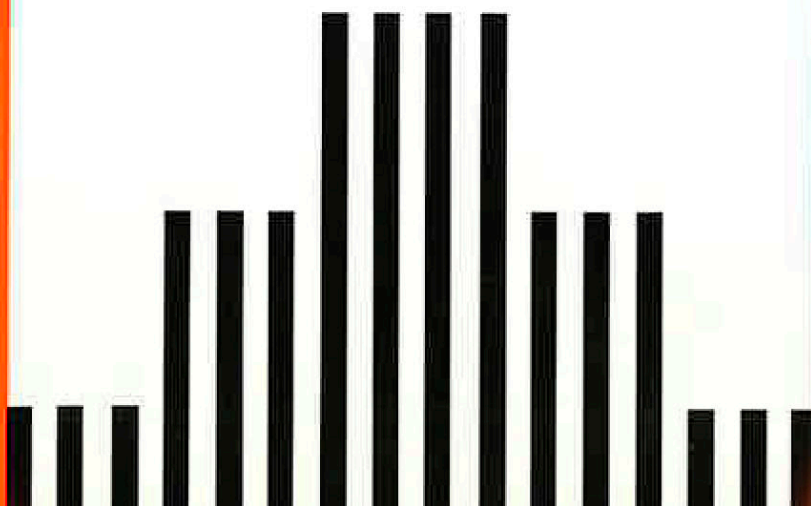


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and Hannu Piekkola**



**Rent-Sharing,
Financial Pressures
and Firm Behavior**



Rent-Sharing, Financial Pressures and Firm Behavior

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Tiivistelmä: Voitonjako ja yritysten velkaisuus, jota mitataan korkomenoilla suhteessa kassavirtaan, vaikuttavat tutkimuksen mukaan olennaisesti yritysten työvoiman kysyntään ja palkanmuodostukseen Suomessa. Palkkatason riippuvaisuutta yrityksen kannattavuudesta (ns. quasi rents) voidaan selittää voitonjakoilla työnantajien ja työntekijöiden (ammattiliiton) välillä, koska viiveet ovat suhteellisen lyhyitä. Yrityksen rahoituksellinen tilanne selittää samoin merkittävästi työvoiman kysynnän ja palkkojen vaihtelua. Yrityksen koko on tärkeä tekijä. Suurimmat yritykset ovat vähentäneet voimakkaimmin työvoiman kysyntää laman aikana ja sen jälkeen. Suuryrityksillä on paremmat mahdollisuudet siirtää tuotantoa ulkomaille, millä voi olla samanlainen vaikutus kuin konkurssin uhkalla. Tämä ei ole kuitenkaan johtanut suurempaan työvoiman kysynnän palkkajoustavuuteen. Voitonjakomalli on puolestaan paremmin sovellettavissa aineiston toiseksi suurimpiin yrityksiin. Näissä yrityksissä palkat joustavat enemmän kuin työvoiman kysyntä. Tämä ei tosin välttämättä ole voitonjakomallin seuraus, koska konkurssin uhka vaikuttaa myös työvoiman kysyntään.

Abstract: Rent-sharing and the financial situation of the firm, measured by interest expenses as a proportion of the cash flow, are shown to be important determinants of labor demand and wage formation in the considered large firms in Finland. The sensitivity of wages to profits (quasi-rents) can be explained by rent-sharing between employers and employees (labor union), since the time lag is relatively short. The firm's financial position explains a substantial share of labor and wage variability. The size of firm is an important factor: the largest firms have accommodated their labor demand during and after the 1990's deep recession. The largest firms have greater opportunities to shift production abroad that can have similar effects as the threat of bankruptcy. This has not, however, lead to greater wage elasticity. In the second-largest firms the rent sharing model is more strictly applicable. In these firms wages are more flexible than labor demand. This is not, however, unambiguous consequence of rent-sharing, since the threat of bankruptcy also affects labor demand.

Keywords: Labor Demand, Labor Union, Financial Constraints, Firm Indebtedness.

JEL-code: J23, C33, G32, E24

1. Introduction

Empirical research shows that even in highly developed financial markets in the United States a majority of firms are faced with liquidity constraints. (See Hubbard, 1990, Carpenter, Fazzar and Petersen, 1994, and Hubbard, Kashyap and Whited, 1995.) Financial constraints faced by firms are a distinguishing feature of Finland, too.¹ Until recently both taxation and financial market constraints favored debt finance leading to heavy corporate indebtedness. The recession was exceptionally deep with a 14% drop in GDP in the years 1991-1993. An additional fiscal restraint was the tight monetary policy and relatively high interest rate level from the March 1989 revaluation until the shift to the floating exchange rate in September 1992. The tight monetary policy also contributed to the depth of the recession besides external shocks that hit Finland, including the drop in trade with Russia.

Besides the fact that financing constraints are not invariant over time, they do not affect the firms equally. Carpenter, Fazzari and Petersen (1990, p.82) list two most obvious reasons why financing constraints can be more severe for small firms. To begin with, public information is less available and the possibility of

¹For asymmetric information, financial constraints and corporate behaviour, see Myers and Majulis (1984), Stiglitz and Weiss (1981), Jensen (1986), Devereux and Schiantarelli (1990), Strong and Meyers (1990) and Oliner and Rudebusch (1992).

asymmetric information between managers, the owners of firms and lenders is greater. Second, small firms rely more heavily on bank debt than large firms, that is more likely the only option to replace lower international finance opportunities. Hubbard, Kashyap and Whited (1995) find, however, that the empirical evidence is mixed and emphasize the low-dividends-payout and the low profitability of the smaller firms to explain the greater financial restrictions.

The high unionization rate in Finland also calls for the incorporation of features of a centralized/ institutional labor market in the analysis. In the period 1964-1996 in Finland centralized agreement was reached, with the only exception of industry settlement, for 6 years. However, wages are not bargained entirely on the national level that would leave little scope for wages to be shaped by industry performance. Wage drifts in Finland have been around 30%. This is less than in Norway, where the figure is 50%, but enough for rent-sharing on corporation level to be important, as found in this study. Rent-sharing may also be of importance in other countries as the studies referred to in section 3.2 suggest. It can be one reason for the ambiguous long-run effects of wage expenses on labor demand (See Newell and Symons, 1986, 1987, Hamermesh, 1993, Jackman et al., 1996, and Nickell, 1997).²

²It is also safe to say that in Finland the approximately seven percentage point increase in

We analyze labor demand and wage formation taking into account the role of rent-sharing and the financial pressures in a Nash bargaining process between laborers, banks and firms.³ We do not measure rent-sharing by examining the sensitiveness of wages to output or value-added, as in Nickell and Wadhvani (1990) and Johansen (1996). This may reflect a mere income effect or market demand fluctuations without any strategic union behavior as a background. Hildreth and Oswald (1997) use profits as an explanatory variable but conclude that the relationship between wages and profits can emerge from the short-run inelasticity of the labor supply rather than being explained by rent-sharing.⁴ Here, rent-sharing is estimated from quasi-rents that measure firms' sales over material expenses and wage expenses that would occur if the wages were of the average level in the industry. The presumption is that it is the profit level relative to the average in the industry that is crucial for wage negotiations and this is also implied by Nash bargaining. The measure is different from Abowd and Lemieux (1993) in that it excludes the financial costs. These enter a separate liquidity variable.

taxes on labour during and after the recession in the beginning of 90's can give only a partial answer to the causes of unemployment (For elasticity estimates, see Tyrväinen, 1995, and Holm, Honkapohja and Koskela, 1996.)

