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FINANCIAL SHOCKS, WAGE-SETTING AND EMPLOYMENT*

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The paper investigates the employment effects of changes in interest rate, availability of credit, internal net worth, market power and debt-equity ratio. A model of an oligopolistic risk averse firm is used as an analytical framework, combined with a Nash bargain over wage. The analysis suggests that employment is highly sensitive to changes in financial factors, and that this sensitivity increases with indebtedness. The main reasons for the result are the assumptions of (1) the decisive role of investment in employment determination in long run and (2) credit rationing. The result emphasizes the importance of monetary policy when aggregate employment is concerned. (JEL E22, E24, J23)

1. Introduction

The aim of this paper is to investigate the employment effects of financial shocks, such as changes in interest rate, credit rationing, internal net worth and debt-equity ratio. Usually studies of labor demand omit these kinds of factors while they concentrate on wages, benefits and taxes.[1] As a rule the determination of capital is precluded from the analysis by assuming that the capital stock is an exogenously given constant. The chosen approach has led many authors to conclude that excessive real wage is the most important reason explaining the rise in unemployment experienced in many countries in the late 70's, 80's and early 90's (see for instance Bean, Layard and Nickell, 1986). There are several reasons, however, to assume that financial variables should also affect employment. The importance of financial variables has been confirmed for instance in empirical studies by Wadhwani (1987) and Nickell and Wadhwani (1991); according to the latter study the »(f)inancial factors have a very important effect on unemployment» although the role of these factors is not modelled explicitly. In both studies the estimation results show that employment decreases with the interest rate and debt-equity ratio while it increases with the market capitalization of firms. More general discussions on the links between financial and real variables are offered by Greenwald & Weiss (1984) and Greenwald & Stiglitz (1987).

As many papers on credit rationing and imperfect capital markets have emphasized, the

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[1] *A good example of total imission of financial factors is the famous book by Layard, Nickell & Jackman (1991). For similar analysis, see also the survey articles by Hamermesh (1986) and Nickell (1986).*

firms (or banks) are not neutral between credit and equity when finance matters. Models of asymmetric information in credit markets have been used to show that firms are not able to finance their investments totally by credit; instead, collateral and internal net worth are important indicators of the riskiness of firms to the imperfectly informed banks, and that is why they affect the interest rate and the availability of credit.[2] These theoretical motivations can be supported also by casual empiricism: stock market analysts, bankers and managers tend to put emphasis on financial variables when evaluating the performance of the firms.

In this paper we present a model of oligopolistic manufacturing industry in which the firms try to avoid bankruptcy. Bankruptcy takes place if a firm is not able to borrow any more to cover its costs (similar concept of bankruptcy has been used by Wadwhani, 1987). If there is a positive probability of loss, then with probability one the firm will exceed any line of credit, however large, in finite time. We assume that the prices and financial conditions can fluctuate so that in some states losses are possible. Hence there have to be limits on how much firms can borrow. In this paper this limit is supposed to depend on the rate of credit rationing, or on the liquidity of bank system and on the firm's accumulated stock of debt. Since the bankruptcy risk increases with debt, the firms are not willing to accumulate debt indefinitely. The bankers are not either willing to supply credit beyond limits. When facing lower profits, or higher interest rates, the firms try to reduce their debts by decreasing their investment. We assume that on the margin all investments have to be financed by credit. So debt can be reduced only by decreasing investment. In that kind of framework we investigate the behavior of labor demand. In the model any improvements in aggregate employment are closely related to capital investments, since we assume that a fixed labor input per unit of a capital equipment is needed in production.[3]

Wages are supposed to be determined through a Nash bargain between the firms and a trade union representing employed workers. The parties do not bargain over investments but they take account of how investments are affected by wages. The wage bargain takes place in the beginning of a relatively short contract period. During the period the output price and interest rate can vary. The firm responds to these shocks immediately by adjusting the rate of capacity utilization while the capacity itself stays fixed in the short run. The wage rate is also adjusted either by renegotiation or by some indexation scheme. So in fact wages are supposed to be flexible in this model. Although the stock of capital in reality cannot be changed daily, the target level of capital changes and affects the investment plans of the firm. If there are many firms (or many plants) in the industry which makes staggered investment decisions, then also the capital stock is adjusted quasi-continuously. Our aim is to analyze the changes of capital stock and employment, and that is why we focus on the long term dynamics; that is, on periods which are long enough to enable the capital stock fully adjust to shocks.

