行政院國家科學委員會補助專題研究計畫成果報告

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※ 工作創造、工作消滅與資本市場不完全 ※

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執行期間：89 年 8 月 1 日至 90 年 7 月 31 日

計畫主持人：林亦珍

本成果報告包括以下應繳交之附件：

□赴國外出差或研習心得報告一份

□赴大陸地區出差或研習心得報告一份

□出席國際學術會議心得報告及發表之論文各一份

□國際合作研究計畫國外研究報告書一份

執行單位：淡江大學經濟系

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行政院國家科學委員會專題研究計畫成果報告
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計畫參與人員：孫育伯　　淡江大學產經系

一、中文摘要:

本文發現(1)全樣本估計顯示財務狀況並非影響上市廠商勞動需求之主要因素。但是若將廠商分為財務狀況好與差兩組來做模型估計，則結果顯示財務壓力致使勞動需求下降的影響，財務狀況差的廠商的反應是財務狀況好的廠商的 15 倍之多。而且，近年來財務狀況對上市廠商勞動需求之影響有明顯增加之趨勢。

關鍵詞： 勞動需求、財務壓力、融資限制

Abstract:

This paper investigates the direct influence of an increase in financial pressure on company labor demand using data from companies in Taiwan. Unlike findings using U.K. and Germany data, this paper finds that labor demand for an average listed firm in Taiwan is insensitive to increases in financial pressure. However, when firms with high and low financial pressure are allowed to have different coefficients, reductions in employment in high financial pressure group is 15 times that of firms in the low pressure group. Furthermore, when employment is allowed to respond differently over the business cycle, preliminary evidence indicates that financial pressure is becoming a more and more important determinant in labor demand. Specifically, staring from 1999, with a languishing economy, Taiwanese firms' ability to hire employees is under the threat of financial pressure.

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Keywords: Labor demand, financial pressure, financial constraint

二、緣由與目的

How does financial constraint affect firm's employment behavior in Taiwan? Recently, massive lay-offs by major companies in Taiwan have raised increased public concern about the role of financial pressure on firm's demand for labor. With the arrival of high unemployment rate era, however, none of the existing empirical research has responded to the increased interest in this problem. Empirical evidence using Taiwanese data is confined to the study of financing constraint and firm's investment behavior (see Shen and Wang (2000), for example). Thus this current paper intends to present evidence on the impact of financial pressure on firm's employment using firm level panel data drawn from companies listed in TaiwanStock Exchange.

Beginning with Fazzari, Hubbard and Peterson (1988), a large number of studies conclude that firms with limited access to capital market tend to exhibit greater investment response to changes in cash flow. Gertler and Gilchrist (1994) find that after a tightening monetary policy small firms with limited access to capital market exhibit greater reduction in sales and inventory than large firms. Sharp (1994) find that highly leveraged firms hoard less labor over the business cycle. Nickell and Wadhawani (1991), and more recently, Nickell and Nicolitsas (1999) and Funke, Maurer and Strulik (1999) find that measures of financial pressure are important determinants in employment in the U.K. and Germany.

The purpose of this paper is to address the following questions. How does financial pressure influence Taiwanese firms' employment behavior? Specifically, is there any evidence that changes in a firm's balance sheet position affect its demand for labor?

三、The Econometric Model

In this section, I describe the motivation for the specification used to find out if financial pressure has any impact on labor demand.

The main goal of this paper is to examine the direct effect of an increase in financial pressure on firm employment. Formal modeling of the role of financial pressure is beyond the scope of this paper. Therefore, I borrow the simple formulation used by Nickell and Nicolitsas (1999). For a firm with production function:

$$Y_i = A_i F(N_i, K_i)$$

where Y=output, N=employment, K=capital stock, A=total factor productivity, the equilibrium level of employment is determined by the condition that real wage equals marginal product of labor. That is:

$$A_i F_N(N_i, K_i) = W_i / P_i \kappa_i$$

where W_i=nominal wage, P_i=output price and κ_i=1-(demand elasticity)$^{-1}$. κ_i may change over time and is related to the demand for firm's product. Log-linearising produces an equation for the log of equilibrium employment, n_{it}^*, specifically

$$n_{it}^* = a_{0i} + a_{0t} + a_1 k_{it} - a_2(w_{it} - p_{it}) + \alpha_3 d_{it} \quad (1)$$

where a_{0i} is the firm-specific effect, a_{0t} is a time effect, k, w, p are the log of capital, nominal wage and product price, respectively, and d is the demand effect corresponding to κ_i.