³The paper is based on Piekkola (1997) studying the corporate financial position and the role of labor union behavior for the employment and wage formation in Finland, financed by the Ministry of Trade.

⁴Oswald (1996) surveys studies showing the important role of rent sharing in wage formation. Rent-sharing studies also include Blanchflower, Oswald and Garret (1990), Christofides and Oswald (1992) and Van Reenen (1996).

In contrast to Nickell and Wadhvani (1990) or Abowd and Lemieux (1993) we extend the Nash bargaining process to cover bargaining between banks (lenders) and firms. Thereby the wage formation is sensitive to firm indebtedness. Financial constraints are examined similarly to Nickell and Nicolitsas (1995) measuring them by interest expenses as a proportion to cash-flow. We also assume that the probability of bankruptcy affects the expected wage payment. This implies that labor demand is not invariant to wage setting.

In the empirical analysis, we use ETLA's (The Research Institute of the Finnish Economy) panel data of the five hundred biggest firms since 1986. The firms in ETLA's data employ 630 000, which was nearly half of the total employment of 1 500 000 in the private sector in 1995 (500 000 enter the sample used). The firm-size effect is controlled by examining the various explanatory factors separately for the second-largest and the largest firms. We also adhere to Piekkola (1998) that uses a similar framework in a study of small and medium-sized firms (SMEs) in the 1990's.

The trend of increasing wage dispersion has continued since the recession in Finland. It is shown, however, that labor demand is rather inflexible and there is no increase in wage elasticity. (As was also found to be the case in Slaughter, 1997, for U.S. during 1960-1990.) Rent-sharing and liquidity constraints are im-

portant ingredients of labor demand and wage formation. The neglect of financial constraints and rent-sharing can lead to biased estimates of the role of wage flexibility. Because of the opposite implications the neglect of only one of them can lead to even greater bias.

It is shown that the size of firm matters and the sample was divided into the 250 second-largest and the 250 largest firms. One reason is the importance of liquidity constraints and the fact that firm size works as an important proxy for access to external finance. Financial constraints are relatively more important for the second-largest firms in wage formation, unless high dividend-payout ratio indicate the opposite. Another reason for the importance of the size of firm is presumably globalization, foreign direct investment and the substitution of domestic for foreign labor abroad, which is a relatively recent phenomenon in Finland. Because of the globalization, the largest firms rather adjust labor demand as a consequence of changes in the financial situation. In the whole period the relative decrease in employment has indeed been greater in the largest firms. This has not typically led to an improvement in capital productivity in large firms, however, as for the SMEs.

Section 2 lays out the Nash bargaining equilibrium between workers, employers and lenders and presents the labor demand, wage and productivity equations in

the model. The empirical results are presented in Section 3. Section 4 concludes and summarizes the main findings.

2. Bargaining Model

We consider bargaining over both labor and capital input. We outline here a bargaining model that encompasses elements from trade union approaches (starting from Dunlop 1944).⁵ The employees may negotiate directly or the system is based on labor unions and union representatives in firms. The bargaining between banks and firms leads to loan contracts. These are also in practise negotiated separately with each firm. The employees and a bank bargain with a profit-maximizing firm with a production function $F(K, L)$. The profits are equal to $PR \equiv \theta F(K, L) - WL - rK$, where θ is a revenue shifter that depends on product market competition as well as on technology. Similarly as in the empirical analysis of Nickell and Nicolitsas (1995) (referred to as N-N in what follows) the firm's financial constraints are measured by the ratio of capital expenses to cash flow $BR \equiv K\tau/CF$, where cash flow $CF \equiv \theta F(K, L) - WL$ is the firm's profits net of wage expenses. Let $1 - BR$ denote the probability that the firm survives.

⁵Nash bargaining and other approaches to rent sharing have been surveyed in Oswald (1996). Non-perfect wage setting studies also include efficiency wage - models (Shapiro and Stiglitz, 1984) and insider models (Solow, 1985).

Rent-maximizing employees (or local union representatives in the firm) have the objective function $LW(1 - BR) + (\bar{L} - L)x$, where \bar{L} is the number of workers in the union, L are those employed, W is the negotiated real wage and x is the alternative market wage and $1 - BR$ is the probability that the firm will survive. Rent maximizing banks have the objective function $Kr(1 - BR) + (\bar{K} - K)\rho$ in the individual loan contracts, where \bar{K} is total capital stock yielding ρ in alternative investment (given in a small open economy) and $Kr(1 - BR)$ is the capital income accruing to the bank (assuming that all capital is borrowed, for simplicity). A heavy indebtedness signals the threat of bankruptcy and a decrease in expected payments received by banks given by $r(1 - BR)$, where r is the payment that the bank receives if the firm does not run into bankruptcy.

The threat point for the firm is bankruptcy, for workers the value of work at the alternative work $\bar{L}x$ and for banks the value of alternative investment $\bar{K}\rho$. The fixed alternative income x can also be considered as the probability weighted sum of average wages when in alternative work and unemployment benefit when unemployed. Assume that the firm negotiates simultaneously with the employees (union) and the bank. This can be reasoned by the need of all the market participants for production to occur. It can be shown that the solution is principally the same if wages and capital prices are negotiated separately, but with a priori am-

biguous differences in bargaining powers. Augmenting the bargaining approach, as Abowd and Lemieux (1993), by negotiation between banks and firms, the Nash bargaining solution is obtained by maximizing the following:

$$\begin{aligned} \max_{W, r, L, K} & [LW(1 - BR) + (\bar{L} - L)x - \bar{L}x]^\alpha \\ & [Kr(1 - BR) + (\bar{K} - K)\rho - \bar{K}\rho]^\beta \\ & [\theta F(K, L) - WL - rK]^{1-\alpha-\beta}, \end{aligned} \quad (2.1)$$

where α is the bargaining power of the employees and β is the bargaining power of the banks. The first-order-conditions for wages, capital prices, employment and capital demand can be written as:

$$W = \hat{\alpha} \left(\frac{\theta F(K, L)}{L} - r \frac{K}{L} \right) + (1 - \hat{\alpha}) \hat{x}, \quad (2.2)$$

where

$$\hat{\alpha} \equiv \alpha \left\{ 1 - \beta + \frac{BR}{1 - BR(1 + \frac{WL}{CF})} \left[(1 - \alpha - \beta) \frac{WL}{CF} + \beta \frac{PR}{CF} \frac{\tau(1 - BR)}{\tau(1 - BR) - \rho} \right] \right\}^{-1}, \quad (2.3)$$