The paper is organized as follows. In the next section the basic model is presented and equilibrium capital stock and labor demand are derived. The wage bargaining is also introduced in that section. In Section 3 the comparative statics properties of the equilibrium are investigated. Especially we analyze the employment effects of financial variables. Section 4 discusses the policy implications of the model. Results suggest that monetary policy should have the greatest potential in reducing unemployment while the role of wages is not very important. The financial structure of the firms is shown to be decisive in employment determination: risk averse debt financed firms are more vulnerable and hastier to cut employment as a response to negative shocks than risk neutral firms or firms without debt. The last section contains concluding remarks.

2. *The model*

Consider a manufacturing industry facing a downward sloping demand curve

$$(1) \qquad Y = (P/\mathbf{P})^{-E}M,$$

[2] *For models of credit rationing under asymmetric information see for instance Stiglitz & Weiss (1981, 1987) and for a survey Gertler (1988). Calomiris & Hubbard (1991) models the importance of internal net worth. Gale (1984) presents an early model with bankruptcy risk.*

[3] *This feature of the model resembles a more complex model presented by Driehuis (1986).*

where Y is the industry's output, P is its price, **P** is general price level, E is the price elasticity of demand and M is a measure of nominal demand. M is a combination of domestic and foreign demands; the weights of these depend on the share of exports of a firm. The industry may consist of both domestic and foreign firms. In the case of pure export industry there may be only one or two domestic firms facing truly exogenous prices and demand. For analytical simplicity we assume that all firms are identical.

Equation (1) yields the producer price

$$(2) \quad P = \mathbf{P}(M/Y)^{1/E}.$$

Let there be a finite number (f) of firms in the industry. The output of the industry is the sum of the outputs of the firms,

$$(3) \quad Y = Y_1 + Y_2 + \ldots + Y_f.$$

The market share of the jth firm, m_j, is given by

$$(4) \quad m_j = Y_j/Y \leq 1.$$

The firms of the industry behave like Cournot-oligopolists. It follows that in equilibrium the marginal revenue of the jth firm is given by

$$(5) \quad MR_j = P\,(1-m_j/E).$$

Since we are particularly interested in the behavior of capital intensive firms, i.e. on a manufacturing industry, it is assumed that the upper limit of the industry's output is determined by the productive capacity or by the capital stock (K_j) of the firms belonging to the industry. The firms can choose the rate of capacity utilization, c_j,

$$(6) \quad Y_j = c_j K_j, \quad 0 \leq c_j \leq 1.$$

Employment is assumed to be determined by the volume of output; there is no overhead labor. Employment decreases with the productivity of labor, q,

$$(7) \quad N_j \geq Y_j/q.$$

The capital stock equals the sum of debt (D_j) and the net worth of the firm (Q_j),

$$(8) \quad K_j = D_j + Q_j.$$

By definition the firm is bankrupt if it is not able to cover its costs either by its current cash flow or by raising extra credit, or if

$$(9) \quad CF_j + (D_{maxj} - D_j) < 0,$$

where the cash flow is given by

$$(10) \quad CF_j = PY_j - W_jN_j - iD_j,$$

where i is the interest rate of the firm's loans. Here W_j is the labor cost consisting of basic wage, w, and a premium for shift work or overtime work, $h > 0$, which depends on the capacity utilization rate:

$$(11) \quad W_j = w(1 + hc_j).$$

There is an upper limit of indebtedness set by the creditors. That limit is supposed to increase with the capital stock and the present value of the future cash flow [PV(CF)] and decrease with the rate of credit rationing (R) chosen by the bank. This assumption reflects the common practise of banks to claim a collateral from their debtors. The maximum amount of debt the jth firm can raise in period t is given by

$$(12) \quad D_{max;\,jt} = D^*_{jt}/R_t = [K_{jt} + PV_{jt}(CF_{j,t+i})]/R_t; \quad i, t = 0, 1, 2, \ldots$$

Let all exogenous variables {P, i, R} be random so that the firm does not know their future values. Assume further, that for some realizations of those variables the cash flow may turn out to be negative,

$$(13) \quad CF_{min} < CF_j < CF_{max};\ CF_{min} < 0.$$

It follows that

$$(14) \quad \text{if } CF_{min} + (D_{maxj} - D_j) < 0, \quad \text{then Prob\{bankrupt\}} > 0.$$

It is straightforward to see that the probability of bankruptcy increases with debt (D_j) and decreases with the current cash flow (CF_j), since the probability of a large change in cash flow is less than the probability of a small change. So if the initial cash flow is very high,

it is not likely that it will turn out to be negative very soon.