The adjustment cost model yields an expression for actual employment, n_{it}:

$$n_{it} = \lambda n_{it-1} + (1-\lambda)(1-\omega\lambda) \sum_{j=0}^{\infty} (\omega\lambda)^j E_t n_{it+j}^* \quad (2)$$

where λ is the stable root of the Euler equation and ω is the firm's discount factor. For simplicity, the stochastic processes that generate all the variables, which determine n_{it}^* are assumed to be as follows:

$$a_{0t} = a_{0t-1} + \varepsilon_{1t},$$

$$k_{it} = k_{it-1} + \varepsilon_{2it},$$

$$w_{it} - p_{it} = b_{0i} + b_1(w_{it-1} - p_{it-1}) + \varepsilon_{3it},$$

$$d_{it} = c_{oi} + c_1 d_{it-1} + \varepsilon_{4it}$$

where $\varepsilon_{1t}, \varepsilon_{2it}, \varepsilon_{3it}, \varepsilon_{4it}$ are i.i.d. errors. Then the observable employment equation obtained from equations (1) and (2) can be given by

$$n_{it} = \alpha_i + \alpha_t + \varepsilon\lambda n_{it-1} + \alpha_1 k_i - \alpha_2(w_{it} - p_{it}) + \alpha_3 d_{it} + \varepsilon_{it} \quad (3)$$

As discussed in Nickell and Nicolitsas (1999) the actual stochastic process for capital, real wage and product demand may be more complex, so we allow extra lags of these variables in equation (3). Permitting the role of financial pressure in the basic model (3) and incorporate extra lags, equation (3) can be rewritten as

$$n_{it} = \alpha_i + \alpha_t + \lambda_1 n_{it-1} + \lambda_2 n_{it-2} + \sum_{j=0}^{2} \alpha_{1j} k_{it-j} - \sum_{j=0}^{1} \alpha_{2j}(w_{it} - p_{it}) + \sum_{j=0}^{1} \alpha_3 d_{it-j} + \alpha_4 f_{it} + \varepsilon_{it} \quad (4)$$

where f_{it} denotes a measure of balance sheet position, i.e. a proxy for the firm's financial pressure.

Because deterioration in balance sheet raises borrowing cost and forces firms to cut back on investment and hiring, a good measure of financial pressure is key to our investigation. In order to measure the deterioration of balance sheet, two proxies for financial pressure are used in this study. The first one is the ratio of debt to collateralizable net worth. A typical measure of this is the ratio of debt to asset (DAR). Although the book values of assets are easy to get, the correct market value of assets are hard to estimate. For that reason, debt asset ratio is only an imperfect proxy for financial pressure. Since increases in interest burden are fundamental cause of all subsequent reduction in firm's activity, Nickell and Nicolitsas (1999) propose a flow counterpart of debt equity ratio named borrowing ratio (BR), the ratio of total interest payments to profits before tax, interest and depreciation. The validity of this ratio can be justified by writing the ratio

of debt to net worth as

$$\text{Debt/PV of profits}=\frac{D}{\pi/r}$$

where D is current debt, π is current profit and r is the interest rate faced by the firm. This flow equivalent may be superior to the ratio of debt to net worth because the current interest burden relative to cash flow is an important variable monitored closely by financial intermediaries.

四、 THE DATA

The data used in this study are taken from the Taiwan Economic Journal (TEJ) finance database, a collection of financial statement variables for companies listed in the Taiwan Stock Exchange. Note that this may not be the most ideal data for our purpose because listed firms are more well established and have access to direct finance. Previous studies have found that younger and smaller firms that depend on bank loans as their only source of external fund are more likely to exhibit larger employment response to shocks to balance sheet position (see, for example, Barry and Brown (1984), and Gertler and Gilchrist (1994)). However, because data for small firms are hard to acquire, this study restricts its attention to the biggest firms in the country as previous studies using data from the U.K. and Germany do. Excluding firms in the financial sector and taking into account of the fact that output price index is available only after 1991, I ended up with a sample period of 1991-2000 and a balanced panel of 493 firms. Table 1 presents the means and standard deviations of the variables used in the analysis. Methods of calculation for main variables are described in the Data Appendix.