$$\hat{x} \equiv \frac{x}{1 - BR}; \quad (2.4)$$

$$r = \hat{\beta} \left(\frac{\theta F(K, L)}{K} - W \frac{L}{K} \right) + (1 - \hat{\beta}) \hat{\rho}, \text{ where} \quad (2.5)$$

$$\hat{\beta} \equiv \beta(1 - 2BR) \left\{ \beta(1 - 2BR) + (1 - BR)(1 - \alpha - \beta) + \frac{\alpha BR}{rK} \frac{W(1 - BR)}{W(1 - BR) - x} PR \right\}^{-1}, \quad (2.6)$$

$$\hat{\rho} \equiv \rho / (1 - BR); \quad (2.7)$$

$$\theta F_L = \frac{x}{1 - BR \frac{\theta F(K, L)}{CF}}; \quad (2.8)$$

$$\theta F_K = A \hat{\rho}, \text{ where} \quad (2.9)$$

$$A \equiv \frac{\beta(1 - BR)}{\beta(1 - 2BR) - \alpha BR \frac{r - \hat{\rho}}{r} \frac{W(1 - BR)}{W(1 - BR) - x}}. \quad (2.10)$$

From (2.5) and (2.9) the effective alternative return is given by $\hat{\rho}$ instead of ρ since capital supply and demand also depend on the liquidity constraints and not only on the level of interest rates. Term A exceeds unity under the threat of bankruptcy ($BR > 0$) raising the return requirement. (2.8) shows the central result in strongly efficient Nash bargaining, but here holding only under no threat of bankruptcy, that labor demand is sensitive to average wages x (here on the

industry level) but not to the firm's own wage level w .⁶ Because the probability of bankruptcy affects the expected wage payment, labor demand is not invariant to wage setting. The risk of firm running out of liquidity increases the return requirement by $1/[1 - BR\frac{\theta F(K,L)}{CF}]$. It is also seen that the financial position BR is more important the higher the wage level (raising the value of $\theta F(K, L)/CF$).

(2.2) implies that negotiated wages depend on the negotiated payment on loan r and on the borrowing ratio BR . From (2.2) and (2.5) it is seen that the share of rents allocated to employees and the bank depends on their bargaining power reflected in $\hat{\alpha}$ and $\hat{\beta}$, respectively. These shares are dependent on the firm's indebtedness BR , among others. The firm is able to make positive profits when the weights $\hat{\alpha}$ and $\hat{\beta}$ are below unity (the limit to rent-sharing is not considered explicitly). Eliminating the endogenous r , (2.2) and (2.5) can be arranged to yield for the wages

$$W = \lambda \frac{\theta F(K, L) - \hat{\rho}K}{L} + (1 - \lambda)\hat{x} \quad (2.11)$$

$$= \lambda \widehat{QR}/L - \lambda \hat{\rho}K/L + \hat{x}, \quad (2.12)$$

⁶Abowd and Lemiux (1993) refer to literature that gives a mixed support for this hypothesis, see also Johansesen (1996) as regards Norway.

where

$$\lambda \equiv \frac{\hat{\alpha}(1 - \hat{\beta})}{1 - \hat{\alpha}\hat{\beta}},$$

$$\widehat{QR} \equiv \theta F(K, L) - \hat{x}L,$$

where \widehat{QR} are the quasi rents that also takes into account the implications of indebtedness on return requirement $\hat{x} = x/(1 - BR)$. Rent-sharing λ depends on the effective negotiation power of labor union $\hat{\alpha}$ as compared to banks $\hat{\beta}$. Higher borrowing ratio BR raises both \hat{x} and $\hat{\rho}$ having a direct negative effect on wages W . The relative negotiation power of wage-earners and the bank also changes. From (2.6) $\hat{\beta}$ approaches unity as $BR = Kr/CF$ goes up. The bank is able to extract greater share of profits. From (2.3) the negotiating power of employees $\hat{\alpha}$ is also likely to increase, as always the wage requirement \hat{x} .

2.1. Empirical Formulation

In the empirical study, the quasi-rents for firm i are estimated in the form

$$QR_i \equiv Y_i - M_i - W_j l_i, \quad (2.13)$$

where Y_i is firm real output, M_i is real material costs, W_j is the real average wages in the industry j and l_i is the number of workers. In the empirical study, a logarithmic form, referred to in small letters, is used to include rent-sharing at the firm level QR . The implications of financial liquidity on \hat{x} (through \widehat{QR}) and on \hat{p} are captured by a separate term BR . The importance of QR_i supplies evidence on rent-sharing at the firm level against completely centralized wage setting. Dynamics, quasi-rents and liquidity constraints yield the following log-linear labor demand equation:

$$l_{it} = \mu_i + \mu_t + \eta_1 l_{it-1} + \eta_2 l_{it-2} + \mu_1 k_{it} + \mu_2 c_{it} + \mu_3 qr_{it} - \mu_4 w_{it} + \mu_5 BR_{it} + \mu_6 d_{jt} + \varepsilon_{it} + \gamma t, \quad (2.14)$$

where index i refers to the firm, index j to the industry and t to the time. BR_{it} measures financial constraints. In addition, μ_i = firm factor, μ_t = time, l_{it} = employment, k_{it} = capital, c_{it} =competition, w_{it} = wages, qr_{it} = quasi-rents (all in real terms and logarithmic form, capital k , wages w and rents qr deflated by producer prices). Variable μ_i contains all the firm's characteristics that remain stable over time. Variable μ_t includes all variables common to firms such as

taxation, interest payments, recession etc. Term d_{jt} shows demand factors and γt is a year dummy. Under constant returns to scale $\mu_1 = 1 - \eta_1 - \eta_2$ which is not tested. c_{it} describes the competition in the product market and changes in external circumstances. This includes the concentration of the industry and the market share of the company. From the equation (2.8) in section 2 the hypothesis is that labor demand is independent of quasi rents qr and firm indebtedness BR . The wage equation is of the form:

$$w = \vartheta_o + \vartheta_t + \vartheta_1 c_{it} + \vartheta_2 qr_{it} + \vartheta_3 BR_{it} + \eta_{jt} , \quad (2.15)$$

where ϑ_t is the time factor and c_{it} is the competition in the product market. The time factor ϑ_t describes the aggregate level progress of competition and profitability. One expects an increase in liquidity constraints BR and the financing costs $\hat{\rho}$ to show up as a decrease in wages. This is unambiguous if the negotiation power stays fixed.

The standard production function is estimated in the form:

$$y_{it} - k_{it} = \gamma_i + \gamma_t + \eta (y_{it-1} - k_{it}) + \gamma_1 (k_{it} - l_{it}) \quad (2.16)$$

$$\begin{aligned}
& +\gamma_2 h_{it} + \gamma_3 c_{it} + \gamma_4 qr_{it} \\
& +\gamma_5 BR_{it} + \gamma_{6t} + \omega_{it} .
\end{aligned}$$

Equation (2.16) follows the Cobb-Douglas production function, and includes a dynamic element to account for the productivity difference between old and new workers. The variable γ_i is the firm's factor, γ_t is the time factor and h_{it} is the cyclic variable measured by overtime work. Estimation in the difference form should eliminate the importance of the firm's variation γ_i . Competition in the production market c_{it} can affect productivity. γ_{6t} includes an industry-dummy showing productivity differences in the industries. We have not shown in section 2 the complicated final equation for the optimal price of capital r paid by the firm. The solution for a productivity measure $y_{it} - k_{it}$ would be even more complicated. In normal circumstances one expects financial liquidity BR to have more influence on capital demand than on output so that financial problems raise the productivity demand. Quasi rents qr may also raise the productivity of capital.