Now suppose that those making decision in the firms (they may either be managers, owners or creditors) try to avoid bankruptcy. That makes them to behave in a risk averse manner. The profit maximization will not any more be the only target of the firm but the expected costs of bankruptcy have also to be included into the objective function to make it realistic. In this model we try to capture these features as simply as possible by adding a term which reflects the expected costs of bankruptcy into the profit function. The firm thus maximizes function V (c, K) by choosing c and K optimally:

$$(15)\quad \max_{c,k} V = P(1-m/E)\,cK - WcK/q - iD - \tfrac{1}{2}D^2RB(CF),$$

where B (CF) is an inverse function of the cash flow, $B' < 0$ and $B'' > 0$. [To save space the subscripts are dropped when not necessary.] The higher is the cash flow the lower is the probability of bankruptcy. The probability increases with the rate of credit rationing and with the debt. The objective function has a squared term of debt since it affects not only the probability but also costs of bankruptcy. In the bad case a creditor loses all loans. If $D = 0$, then there is nothing to worry about. It follows from this particular formulation of the firm's objective function that when deciding on capital investments the firm has to take into account the effects of additional lending on the expected costs of business failure. We assume that on the margin all investments are financed by debt.

As the first order conditions for the firm's problem we obtain

$$(16)\quad c:\ V_c = K[P(1-m/E) - w(1+2hc)/q](1-\tfrac{1}{2}D^2RB') = 0;$$

$$(17)\quad K:\ V_K = c[P(1-m/E) - W/q] - i - DRB(.) = 0.$$

From these conditions the optimal values of c and K can be solved:

$$(18)\quad c^* = \tfrac{1}{2}q[P(1-m/E) - w/q]/hw;$$

$$(19)\quad K^* = Q + \{c^*[P(1-m/E) - W/q] - i\}/RB(.).$$

It is obvious that while the capacity utilization rate can be adjusted very rapidly by changing employment or number of shifts, the adjustment of capital stock has to be much slower. Capital stock can be increased only by new investment (net of depreciation), and it is reduced when assets are sold or when the net investment is negative. That may happen if, for instance, the bank urges the firm to reduce its debt. We assume that the length of decision period in our analysis is such that the capital stock can be adjusted within the period.

When c and K are determined, then employment is also known, since

$$(20)\quad N^* = c^* K^*/q.$$

This is the long-run equilibrium level of employment determined by the equilibrium capital stock. It can be seen from equation (18) that the capacity utilization depends on price, market power, price elasticity and real wage: P, m, E, W, h and q. The capacity utilization increases with the marginal product of labor. The optimal capital stock increases with the capacity utilization:

$$(21)\quad K^*_c = [P(1-m/E) - w(1+2h)/q]RB(.) > 0.$$

The link between K and c complicates the calculation of the effects of exogous variables on employment. The derivative of employment with respect to variable x is given by

$$(22)\quad N_x = [(K + cK_c)c_x + cK_x]/q.$$

We are going to use this formula in what follows.

In order to endogenize the wage rate we assume that it is determined through a Nash bargain between the firm and the trade union representing the workers. The bargain takes place in the beginning of each contract period, before the realizations of the exogenous variables. The contract period is short enough to enable the parties to adjust the wage rate to exogenous shocks. The parties maximize the Nash product given by

$$(23)\quad \max_w \hat{A}(w) = \{[U(w) - U_A]^a [N(w)]^{1-a}\}^b [V(w) - V_A]^{1-b},\quad 0 \le a \le 1,\ 0 \le b \le 1,$$

where a is the relative weight of wage or a seniority measure in union's decision making,

and b is the relative bargaining power of the trade union. The threat points of the parties are given by U_A and V_A. U(w) is the utility function of an individual worker; $U_w > 0$ and $U_{ww} < 0$. We assume that the utility decreases with general price level, interest rate, credit rationing and monopoly power of the firms: $U_x < 0$ for $x \in \{P, i, R, m\}$;

$$(24) \quad U = U(C(w)); \; c = [w + D_h(1-i)/R]/P(m).$$

It is assumed that the workers have net debts, so $D_h > 0$. D_h is the desired level of debt and D_h/R is the actual debt. In the absence of credit rationing $R = 1$.