五、EMPIRICAL RESULTS

Equation (4) is estimate with time dummies to remove the general macroeconomic fluctuations. Furthermore, 2-digit industry output is also included to capture product demand. The estimated version of (4) has the form

$$n_{it} = \alpha_i + \alpha_t + \lambda_1 n_{it-1} + \lambda_2 n_{it-2} + \sum_{j=0}^{2} \alpha_{1j} k_{it-j} - \sum_{j=0}^{1} \alpha_{2j} (w_{it-j} - p_{it}$$

$$+ \sum_{j=0}^{1} \alpha_{3j} d_{it-j} + \alpha_4 f_{it} + \text{ Time dummies} +$$

$$\text{Industry Output} + \varepsilon_{it} \qquad (5)$$

Because of the presence of lagged dependent variables in equation (5) the OLS estimator is no longer unbiased and consistent. Therefore, equation (5) is estimated with the generalized method of moments approach developed by Arellano and Bond (1991). Because it is possible that shocks to employment also have an effect on current wage, capital and financial pressure, current firm-specific variables are likely to be endogenous. In addition, due to the presence of the lagged error in the first-differenced equation, the lagged dependent variable and all lagged variables are endogenous. To correct these endogeneity problems, we need a set of instruments. The basic instruments are deep lags on employment, output wages and capital stock. For the financial variables, we can exploit the fact that exogenous shifts in prime rate, which are controlled by the tgovernment, will have a bigger impact on firms that have heavier debt burden. Therefore the product of debt-capital ratio one, two and three years lagged and the contemporaneous change in the prime rate can be used as instruments for the key financial variables. The consistency of the estimator and validity of the instruments are assured by the absence of second order serial correlation in the residuals of the first-differenced equation assures. In contrast, because of the MA structure of the error term, negative first order serial correlation is anticipated. For that reason, the m_1, m_2 test statistics provided by Arellano and Bond (1991) to detect the presence of serial correlation are reported in Table 2. Following the recommendation by Arellano and Bond (1991), one-step robust standard errors are reported for inference on coefficients. Two-step Sargan test is also reported to judge the validity of instruments. To emphasize the role played

by the balance sheet position in firm's ability to find finance, I split the sample into two equal size groups above and below the median on the basis of the firm's average BR over the sample period.

Table 2 presents results for both groups and the whole sample. A comparison between the one-step Arellano and Bound estimates for high and low BR group shows that balance sheet positions affect financially constrained and unconstrained firms in a very different way. The absolute value of coefficient on BR_{it} for high BR group is 15 times larger than that of low BR group. The negative impact on labor demand of an increase in current financial pressure is 15 times larger for a firm in the high BR group than that of a firm in the low BR group. What is more, a comparison between column 4 and 5 in Table 2 reveals that lagged debt to asset ratio (DAR_{it-1}) enters negatively and significantly for the high BR group but positively for the low BR group. To sum up, these results imply that a rise in interest burden relative to cash flow causes much sharper employment falls in firms that have a higher average debt burden than in firms that have relatively lower debt burden. An increase in debt asset ratio causes employment in the subsequent year to fall sharply in firms that have higher debt burden while it has positive but insignificant effect on employment in companies with low debt burden.

The coefficients for BR_{it} and DAR_{it-1} in Table 2 are all insignificant except in column 5. This result implies that for the period from 1991 to 2000, labor demand in a typical Taiwanese listed firm are not sensitive to changes in financial pressure; although firms with higher debt burden seems to react more to financial pressure than low burden firms. This could be owing to the fact that the companies in our sample are all listed and thus have access to direct finance. They are less dependent on bank loans as sources of fund. On the other hand, this could be due to the sample period of 1991 to 2000 are mostly economic expansion for the Taiwanese economy. The result in Table 2 does not take into account the idea that the link between balance sheet position and terms of credit may be looser in economic expansion and tighter in recessions. To see if there is any sign of asymmetric response to financial pressure over the business cycle, I estimate the following equation by simple OLS year by year:

$$n_{it} = a + b_1 w_{it} + b_2 w_{it-1} + b_3 k_{it} + b_4 k_{it-1} + b_5 f_{it} + \varepsilon_{it} \quad (6)$$

Table 3 reports the coefficients on BR_{it} and DAR_{it-1} from the year-by-year regressions. The striking result is that both real GDP growth rate and the coefficient for DAR_{it-1} have a downward trend. In addition, starting from 1999 both coefficients turned from positive to negative and from insignificant to significant. In summary, preliminary evidence shows that starting from 1999, measures of financial pressure have become important determinants in firm labor demand.