3. Results

The data relating to the analysis of the 500 biggest firms in Finland are described in Appendix. The panel includes all sectors in the period 1986-1995, whereas

Nickell and Nicolitsas (1995) concentrate on British manufacturing companies in an earlier period, 1972-86. First-differences are used to eliminate the firm-specific effects. The endogeneity problem is solved by using instrument variables that should correlate with the firm's quasi-rents and liquidity but not with the dependent variable. The time lags for most of instrument variables are three periods. The time lag is sufficient for current labor demand or wage formation to be insensitive to the instruments. The instruments include the past return on investment RA and export shares per sales $export$ with at least a three period time lag. Excluding the return on investment and export share as an instrument does not significantly affect the coefficients for quasi rents and liquidity, except in the productivity analysis.⁷ The inclusion of return on investment follows N-N but differs from other studies.⁸ The industry level export or import prices were not, however, found to be viable instruments. This contrasts the sharp fifty-fold increase in the estimated coefficient on quasi-rent per worker in Abowd and Lemieux (1993).

In the tables of results shown in Appendix, the liquidity variable BR and quasi-

⁷The wage elasticity of labor demand is, though, increased from the average of -0.3 to -0.4. Return on investment seems to correlate with the return on labor in a way that true wage effects are lower when this is controlled for.

⁸Abowd and Lemieux (1993) uses as the instrument the prices of exports and imports, Van reenen (1996) the number of major innovations made by the company and Estevao and Tevlin (1995) the output movements in the sector to which an industry sells.

rents qr are as shown above. In the calculation of average wages in the latter, the industry classification follows table A.1 in Appendix. Since wage settlements last for 1-2 years, it is found convenient to analyze qr and BR with one and two-period lags. The rest of the variables are as shown earlier. The estimation uses the Arrelano and Bond (1991) IV(GMM) method. We have time dummies and firm type dummies as shown in Appendix. (See table A.2.) The number of observations is 1543 in the period 1990-1995 (with a three-period lag).

3.1. Labor Demand

The labor demand equations are reported in tables 1 and 2. Table 1 includes, in column 2, liquidity effects analysed in the three time periods 1986-88, 1989-92 and 1993-95 observed in the monetary policy. The middle period 1989-92 is characterized by a tight monetary policy and high interest rates ending up in a devaluation in 1991 and in a currency floating regime in 1992. Table 2 analyses, in columns 2 and 3, liquidity and quasi-rent effects separately for the 250 second-largest and the 250 largest firms.

The wage elasticity can be seen to be fairly low. In table 1, the coefficient for wages is around -0.15. The long-term value is two times greater. The short-term wage elasticity is less than in Holm, Koskela and Honkapohja (1996), where

its value is around -0.3, and for SMEs in Piekkola (1998), where its value is -0.24. The long-term effect is also one half of that in other studies being around -0.3 (or -0.4 not using the return on investment and exports as instruments). In contrast to Holm, Koskela and Honkapohja, we exclude a firm's own output as an explanatory variable that would raise the value of the negative substitution effect of wages to labor demand (by eliminating the positive income effect). The wage elasticity also remains the same as reported ignoring liquidity constraints and rent-sharing. This is because the omission of liquidity constraints biases the elasticity downwards (see the more negative coefficient in column 3) and the omission of rent-sharing upwards (less negative) and the opposite implications offset each other. The flexibility of labor demand is also lower than for small and medium-sized firms (SMEs), for which the long-term elasticity in Finland is -0.7 (see Piekkola, 1997). It is seen that the wage flexibility is somewhat lower (less negative) for the largest firms (see column 3 in table 2). This difference in wage flexibility is interesting because average wage levels are rather similar in the second-largest and largest firms.⁹ The largest firms also have bigger opportunities to invest and shift employment abroad when the wage level increases.

⁹The usual finding of the higher wage level in big firms in other countries, and also true in plant-level studies in manufacturing in Finland, has been explained by more demanding production technology, by the schumpeterian innovativeness and by higher capital intensity with stronger complementarity of capital and labour of large firms.

The theoretical model implies from (2.8) that labor demand should decrease as the firm is more heavily indebted. The firm's financial liquidity has indeed a notable effect on labor demand, especially so for the largest firms. (See table 2.) The ratio of interest expenses to cash flow BR is significant with a negative short-term coefficient -0.18 for the whole sample and -0.4 for the largest firms. The average interest rate on borrowed capital was 12.7 in the recession period 1991-1993 and 2 percentage points lower in 1995 (in 1996 over 3 percentage points lower). Consider the employment effects when the ratio of interest expenses to cash flow is 60% lower as a result of this favorable trend in interest rates and the firm's cash-flow. The liquidity parameter BR then increases by 0.23. (The average share of interest expenses to cash flow is 0.37.) Unemployment will decrease by 4% in two years (using the short-term coefficient -0.18 from column 1). The long run effect is 8%. If labor demand dispersion is four times the standard deviation, the variation of the firm's liquidity in that period explains around 20% of the variation in labor demand.¹⁰ The labor demand effect is over two times higher for the largest firms. (See table 2.) This is also true for the half of firms that are less profitable on average (not reported).

¹⁰From $0.37 \cdot 0.18 \cdot 4 \cdot (0.25/0.37)$, where 0.37 is the average liquidity (BR), 0.18 is the coefficient and 0.25 is the standard deviation of BR .

Column 2 in table 1 shows that the financial liquidity has been an especially important factor in the years 1993-95 after the deepest recession in 1991-92. The rapidly decreasing interest rates had an important positive effect on labor demand.¹¹ The period of very tight monetary policy from 1989 to 1992 is also divided into a period of economic growth from 1989 to 1990 and into a deep recession in 1991 and 1992 that mitigates the whole period's explanatory value. One can conclude that the liquidity effect is less than that calculated in Nickell and Nicolitsas (N-N) for England. But this is not necessarily so in considering the importance of profitability in general that should include, besides the liquidity, the quasi rents effects (not analysed in N-N). But it appears that liquidity constraint explains the greater share of labor demand than quasi-rents. This is in line with the theoretical model implying from (2.8) that labor demand is independent of rent-sharing behavior but not on financial liquidity when the threat of bankruptcy affects the expected wage incomes. The liquidity effect is stronger for the largest firms. It is not clear why this is so. One reason can be that the threat to substitute foreign labor abroad for domestic labor reinforces the 'bankruptcy'

¹¹Liquidity constraint are also presumably differently affected by interest rates, the general tightness of monetary policy and profitability, as found in the adjustment of firms' stocks in Carpenter, Fazzari and Petersen (1994). In their study the interest rate level was an insignificant factor whereas the tightness of monetary policy, in particular, explained the cyclical adjustments of firms' stocks.

effect. It is also very large firms in the car trade, the paper and pulp industry, transportation and construction that are indebted and where debt payments have also most radically decreased. On the other hand, large firms should also have had better access to external finance than the second-largest firms.