Setting $V_A = 0$ as usual and taking logarithms transforms (23) to

$$(25) \quad \max_w A(w) = ab\log[U(w) - U_A] + (1-a)b\log N(w) + (1-b)\log V(w),$$

where $A(w) = \log\hat{A}(w)$. Differentiating A(w) with respect to w yields the first-order conditions:

$$(26) \quad A_w = ab[U_w/(U-U_A)] + (1-a)b(N_w/N) - (1-b)N(1 - \tfrac{1}{2}D^2RB')/V(w) = 0.$$

The equilibrium wage can be solved from this condition,

$$(27) \quad w^* = \arg\max A(w).$$

3. *Equilibrium and comparative statics*

Let us now briefly focus on the method which is used to derive the results in this section. In equilibrium the wage and the employment can be expressed as functions of the exogenous variables:

$$(28) \quad N = \arg\max V = N(w, \mathbf{Z}) = N(w(\mathbf{Z}), \mathbf{Z}) = N(\mathbf{Z});$$

$$(29) \quad w = \arg\max A = w(N, \mathbf{Z}) = w(N(w, \mathbf{Z}), \mathbf{Z}) = w(\mathbf{Z}),$$

where $\mathbf{Z}$ is the vector of exogenous variables,

$$(30) \quad \mathbf{Z} = (P, m, E, i, R, Q).$$

A change in an exogenous variable x induces a wage change dw which can be calculated from

$$(31) \quad dw/dx = -A_{wx}/A_{ww},$$

where $A_{ww} < 0$ (see appendix for proof). The partial derivative A_{wx} is given by

$$(32) \quad A_{wx} = abF(x) + (1-a)bG(x) - (1-b)H(x).$$

The first component of that differential is F(x), which catches the effect of x on the utility of an individual worker:

$$(33) \quad F(x) = [U_{wx}(U-U_A) - U_xU_w](U-U_A)^{-2},$$
$$F(x) < 0 \text{ for } x \in \{P, m, i, R\} \text{ and}$$
$$F(x) = 0 \text{ for } x \in \{D, Q\}.$$

The second component is the employment effect

$$(34) \quad G(x) = (N_{wx}N - N_xN_w)N^{-2}.$$

Using equation (22) yields

$$(34') \quad G(x) = (-1/q)\{c_x[Kc_w(K + cK_c) + c^2K_c(c_wK_c + K_w)] + c^2K_x(c_wK_c + K_w)\},$$

the sign of which can be calculated unambiguously:

$$(34'') \quad \text{sign } G(x) = \text{sign}(c_x) = \text{sign}(K_x).$$

The last part of equation (32), namely function H(x), is the most complicated. It is the effect of x on the firm's objective function V(x):

$$(35) \quad H(x) = (N_x - NV_x)(1 - \tfrac{1}{2}D^2RB')v^{-2} - \tfrac{1}{2}N[D^2RB''(d(CF)/dx) + B'(dD^2R/dx)]V^{-2}.$$
$$= \{\Psi\{N_x - NYd(CF)/dx] + \mathcal{K}(x)\}V^{-2},$$

where

$$\Psi = 1 - \tfrac{1}{2}D^2RB' > 0 \text{ and}$$
$$\mathcal{K}(x) = -\tfrac{1}{2}N[D^2RB''(d(CF) + B'(dD^2R/dx)].$$

Recall that $B' < 0$ and $B'' > 0$. The signs of $d(CF)/dx$ and dD^2R/dx are not the same for any variable x. It follows, that

$$\text{sign } \mathcal{K}(x) = -\text{sign}[d(CF)/dx] \text{ and}$$
$$\text{sign } H(x) = -\text{sign}[d(CF)/dx].$$