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Table 1 Summary Statistics

Variable	Mean	Standard Deviation
N	**977**	**2006**
W	**47504.44**	**110968.2**
K	**3615582**	**1.6+e07**
Y_i	**5701627**	**1.22+e07**
BR	**0.067**	**11.124**
DAR	**0.435**	**0.242**
r	**7.97%**	**0.57%**

Table 2 One-Step Estimation Results, 1991-2000

	1	2	3	4	5	6
	LOW BR	HIGH BR	ALL	LOW BR	HIGH BR	ALL
n_{it-1}	0. 52**	0.53**	0. 51**	0. 36**	0. 64**	0. 49**
	(6.71)	(5)	(5.29)	(2.92)	(5.26)	(4.6)
n_{it-2}	0.026	0. 05	0. 058*	0. 05	0. 04	0. 06*
	(0.59)	(1.48)	(1.7)	(1.36)	(0.65)	(1.81)
w_{it}	-0.15**	-0.17**	-0.15**	-0.11**	-0.11**	-0.087
	(-2.46)	(-3.91)	(-3.26)	(-2.34)	(-2.42)	(-2.66)
w_{it-1}	0. 09**	0.14**	0.09**	-0.11	0. 08**	0. 045*
	(2.2)	(3.96)	(3.03)	(1.19)	(2.39)	(1.87)
k_{it}	0. 15**	0. 296**	0.18**	0. 27**	0. 23**	0. 26**
	(2.65)	(5.46)	(2.62)	(4.26)	(5.18)	(4.81)
k_{it-1}	-0.12**	-0.11**	-0.14**	-0.13**	-0.16**	-0.21**
	(-2.52)	(-1.93)	(-2.41)	(-2.57)	(-3.23)	(-4.59)
k_{it-2}	0. 002	-0.037*	-0.0149	0. 27	-0.02	-0.008
	(0.11)	(-1.85)	(-1.02)	(1.53)	(-1.09)	(-0.5)
y_{jt}	0. 18**	0.015	0.12**	0. 2**	0. 02	0. 118**
	(2.31)	(0.26)	(2.51)	(2.87)	(0.24)	(2.44)
y_{jt-1}	0. 0195	0. 021	0. 05	-0.009	0. 04	0. 0238
	(0.29)	(0.37)	(1.14)	(-0.13)	(0.63)	(0.49)
BR_{it}	**-0.00035**	**-0.0053**	**-0.001772**			
	(-0.26)	**(-1.54)**	**(-0.72)**			

DAR_{it-1}				**0. 27 (1.53)**	**-0.41** (-2.97)**	**-0.11 (-0.9)**
Wald-test	275.85**	263.94**	413.98**	264.84**	349.88**	389.59**
Sargan	156 [0.13]	146 [0.28]	171 [0.03]	147 [0.27]	140 [0.41]	165 [0.05]
Serial Correlation(1)	-4.82 [0.00]	-2.95 [0.0032]	-3.29 [0.001]	-2.25 [0.02]	-3.04 [0.0024]	-3.36 [0.0008]
Serial Correlation(2)	-0.4 [0.69]	-2.4 [0.0165]	-2.54 [0.0111]	-0.85 [0.3952]	-1.33 [0.1836]	-2.17 [0.03]

Notes: Dependent Variable= n_{it}. There are 493 firms and 2930 observations. Only y_{jt} and its lags are treated as exogenous. One-step t-values robust to heteroskedasticity are given in parenthesis, * and ** denotes significance at 10% and 5% level. Wald-test indicates the joint significance of all variables except time dummies. Instruments include $n_{it-4,}n_{it-5,}y_{it-3}, y_{it-4}, w_{it-3}, w_{it-4}, k_{it-4}, k_{it-5}, \Delta r_t \times (D/K)_{it-1}, \Delta r_{t-1} \times (D/K)_{it-2}, \Delta r_{t-1} \times (D/K)_{it-3}$ where r_t =average prime rate for year t. D/K=debt-capital ratio calculated from book value. y_{jt} = real 2-digit industry output. All equations include time dummies and firm dummies. P-values are given in square brackets.

Table 3 Coefficients on Measures of Financial Pressure from Year-by-Year OLS Regression

Year	BR_t	DAR_{t-1}	GDP Growth Rate
1991	0.077 (0.75)	1.12** (3.84)	7.36%
1992	0.01 (0.27)	0.5* (1.81)	8.19%
1993	-0.02 (-0.67)	0.28 (1.04)	7.32%
1994	-0.08 (-1.18)	0.23 (0.92)	7.62%
1995	0.0015** (14.6)	0.35 (1.38)	6.55%
1996	-0.002 (-0.07)	0.33 (1.52)	5.66%
1997	0.06 (1.23)	0.08 (0.37)	7.69%
1998	0.009 (0.84)	0.11 (0.53)	4.61%
1999	-0.011** (-1.79)	-0.545** (-2.66)	5.63%
2000	-0.013**(-3.25)	-0.7056** (-3.23)	5.66%

Note: The equation estimated is $n_{it} = a + b_1 w_{it} + b_2 w_{it-1} + b_3 k_{it} + b_4 k_{it-1} + b_5 f_{it} + \varepsilon_{it}$ where f_{it} is a measure of financial pressure.