It is seen that the quasi-rents $qr_{it-x} = 1,2$ have an insignificant effect on labor demand, unless the positive effect for the second-largest and the surprising negative effect for the largest firms are separated, as in column 3 in table 2. Hence, there exists a decreasing sensitivity of labor demand to quasi-rents as the firm size decreases. Quasi rents have strongest positive effect in the tight monetary policy period 1988-92 with a two-period lag (not reported). For the largest firms the profitability has rather decreased labor demand which is hard to explain based on our theoretical model. (See columns 2 and 3 in table 2.) It is tempting to claim that the reduction in employees has been used to improve a firm's financial solidity and profits, which causes some reverse causality errors that explains the negative relation. The model also excludes the implication of bankruptcies for a number of firms. The real effects of quasi-rents on employment may be more positive.

The coefficient on capital stock is statistically insignificant in tables 1 and 2. It is seen that the market concentration *conc* has a negative effect (column 1 in

table 1). The effect is clearer when the borrowing ratio BR enters the model, since the concentrated industries are also less indebted (columns 1 and 3 in table 1). A greater market share of the firm in the branch $mksh_i$ has a negative effect. A 10 percent increase in the market share will lead to a decrease of over 10% in the short-run and a decrease of over 20% in the long-run labor demand.

One can conclude that the low wage elasticity is in line with the Nash bargaining model. But the result is not conclusive, since the elasticity with respect to average wages is also not so high (not shown). The firm size matters, also in view of SMEs analysed in Piekkola (1998). The negative labor demand effect of quasi rents for the largest firms suggests that other factors besides rent-sharing have contributed to the effect.

3.2. Wage Formation

The standard deviation of log real wages has increased over time as well as the average wage level. Both of these can be explained by the increase in labor productivity (valued added divided by labor). Table 3 shows the factors affecting wage formation similar to the labor demand analysis. It is seen that wages adjust quickly so as to have little difference between short and long terms. Column 2 in table 3 indicates that the coefficient for the liquidity variable BR is negative for

the second-largest (coefficient is -0.29) and positive for the largest firms (coefficient is 0.17). For the second-largest firms, a considered 60% improvement in financial position increases wages by 7% in the short run. (The average value of BR is 0.37.) For the largest firms, financial problems have more direct bearance upon labor demand, as was apparent from table 2. Wages go down rather than up when financial position improves.

Table 3 reveals that the short run coefficient for quasi-rents qr varies from 0.03 in column 1 down to zero for the largest firms in column 3. The coefficient is not very high for the entire data, although it can be somewhat undervalued, since wages can be negatively related to the firm's profits (the reverse causality-problem). An alternative measure, profits per labor, would be an important factor for wage formation, but, again, rather for the second-largest firms. This is despite the fact that the variation in profits per labor is much lower in the second-largest firms. Quasi rents have a stronger effect on wages during the times of recession. (Similar to SMEs in Piekola, 1997, not reported). Based on our theory from (2.11), the reason is that the negotiation power of labor $\hat{\alpha}$ is higher, also enhanced by the increase in the negotiation power of banks [see equation (2.3)].

In the entire data, the coefficient for profits estimated similarly as in Hildreth and Oswald (1997) explains about 10% of wage dispersion, which is less

than one half of that obtained by them.¹² The overall wage dispersion explained both by liquidity (12%) and quasi-rents (10%) is instead only of somewhat lower magnitude than that explained by profits in Hildreth and Oswald (1997) or in Blanchflower, Oswald and Sanfey (1996). It is seen that the liquidity constraints are at least as important as quasi rents for wage variation. Separating liquidity position depending on firm size still raises its relative importance.

It can be concluded that the magnitude of the profit effects is not much less than in some of the other studies, see Hildreth and Oswald (1997). Quasi-rents and liquidity constraints together very much explain the same share of wage dispersion using the entire data and a greater share for the second-largest firms. It remains open to what degree liquidity constraints explain the profit effects in other countries. In Finland, the relative value of the liquidity effect is enhanced by the deep 1990s' recession and has also accentuated profit sharing (or loss sharing).

One difference from Hildreth and Oswald (1997) is that quasi rents are most important with a one-period lag. Hildreth and Oswald (1997), instead, have the strongest effect after two periods in the UK. For the US manufacturing industries in Blanchflower, Oswald and Sanfey (1996) the strongest influence of profits

¹²From $4 * 0.1 * 0.18$ where 0.1 is the coefficient (with 1.1 t-value) and 0.18 is the standard deviation of profits per labor. Caution should be made in this result given the negativity of profits during the recession and the implied lack of meaning of a profit elasticity measure.

happens even after a three-year lag (see also Holmlund and Zetterberg, 1991). It remains open as to what the causes are for longer lags in other studies. One reason is apparently the longer lags in liquidity effects. (The strongest effect for Finland is after two periods.) It is likely that the lags for other components relating to profitability are shortened if the liquidity effects are analysed separately. Our result can be more easily explained by rent-sharing at the firm level.

It is of interest also to check whether the liquidity constraints are more binding for low-profitability firms as implied by our model. Dividing the firms into two groups depending on average operating profits in the entire period, it is seen that the short-run coefficient for the low-profitability firms is -0.21. This is of similar magnitude as that obtained for the second-largest firms. For the high-profitability firms the coefficient is instead positive and given by 0.3. Similarly, for firms with a high dividend payout-ratio borrowing rate BR is not negatively related to wages.¹³ The finding that the liquidity effect is more important for low-profit firms is in line with equation (2.12) in section 2. For firms that are profitable and can afford to pay high dividends, a higher borrowing rate is not necessarily a sign of financial constraints even if the firm is small in size. Obviously, one of the reasons why

¹³Dividend payout/ratio was the criteria used for separating financially constrained firms in Hubbard, Kashyap and Whited (1995).

firm-size matters can be that the profit level in the second-largest firms is lower. However, there is no significant difference between the second-largest and the largest firms in this respect. It is also noteworthy that a similar analysis for labor demand would not show any strong difference in the importance of BR depending on the dividend payout-ratio. This also shows that the labor demand effects of BR of the largest firms also relate to other factors besides liquidity constraints.

The different implications of profits and liquidity on wages depending on firm-size could, in principal, explain some of the greater wage dispersion in Finland than in Sweden as found in Vainionmäki and Laaksonen (1995). They observe that about 8 percentage points of industry wage differences cannot be explained by differences in education or labor characteristics. This unexplained variation, though, mitigates to more modest 2-3 percentage points in a fixed-effect model. Without further evidence it is difficult to analyse whether the remaining wage variation emerges from differences in profit variability or from some other factors. It is only clear that the large firms play a more dominant role in Sweden than in Finland, as is clearly the case when comparing Sweden with other countries (see Davis and Henderson, 1997). This can explain part of the lower wage dispersion in Sweden.