After deriving the signs of functions F(x), G(x) and H(x) we can investigate the wage effects of the exogenous variables. For that purpose, let us combine equations (31) and (32) to yield

$$(36)\quad dw/dx = -[abF(x) + (1-a)bG(x) - (1-b)H(x)]/A_{ww} = J_x(a, b);$$

Since we are not interested in the very short-run changes it is reasonable to assume that wages also can be adjusted. By allowing the wages to respond to various shocks we can derive the new equilibrium level of capital stock and the permanent change in employment. The effects of changes in different variables x on the components of J(x) are summarized in Table 1.

The signs are not unexpected. The effect of variable x on employment with endogenous wage response can then (after knowing how wages are affected) be obtained by substituting the wage effect $J_x(a, b)$ given in equation (36) into equation (22), which yields the following formula:

$$(37)\quad \partial N/\partial x = L_x = [(K + cK_c)(c_x + c_w dw/dx) + c(K_x + K_w dw/dx)]/q = [(K + cK_c)[c_x + c_w J_x(a, b)] + c[K_x + K_w J_x(a, b)]]/q.$$

In the rest of this section the effects of the exogenous (financial) variables on employment are investigated, presuming that wage setting is endogenous.

Aggregate demand or aggregate price level (P) has two effects on employment. First, it has a direct positive effect which is captured by the first part of the right-hand side of equation (38); and second, there is an indirect negative effect through wage equation ($-J_P < 0$). To put it simply, increased demand adds to the profits of the firm but also induces the workers to urge higher wages thus reducing the positive effect. It is reasonable to suppose, however, that the overall effect of demand on employment is positive, or at least nonnegative,

$$(38)\quad L_P = [\hat{P}(\hat{K}S + c^2T)/P - J_P(\hat{K}\hat{P}S - cK_w)]/q \geq 0;$$
$$L_{Pa}, L_{Pb} < 0, L_{PD} > 0,$$

where $\hat{K} = K + cK_c$ and $\hat{P} = P(1 - m/E)$. The size of this effect decreases with seniority and union power, and increases with the indebtness of the firms, as the signs of the second derivatives of L_P indicate.

An interesting variable is the market share of a representative firm, m, which is also an indicator of the market power of firm. Stronger market power (or equivalently less competition) decreases employment most probably although this result may be reversed in the case where the firm has acquired a lot of credit. The sign of that derivative is ambiguous:

$$(39)\quad L_m = -[P(\hat{K}\hat{P}S/E + c^2T) + B_m cDTR + J_m(\hat{K}\hat{P}S - cK_w)]/q;$$
$$\text{sign}\,(L_m) = ?;\ L_{ma}, L_{mb} < 0, L_{mD} > 0,$$

where $B_m < 0$ is the derivative of bankruptcy risk with respect to the market share. Increased competition squeezes the profit margins of the firms and makes them to produce more with lower prices as the theory tells us. However, the profit-squeeze raises bankruptcy risk in the case where the nominal debts are given, and may even force a debt-ridden industry to cut its aggregate employment and output in order to be able to reduce risk.

The model produces the intuitively sound result that employment decreases with interest rate and credit rationing; these effects become stronger when the union power or the indebtedness of the firms increase:

$$(40)\quad L_i = -[c(T - B'D^2/B) + J_i(\hat{K}\hat{P}S - cK_w)]/q < 0;$$
$$L_{ia}, L_{ib}, L_{iD} < 0;$$

$$(41)\quad L_R = -(cD/R + J_R(\hat{K}\hat{P}S - cK_w)]/q < 0;$$
$$R_{Ra}, L_{Rb}, L_{RD} < 0.$$

Higher interest rate or lower credit ceiling for firm decrease directly the equilibrium capital stock. In our model that also decreases output and employment.

Table 1. The effects of exogenous variables on wages

x	F(x)	G(x)	–H(x)	Jx(a, b)
P	+	+	+	+
m	+	+	+	+
i	+	–	–	?
R	+	–	–	?
D	0	–	–	–
Q	0	+	+	+

Trade unions may try to increase wages (depending on their relative bargaining power and on the relative strength of senior members) when facing higher interest rates or credit rationing in order to compensate the welfare losses of their members, if they are net-debtors. This adverse wage effect of higher interest rate may worsen unemployment further.

