correct for the heteroskedasticity.

Table 7. Total Factor Productivity and Net Profits As a Function of Capital, Efficiency Wage and Quasi Rent

Dependent Variable:	log(TFP) Level		Net Profits/L/100 Difference Instrument		log(TFP) Difference Instrument	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	-1,030	(10,2)	-43,191	(0,8)	-0,215	(1,8)
X_l	0,002	(3,1)	-21,115	(5,5)	0,012	(14,5)
X_m	-0,003	(4,2)	9,560	(1,7)	-0,001	(0,6)
X_u	0,000	(0,0)	-8,759	(1,6)	-0,003	(1,4)
$Experience_l$	-0,036	(4,0)	-21,316	(1,9)	0,007	(1,2)
$Experience_m$	-0,003	(1,1)	37,635	(6,2)	0,017	(10,1)
$Experience_u$	0,005	(3,9)	1,495	(0,5)	0,019	(9,8)
Firm-Specific $Wage_l$	0,74	(1,0)	-1266,16	(0,6)	-2,52	(10,9)
Firm-Specific $Wage_m$	-26,52	(7,7)	-28269,00	(10,5)	-26,52	(7,7)
Firm-Specific $Wage_u$	3,83	(5,9)	23923,00	(7,3)	-5,12	(10,2)
White-Collar Share	1,80	(28,0)	-576,52	(0,5)	0,06	(0,3)
Market Share/100	5,34	(7,9)	31386,35	(4,9)	11,91	(11,0)
Export Share/100	-8,4	(2,0)	-1433,0	(0,0)	-8,4	(2,0)
Quasi-Rent/L/100	0,15	(10,8)	642,14	(8,9)	0,00	(11,8)
Quasi-Rent/L, Quadratic/100	0,000	(6,8)	-0,50	(6,8)	0,000	(0,1)
Quasi-Rent/1000, Firm-Specific W_l	1,28	(7,0)	-937,88	(2,3)	1,30	(8,5)
Quasi-Rent/1000, Firm-Specific W_m	1,35	(9,3)	4284,63	(6,7)	2,45	(9,8)
Quasi-Rent/1000, Firm-Specific W_u	-0,03	(0,6)	-878,62	(5,9)	-0,37	(7,5)
Quasi-Rent/L/100, Market Share	-0,02	(8,2)	-68,72	(8,4)	-0,05	(11,3)
Consumer price-Producer price	0,07	(7,4)	-85,10	(0,8)	-0,80	(2,9)
Sample size	3202		1480		2052	
Coefficient Degrees of Freedom	57		21		21	
Root Mean Squared Error	41,174		56,368		35,175	
R^2	0,906		0,3955		0,657	

Table 7 shows that quasi rent has a positive effect on total factor productivity while firm specific wages have a negative or insignificant effect. However, firm specific wages interact strongly

with quasi rent. It is evident that while the wage effect is non-positive, total factor productivity is improved when efficiency wages are contingent on firm performance. The more detailed estimates not reported indicate that quasi rent is particularly associated positively with productivity in firms with less than 500 employees. The more ambiguous interaction of quasi rent and productivity for the largest firms can also be a sign of monopoly rents, explaining the lower rent sharing, too.

We can also observe that a rise in average experience of personnel associates with a decrease in total factor productivity; we already observed earlier the negative relationship with the wage level. However, the opposite holds for skilled workers, which, in part, explains the relatively steeper wage profile in experience.

7. Conclusions

We derive a rent splitting parameter of 2 persent, but show that its large variation depends on the education level of employees. Wage formation is heavily dependent on the education/skill level of employees with human capital and sorting models explaining the compensations paid to the skilled personnel. Firm-specific compensations independent of firm performance are more typical for the rest, one reason being the recession that lowered the firm-specific compensations for the most educated, while maintaining the level for the others.

Appendix A.