Finally, the coefficient for capital is negative. This is in line with the inefficient

capital investment hypothesis by Pohjola (1996). (See later discussion in the following section.) The coefficient for both concentration and the market share is positive in the wage equation. Increased concentration (less competition) lowers labor demand and increases wage level. The unit coefficient for the market share in two years in column 1 implies that a 10% percentage increase in the market share increases the wage level up to 5%. (The average market share is 5%.)

3.3. Productivity

Table 4 examines the factors explaining productivity based on equation (2.16). Column 2 in table 4 suggests that the financial liquidity had the greatest negative influence on productivity in 1986-88. In this period, the investment rate was substantially higher than after the recession, but the boom period gave no incentive to improve efficiency as a result of increasing indebtedness. In the whole period, column 3 shows that liquidity constraints (higher BR) have a short-term positive effect on productivity for the second-largest firms. The unimportance for the largest firms and the even negative effect in 1986-88 may be explained by the fact that large firms in Finland have some monopoly power in financing when negotiating with banks. The banks cannot afford to let large firms go bankrupt. The true coefficients, though, may be more positive, since in the long term higher

productivity lowers the debt ratio.

It is also seen that quasi-rents are important for factor productivity and the more so for the largest firms. In the earlier period since the 1960s, Pohjola (1996) uses the inefficient investment to explain the low return on equity of the Finnish listed companies. The increase in market values has been explained by the higher level of funds allocated there, while the return on that invested capital is close to zero. It is seen that, at least after the capital market liberalization since 1985, followed by an increase in the return requirement on investment, profitability and capital productivity are positively related. Note that instrumenting for return on investment and export is important, since otherwise both quasi rents and liquidity have no effect on productivity. These instruments are important to capture the increase in the rates of return on borrowing not relating to any increase in the efficiency in the use of capital.

To also consider the efficiency of labor, figure 1 shows the development of labor productivity (valued added per labor) in the large firms and in the SMEs in Piekkola (1998). The picture shows a labor productivity increase both in SMEs and large firms. The productivity of large firms has become closer to that of the relatively profitable firms included in the SME data. The labor productivity improvement has been more apparent in the domestic sector outside manufacturing

(especially in the food industry and retail trade). It can be seen that inefficient labor and not only inefficient capital is then the background for the lessening of the labor force in large firms.

Table 4 shows that labor relates positively to capital productivity in large firms. (But not so for SMEs in Piekkola, 1997.) It cannot be concluded that employment has typically declined in plants experiencing positive (total) productivity growth, as in U.S. manufacturing according to Baily, Haltiwanger, and Hulten (1996). It is rather evident that labor productivity improvement by reducing the labor force has been partly achieved at the cost of capital productivity. A decrease in labor leads to a decrease in capital productivity. Admittedly, part of the labor productivity increase is also explained by movement away from the raw material end of the production process that usually implies a higher content of valued added to sales ratio (see Scherer, 1980. p. 79). This phenomenon may have been stronger for the larger firms. The capital productivity has also stayed permanently at a higher level since the recession, since the year dummies for productivity behavior yield a positive value after 1991.

Finally, columns 2 and 3 in table 4 suggest that industry concentration *concen* has an insignificant effect on productivity. The coefficient for *mksh* remains ambiguous, too. It is indeed claimed, e.g. by Willig (1987), that the overall effect of

competition (industry concentration and market shares) on productivity can be ambiguous. One reason for this is that although a higher market share implies less competition, the demand elasticities of products and the monopoly profits also decrease.

The overtime hours H_{ojt}/H_{njt} works as a proxy for demand fluctuations. (It is, though, not found to be an important instrument.) The coefficient is around 0.2 (the average value is 1.39) so that a 10% percent increase in overtime work improves productivity by 3%. The cyclical demand factors have, hence, a significant effect on productivity.

Table 4 shows that the differences between export and non-export firms are significant. This is in line with the usual finding in Finland that export share is an important factor for efficiency. Productivity might also have been affected by the two devaluations in 1991 and 1992, but profitability implications are ambiguous if the firm has borrowed a large share of funds in foreign currencies (see Ilmakunnas and Topi, 1996).

4. Conclusions

We show that the wage elasticity of labor demand is reasonably low with or without accounting for the separate effects of firm's financial constraints and

rent-sharing. The long run wage elasticity is -0.3, while it is -0.7 for the SMEs considered in Piekkola (1998).

The quasi-rents and the financial situation of the firm, measured by interest expenses as a proportion of the cash flow, are important determinants of labor demand and wage formation in Finland. For the second-largest firms, the explanatory power of quasi-rents and liquidity is similar to the role of profits in a number of other studies in the UK and the United States (see Hildreth and Oswald, 1997). The financial position of the firm is at least equally important as rent-sharing for labor demand and wage formation during the considered period including deep recession. It is possible that liquidity constraints explain the long lags of profits in other studies. It is clear, however, that part of the importance of the financial position, especially for the largest firms, cannot be solely contributed to the firm being in liquidity crisis. The largest firms have greater opportunities to shift production abroad that can have similar effects as the threat of bankruptcy. This has not, however, lead to greater wage elasticity.

It is evident that despite the productivity increase, firms continue to stay susceptible to financial constraints that affect the firm's performance and employment. We also have no evidence of a relative increase in the importance of rent-sharing over time as compared to financial position, rather the opposite. The

shock sensitivity of the firms is measured in table A.3 in Appendix by the change in the number of firms, where value added covers wages, when wages are increased by 20%. It shows a value higher after the recession than before. This is despite the fact that the profit level on average has improved since the recession. This increase in shock sensitivity together with the increase in profit dispersion, although average profits are more similar across industries, imply that profitability and liquidity constraints are still a potentially important factor for labor demand.

It is interesting to find the strong importance of firm-size to labor demand and wage formation. For the second-largest firms, the labor demand is insensitive and wages sensitive to changes in quasi rents and financial position. The behavior with respect to quasi rents is in line with rent-sharing on firm-level. This is also because profitability is not particularly low for the second-largest firms so that this cannot explain the strong effects. One reason for the insensitivity of labor demand to liquidity can be that workers do not similarly sense the threat of bankruptcy as lenders.

The largest firms negotiate less and adjust their labor rather than wages in response to changes in the profit level or the financial position. The aim is, perhaps, to improve labor productivity and to bring it closer to the international level, also by substituting foreign for domestic labor. In this respect, the improvement in the

financial position after the tight monetary policy in Finland in the years 1989-93 and the substantial drop in interest rates had the most prominent influence.

The future work is to control better for personal characteristics in a linked employer-employee data and to have larger sample of firms to scrutinize in greater detail the industry-specific differences.