Changes in the financial structure of the firm affects the way employment adjusts to shocks. By financial structure we mean here the relative shares of debt (D/K) and equity (Q/K) in the finance of the firm. The following derivatives measure the effect of changes in the stock of debt and own capital, respectively, when the total capital stock is held constant. Higher debt/equity -ratio raises the riskiness of the firm and hence reduces employment. The size of this effect increases with the union's bargaining power and with the initial level of debt (L_{Db}, $L_{DD} < 0$). These effects are visible in the next equation,

$$(42)\quad L_D = [iB'cD/B - J_D(\hat{K}\hat{P}S - cK_w)]/q < 0;$$
$$L_{Da} = 0,\ L_{Db},\ L_{DD} < 0.$$

Analogously, employment increases with the share of equity (Q), although the trade union will try to squeeze part of this increased liquidity to higher wage:

$$(43)\quad L_Q = [c - J_Q(\hat{K}\hat{P}S - cK_w)] > 0$$
$$L_{Qa} = 0,\ L_{Qb} < 0.$$

Despite of the wage effect, the overall effect of higher equity on employment is positive. It follows also, of course, that decreased equity is harmful to investment, output and employment. That holds not only to the equity itself but also to all assets of the firm; if the asset prices fall, then the net worth of the firm and the collateral value of the firm's capital is reduced and its ability to raise credit will be weakened.

Table 2 summarizes the comparative statics results. Financial variables such as interest rate, rate of credit rationing and debt-equity ratio do affect directly employment and indebtness as well as union power makes the firms more vulnerable to these shocks. It is also interesting to note that increased competition may fail to increase aggregate output and employment if it has sufficiently large negative effect through higher bankruptcy risk.

Table 2. Labor demand curve

x	L_x	L_{xa}	L_{xb}	L_{xD}
P	+	–	–	+
m	?	–	–	+
i	–	–	–	–
R	–	–	–	–
D	–	0	–	–
Q	+	0	–	

4. *On policy implications*

In this section we discuss briefly the possibilities of different policy measures to cure unemployment in our model economy. Such alternative policies are (1) traditional Keynesian-style demand management, (2) wage-cutting through either anti-trade union policy or incomes policy, and (3) increased competition in product markets. The comparative statics results derived in the previous section shed some light on the possibilities of different policy measures to promote employment.

Let us first turn to the demand management. It seems quite obvious that expansionary policies can successfully increase employment in the model economy. Output prices can be increased either by fiscal policy under fixed exchange rates or by a devaluation. Capital costs as well as financial risk can be decreased by expansionary monetary policy. Monetary expansion is helpful in two ways: it lowers the cost of credit and increases the net worth of firms through higher asset prices. The effectiveness of fiscal policy and devaluations is eroded by the union power in general and by insider power in particular. In an extreme case of absolute union power (i.e. monopoly union model) all increases in nominal demand are fully squeezed from firms to higher money wages. In such a case fiscal policy is neutral. Expansionary monetary policy may also increase wage pressure in long run if higher money supply increase consumer prices. However, as far as union members are net debtors, lower interest rates benefit workers and thus should lower the wage claims of the union. The better availability of credit and lower cost of capital should actually decrease wage inflation in this model.

Although potentially effective this kind of old-fashioned Keynesian-style demand management policy may not be feasible in a small open economy which is tightly integrated to international economy. For instance, in the future European Monetary Union independent demand management by domestic authorities in an individual country through fiscal or monetary policy will be ruled out. Then, of course, there remains a scope for the use of federal fiscal and monetary policies to remedy unemployment within the Union.[4]