Proceeding from the maximization of (1) shown in the text, the FOC for wages W reduce to

$$0 = \alpha L(1-B)\left[L(W-x)\right]^{-1} - (1-\alpha)(1-B)0.5\bar{\varepsilon}\left(L - \frac{\partial F}{\partial W_e}\frac{\partial W_e}{\partial W}\right)PR^{-1} - \frac{\partial B}{\partial W} \qquad \text{(A.1)}$$

$$0 = \alpha\frac{PR}{L} - 0.5\alpha BRax - 0.5(1-\alpha)(W-x)\bar{\varepsilon}\left(1-\varepsilon_e^F\right) - 0.5BR(W-x) \tag{A.2}$$

where the second equality makes use of $PR = (1-B)CF$ and the definition $BR = rK/CF$ and $\hat{\delta} = (1-b)/(1-B)$. Substituting in $PR/L = 0.5\left[\bar{\varepsilon}(\frac{F}{L} - W) - r\frac{K}{L}\right] = 0.5q - 0.5\bar{\varepsilon}(W-x)$, where $q = \bar{\varepsilon}(\frac{F}{L} - x) - r\frac{K}{L}$ implies (3) in the text after some manipulation. The FOC for labour input is straightforward when the employees do not negotiate on employment. When employees negotiate on labour input, the FOC for L reduces to

$$0 = \alpha(1-B)(W-x)\left[L(W-x)\right]^{-1} - (1-\alpha)(1-B)0.5\bar{\varepsilon}(L-W)PR^{-1} - \frac{\partial B}{\partial L} \tag{A.3}$$

$$0 = \alpha\frac{PR}{L} + 0.5\alpha BRx\frac{F_L - W}{W-x} + 0.5(1-\alpha)\bar{\varepsilon}(F_L - W) + 0.5BR(F_L - W) \tag{A.4}$$

where the second equality makes use of $PR = (1-B)CF$ and the definition $BR = rK/CF$ and $\hat{\delta} = (1-b)/(1-B)$. Using (A.2) for $\alpha BRx/(W-x)$ and rearranging, this can be rewritten as

$$0 = (F_L - x)\left(\alpha\frac{PR/L}{W-x} + (1-\alpha)\varepsilon_e^F\right) - (1-\alpha)(W-x)\varepsilon_e^F, \tag{A.5}$$

giving (5) in the text.

Appendix B.

Table B.1 Summary Statistics: Mean

Variable	1987	1988	1989	1990	1991	1992
Wages	117	115	115	112	108	110
Opportunity Income	118	114	115	111	108	110
Firm Income	0.01	0.02	0.01	0.00	0.03	0.02
Average Experience	0.11	-0.08	-0.02	-0.03	-0.01	0.05
Quasi Rents Per Capita	172	170	174	175	176	177
Quasi Rents Squared Per Capita	6986	14777	19549	8256	12215	125569
Net Profits Per Capita	227	357	306	147	201	-16
Market Share	1.50	1.62	1.21	1.08	1.00	1.20
Consumer Price - Producer Price	2.84	4.17	5.61	5.10	3.15	1.66
White Collar Share	0.29	0.28	0.28	0.28	0.30	0.30
Export Per Sales	9	9	10	10	10	12
Employment	70	75	65	64	53	49
low educated	53	57	50	49	40	36
medium educated	11	11	11	10	9	8
high educated	9	9	8	8	7	7
Firm-Specific Wages %	0.0070	0.0179	0.0074	0.0049	0.0339	0.0194
Firm-Specific $Wages_l$ %	0.0057	0.0172	0.0074	0.0059	0.0517	0.0194
Firm-Specific $Wages_m$ %	0.0028	0.0050	0.0017	0.0005	-0.0006	-0.0017
Firm-Specific $Wages_h$ %	0.0087	0.0248	-0.0031	-0.0077	-0.0270	-0.0079
Firm-Specific $Wages_l$ X Quasi Rents Per Capita	6.38	1.84	-8.61	0.04	28.72	18.26
Firm-Specific $Wages_m$ X Quasi Rents Per Capita	7.17	5.77	1.30	-3.34	-7.09	-11.44
Firm-Specific $Wages_h$ X Quasi Rents per Capita	0.57	-3.87	-48.27	-37.01	-9.80	1.34
White Collar Share	22.99	22.18	22.24	23.48	24.92	23.09

Wages, opportunity income, net profits per labour and quasi rent in thousands of 1990FIM, Quasi Rent evaluated using weighted oppportunity incomes for each education group.

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