Tables of results

Table 1 Employment

Independent variables	Dependent variable: Labour demand l_{it}		
	Basic		
	1	2	3
* l_{it-1}	0.46 (11.6)	0.44 (8.8)	0.51(13.7)
* l_{it-2}	0.02 (0.5)	-0.01 (0.3)	-0.02 (0.7)
* k_{it}	-0.001 (0.1)	0.007 (0.3)	-0.003 (0.2)
* w_{it}	-0.15 (2.2)	-0.15 (1.8)	-0.17 (2.1)
* w_{it-1}	0.08 (1.5)	0.05 (0.9)	0.0 (0.1)
* qr_{it-1}	0.01 (1.2)	0.008 (0.7)	0.02 (2.1)
* qr_{it-2}	0.0 (0.3)	0.002 (0.4)	0.01 (0.9)
		86-88 0.11 (1.0)	
* BR_{it-1}	-0.09 (2.1)	89-92 -0.13 (2.8)	
		93-95 -0.26 (4.1)	
		86-88 -0.13 (1.8)	
* BR_{it-2}	-0.09 (2.9)	89-92 -0.01 (0.3)	
		93-95 -0.20 (2.7)	
$conc_{it}$	-0.0026 (2.4)	-0.0023 (1.8)	-0.0012 (1.2)
$mksh_{it-1}$	-0.67 (2.1)	-0.67 (1.9)	-0.5 (1.4)
$mksh_{it-2}$	-0.75 (1.9)	0.82 (1.9)	0.6 (1.8)
Serial correlation	-1.451	-0.984	0.937
Instrum. validity	94 d.f. 83	87 d.f. 79	91 d.f. 85

(i) t-statistics in parentheses robust to heteroskedasticity. Serial correlation (0,1) shows no second-order autocorrelation in first-difference errors, hence no first-order autocorrelation in the level errors.

(ii) Starred variables are endogenous. Instruments include exogenous variables, and l_{it-4} , w_{it-3} , qr_{it-3} , $export_{it-3}$, $export_{it-4}$, RA_{it-3} , RA_{it-4} , $mksh_{it-3}$, k_{it-3} .

(iii) l_i =employment, k_i =capital stock, w_i =wage, qr_i =quasi-rents, BR=liquidity (interest expenses/cashflow), conc=concentration

mksh= market share, RA = return on investment, export= exports per sales.

Table 2 Employment and firm size

Dependent variable: Labour demand n_{it}

Independ. variab.	1	2	3
$*l_{it-1}$	0.36 (7.7)	0.36 (7.0)	0.36 (7.0)
$*l_{it-2}$	0.0 (0.0)	-0.01 (0.5)	-0.04 (1.0)
$*k_{it}$	0.020 (0.8)	0.029 (1.1)	0.038 (1.0)
$*w_{it}$	0.02 (0.2)	0.03 (0.3)	s.largest 0.17 (1.1) largest -0.07 (0.6)
$*w_{it-1}$	0.16 (2.4)	0.13 (1.8)	s.largest 0.16 (1.7) largest 0.14 (1.3)
$*qr_{it-1}$	0.02 (1.7)	s.largest 0.03 (1.5) largest 0.01 (0.9)	s.largest 0.03 (1.2) largest 0.01 (0.7)
$*qr_{it-2}$	-0.01 (1.9)	s.largest 0.027 (1.5) largest -0.034 (3.0)	s.largest 0.03 (1.6) largest -0.03 (3.0)
$*BR_{it-1}$	s.largest 0.09 (1.2) largest -0.12 (2.1)	s.largest 0.11 (1.4) largest -0.11 (1.8)	s.largest 0.12 (1.4) largest -0.13 (2.1)
$*BR_{it-2}$	s.largest 0.02 (0.4) largest -0.29 (4.7)	s.largest 0.07 (1.1) largest -0.35 (5.3)	s.largest 0.09 (1.3) largest -0.32 (5.2)
$conc_{it}$	-0.0 (0.3)	0.002 (0.7)	0.0 (0.2)
$mksh_{it-1}$	-0.7 (1.6)	-0.7 (1.5)	-0.9 (1.7)
$mksh_{it-2}$	-1.1 (2.0)	1.0 (1.7)	1.2 (2.0)
Serial cor.	-1.600	-1.542	-1.294
Instrum. val.	70 d.f. 81	65 d.f.79	64 d.f. 77

(i) As table 1.

Table 3 Wage formation

Dependent variable: wages w_{it}

Dependent variables	1	2	3
* w_{it-1}	0.10 (1.6)	-0.02 (0.3)	0.01 (0.2)
* l_{it-1}	0.22 (5.3)	0.21 (5.0)	0.20 (4.4)
* l_{it-2}	-0.05 (1.6)	-0.02 (0.7)	-0.03 (0.8)
* k_{it}	-0.027 (1.5)	-0.053 (2.8)	-0.05 (2.5)
* qr_{it-1}	0.029 (2.7)	0.01 (0.5)	s.large 0.01 (0.7) largest 0.0 (0.3)
* qr_{it-2}	-0.008 (1.5)	0.0 (0.7)	s.large 0.01 (0.6) largest -0.01 (1.0)
* BR_{it-1}	-0.01 (2.0)	s.large -0.05 (0.9) largest 0.05 (1.3)	s.large -0.06 (0.9) largest 0.06 (1.3)
* BR_{it-2}	-0.11 (2.2)	s.large -0.24 (4.3) largest 0.12 (2.5)	s.large -0.21 (3.3) largest 0.10 (2.1)
$concen_{jt}$	0.002 (1.7)	0.001 (0.6)	0.001 (0.4)
$mksh_{jt-1}$	-0.37 (1.1)	0.22 (0.6)	0.15 (0.4)
$mksh_{jt-2}$	1.21 (3.7)	0.82(2.6)	0.80 (2.5)
Serial correlation	-0.491	-1.140	-1.345
Instrum. validity	115 d.f. 84	108 d.f. 82	103 d.f. 80

(i) As table 1.