Consider then the employment effects of a wage cut as response to decreased demand or lower output prices. A direct effect of a wage cut on employment is obviously positive. However, that is only partial equilibrium. An economy wide wage reduction decreases obviously aggregate demand. Let the aggregate demand M consist of export demand (X) and domestic demand, which in turn is a share ($0 < \hat{k} < 1$) of domestic labor incomes plus other components of demand (G),

$$(44) \quad M = X + \hat{k}NW + G.$$

Now suppose that wages could be somehow reduced. In fact, assume that wages are not determined through a Nash bargain as above but to be exogenous. Alternatively one could assume that the bargaining power of the unions were reduced sharply somehow. Then the total effect of an exogenous wage change on employment is given by

$$(45) \quad L_w = Kc_w + cK_w + L_P(dP/dw).$$

Substituting equation (38) into (45) and setting $J_P = 0$ (since the feedback of wages is now ruled out) yields

$$(46) \quad L_w = -\hat{K}\hat{P}S(1 - k/qP) + c(K_w + ck\hat{P}T/qP), \quad L_{wk} > 0,$$

where $k = \partial P/\partial \hat{k} = \hat{k}P/EM$. Here k is the partial derivative of aggregate price level (or aggregate demand) with respect to the share of domestic goods. It can be seen from (46) that the favourable employment effect of a wage cut decreases with the share of domestic demand. In autarky cutting nominal wages wouldn't help very much. The same holds for large integrated economic areas such as European Community as a whole and the United States, which resemble closed economies, as well as industries belonging to »closed» sectors in open economies. Furthermore, if the households face liquidity constraints like the firms in this model, then lower nominal wages may force the households to cut their consumption more than in the case where no constraints prevail.

Let us finally consider the effects of increased competition. More competitive goods market through the entry of new firms should increase output and employment and decrease prices when the market power and market share of individual firms are diminished. That is obvious from the basic microeconomics textbook presentations of imperfect competition. However, it was shown above that even this mechanism may fail to increase employment if the indebtness of existing firms is very high. Lower profit margins due to tougher (e.g. foreign) competition reduce the creditworthiness of domestic firms and force them to lower their debts. Usually that is done by reducing capacity and output. Then the benefits from competition will be outweighted by costs of higher risk premiums.

5. *Concluding remarks*

We have used a simple model of manufacturing firm with bankruptcy risk aversion to investigate the employment effects of financial shocks. The analysis of the model suggests that employment is highly sensitive to the changes in interest rates, availability of credit and debt-equity ratio. The sensitiveness increases with the debt-equity ratio in the finance of firms. Lower profit margins or banks' unwillingness to give extra credit may force the firms to cut their debts by capacity and employment reductions. Curiously enough, even increased competition in the product market may turn to be harmful to employment if the existing firms in the market have high levels of debt. The results emphasizing the importance of financial factors suggest that expansionary monetary policy should be used more actively to reduce employment. In the light of the results of this model it seems quite plausi-

[4] *However, the record of the EMS from the 1980's and early 1990's does not suggest that the Commuynity would put much weight on better employment as a policy objective vis-a-vis lower inflation in future either.*

ble that the high real interest rates in Europe during the 1980's have something to do with mass unemployment, maybe more than high real wages. Another important message of this investigation is that, ceteris paribus, economies in which firms are financed mostly by debt should face larger fluctuations during business cycles, as compared with economies where companies finance investments mostly by their own capital.

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Appendix

Partial derivatives of the capacity utilization rate, c, w.r.t. exogenous variables:

$$(A.1) \qquad c_w = -S\hat{P} < 0,$$
$$(A.2.) \qquad c_P = S\hat{P}/P > 0,$$
$$(A.3) \qquad c_m = -S\hat{P}/E < 0,$$

where

$$(A.4) \qquad S = q/2hw$$

and

$$(A.5.) \qquad \hat{P} = P(1 - m/E).$$

For the rest of exogenous variables the derivative is zero:

$$(A.6) \qquad c_i = c_R = c_D = c_Q = 0.$$

The optimal capital stock is affected by the same variables as follows;

$$(A.7) \qquad K_w = T(RKDB' - 1)W < 0,$$
$$(A.8) \qquad K_P = Tc\hat{P}/P > 0,$$
$$(A.9) \qquad K_m = -T(cP + B_m DR),$$

the sign of which is ambiguous;

$$(A.10) \qquad K_i = -T + B'D^2/B < 0,$$

where

$$(A.11) \qquad T = 1/RB;$$

and

$$(A.12) \qquad K_R = -D/R < 0,$$
$$(A.13) \qquad K_D = iB'D/B < 0,$$
$$(A.14) \qquad K_Q = 1.$$