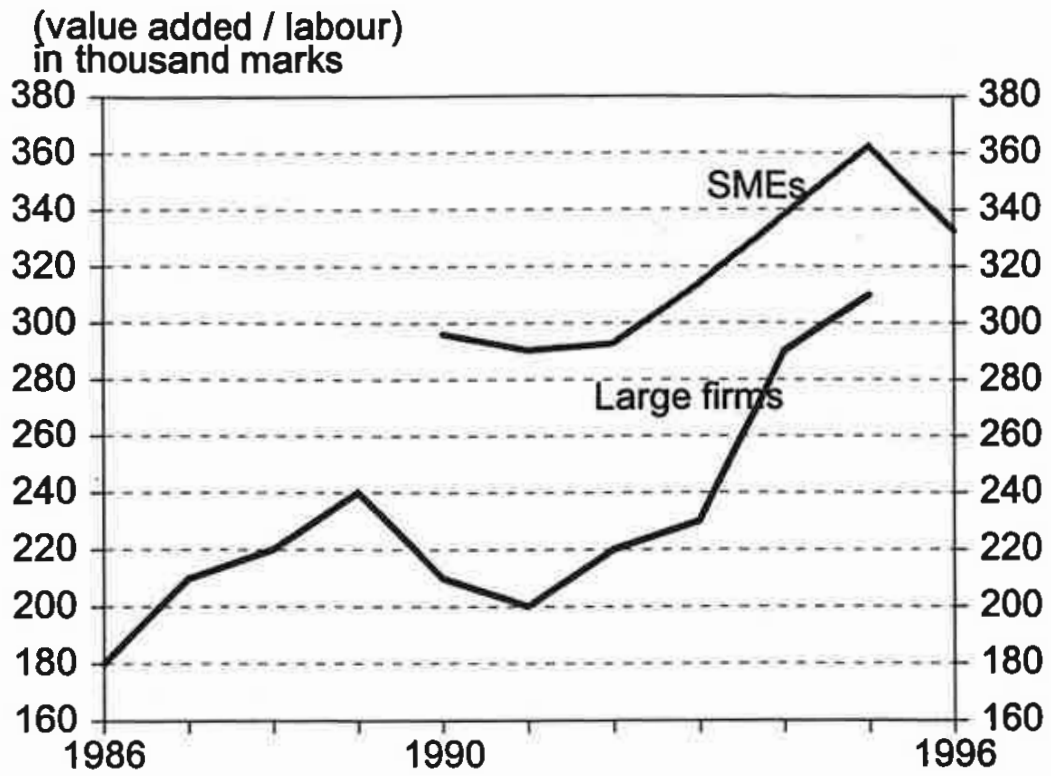
Table 4 Productivity

Dependent variable: Productivity $y_{it} - k_{it}$

Independent variables	1	2	3
$*y_{it-1} - k_{it}$	-0.25 (1.1)	0.23 (1.0)	-0.22 (0.8)
$*l_{it-1} - k_{it-1}$	0.21 (3.4)	0.17 (2.6)	0.19 (2.7)
$*l_{it-2} - k_{it-2}$	-0.15 (2.8)	-0.13 (2.3)	-0.10 (1.7)
$*H_{ojt}/H_{rjt}$	0.26 (2.4)	0.25 (2.2)	0.27 (1.9)
$*w_{it-1}$	0.25 (1.2)	0.09 (0.4)	0.29 (1.2)
$*qr_{it-1}$	0.061 (1.6)	0.063 (1.6)	s.large 0.066 (0.7)
			largest 0.128 (2.3)
$*qr_{it-2}$	0.026 (1.2)	0.033 (1.4)	s.large -0.108 (1.9)
			largest 0.072 (1.8)
$*export_{it-1}$	0.9 (2.5)	0.82 (2.2)	0.25 (0.4)
		86-88 -0.38 (1.0)	
$*BR_{it-1}$	0.26 (1.6)	89-92 0.17 (0.9)	s.large 0.69 (2.6)
		93-95 0.09 (0.4)	largest 0.02 (0.7)
		86-88 -0.29 (1.0)	
$*BR_{it-2}$	-0.20 (1.9)	89-92 -0.08 (0.6)	s.large -0.56 (3.0)
		93-95 -0.30 (1.3)	largest -0.07 (0.3)
$concen_{jt}$	0.0079 (1.7)	0.0063 (1.4)	0.010 (1.9)
$mksh_{it-1}$	-2.2 (1.0)	0.1 (0.1)	-1.8 (0.7)
$mksh_{it-2}$	-0.8 (0.3)	0.4 (0.2)	1.3 (0.6)
Serial correlation	-0.896	-1.051	-1.049
Instrum. validity	70 d.f. 82	67 d.f. 78	58 d.f.78

(i) As table 1, starred variables, including $y_{it-1} - k_{it}$ and $l_{it-1} - k_{it}$, endogenous.

Figure 4.1: Labor Productivity in Large Firms and SMEs



A. Appendix

Firm-level data

The data bank consists of the 500 biggest firms in sales and their balancing of the account in the years 1986-95. It was collected by *Talouselämä* magazine and maintained by ETLA (see Aalto 1993). Consistency and the requirement of information on firms for five successive years has reduced the maximum number of firms to 335. The number of firms in the unbalanced panel varies from a low 201 in 1986 to a high 334 in 1995. In the sample, the median output is 570 million marks in 1995. (Lowest is 158 million marks.) The border for middle-sized firms is below 40 million Ecus according to EU recommendations (about 240 million marks), and 50 of the second-largest firms satisfy this requirement. Personnel of the second-largest firms (an average of 300) is one-tenth of that in bigger firms. The industry division and employment in 1993 is given by the following table.

Table A.1 Industry

Industry branch	Number	Employed
food industry	37	42 000
metal industry	38	124 000
paper and pulp and chemical industry	27	112 000
textile and furniture industry	10	17 000
retail trade	44	55 000
wholesale- and car trade	57	30 000
construction, traffic, energy	46	66 000
engineering ¹	29	47 000
services ²	35	36 000
firms in all	323	529 000

1 electricity- , electronic industry, information technology

2 includes graphic industry, advertising agency, communication and other services

Manufacturing firms are 47% of all firms and 55% of all workers (300 000) are employed there.

The original division into 20 industries would leave some industries with relatively few observations and the statistical importance of the liquidity variables was lower. In excess of this, 41 were classified from multi-industry to its main industry. (In ETLA 60% sales is required for the firm not to be a many-field industry). The empirical study, hence, adapts the sevenfold division below.

Table A.2 Firm types

Type of firm	Number	Employed
retail trade, services	77	76 000
wholesale trade	43	20 000
food industry	58	60 000
home market 1	25	28 000
information/engineering 2	28	49 000
export	53	231 000
infrastructure 3	39	64 000

1 including furniture, textile

2 electronic, electricity, information

3 technology, construction, energy production

The division also reflects the difference between export and home market industries, although in the data exports of the latter also amount to 17% of average sales. The wage variable is wage expenses divided by the number of employees. The cash flow is the real profit plus assessed taxes.

Capital Stock k_{it} is obtained by assessing the replacement value of firm's asset at the beginning of period (assuming that the average life of assets is seven years) and then cumulating net investment and normalizing using the price index for plant and machinery (See Wadhvani and Wall, 1986). Market Share $mksh_{it}$ is derived as in Nickell and Nicolitsas (1995). Return on investment RA_{it} is net profits plus net interest expenses divided by firm's balance sheet less interest-free debt (the balance sheet is the end of year figure and not the average, as usual).

Industry level variables

Concentration ratio $conc_{jt}$ is the share of five largest firms from total sales in 12 branches, Source: Enterprises, Statistics Finland. Overtime hours H_{ojt}/H_{njt} is yearly overtime hours per normal hours in 9 branches, Source: labor Force Statistics, Statistics Finland. The producer prices are from 15 and import prices from 14 different branches using consumer price (before taxes) and wholesale price indexes for service and trade sector, Source: Bulletin of Statistics, Statistics Finland.

Shock sensitivity

The shock sensitivity shows percentage decline in firms for which value added covers wage expenses if wages are increased by 20%.

Table A.3: Shock Variable

	1986	1987	1988	1989	1990
wages	97	99	99	99	98
wages up 20%	93	96	94	96	88
difference	4	3	5	3	10
	1991	1992	1993	1994	1995
wages	93	95	96	99	99
wages up 20%	80	84	88	94	94
difference	13	11	8	5	5

The shock absorption measure is over 10%-points during the recession and thereafter 5%-points and higher than before recession.

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