한국경제학보 제15권 제2호
The Korean Journal of Economics Vol. 15, No. 2(Autumn 2008)

What does the Relative Price of Producer Durable Equipment Say about Investment-Specific Technology Shocks?

Kwang Hwan Kim*

Abstracts

This paper shows that the importance of investment-specific technology shocks to the business cycles crucially depends on the following fact: a SVAR model identifies the countercyclical movement of the relative price of producer durable equipment during two major postwar recessions and the recovery period after the recession of 1981-1982 as entirely driven by investment-specific technology shocks. However, this paper shows that the effect of price control on machinery, lifted at the end of April 1974, and the cost-channel of tight monetary policy in response to oil shocks during these two major postwar recessions and increased competition in the producer durable sector after 1981 could have exerted a consequential impact on the relative price of equipment. Hence, the finding here caution against the growing interest in investment-specific technology shocks as the main contributor to the business cycles.

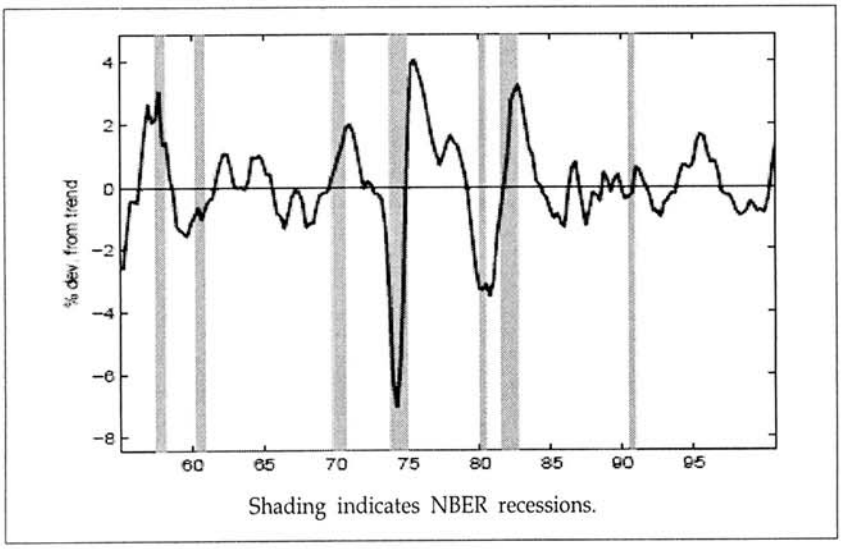
KRF Classification : B030300
Keywords : Structural VAR model, Real Price of Equipment

* I appreciate two anonymous referees on their helpful comments. Correspondence: Kwang Hwan Kim, Department of Economics, Dongguk University, 26, 3 Pil-Dong, Chung-gu, Seoul, Korea, Email: k2kim@dongguk.edu

Ⅰ. Introduction

This paper investigate why the relative price of producer durable equipment (PDE) sharply has increased during the recessions of 1973:4~1975:1 and 1981:3~1982:4 and declined after the recession of 1981:3~1982:4, as it is evident in Figure (1). I show that the significant movement in PDE during these periods do not necessarily imply the presence of negative or positive investment-specific technology shocks and can be explained by other factors not related to technology shocks. The effect of price control on machinery, lifted at the end of April 1974, and the cost-channel of tight monetary policy in response to oil shocks during these two major postwar recessions could have exerted a consequential impact on the relative price of PDE. Furthermore, the paper also documents evidence indicating that U.S capital goods manufacturers faced tougher import competition than they did prior to 1982 and argue that this could make nonnegligible

【Figure 1】 The cyclical behavior of real price of PDE (1955:1-2000:4): HP filtered



contribution to the sharp decline of the relative price of PDE. The evidence presented here has important implications about quantifying the extent to which technology shocks explain the economic fluctuations.

The evidence presented in this paper casts serious doubt on a striking finding by Fisher (2002 and 2005) that investment-specific technology shocks account for about 50% of the fluctuations in hours at business cycle frequency. Motivated by the countercyclical movement of the relative price of PDE, Fisher (2002, 2005) extends a Gali's (1999) one neutral technology shock SVAR model to incorporate two technology shocks SVAR model that is capable of identifying investment-specific technology shocks and resurrects the idea of technology-driven business cycles[1]. According to Fisher's SVAR model, the increases in the relative price of PDE during the recessions of 1973:4~1975:1 and 1981:3~1982:4 are almost entirely identified as negative investment-specific technology shocks and a large portion of these two major U.S postwar recessions are explained by these identified negative investment-specific technology shocks. As this paper will show in detail later, what drives the striking result claiming that investment-specific technology shock is a quantitatively important factor in explaining the U.S business cycles is in large part owing to the fact that a strong countercyclical movement of the relative price of PDE during these two major U.S postwar recessions is identified as stemming from negative investment-specific technology shocks. Besides these two major postwar recessions, another important

1) A current line of research emphasizing the role of technology shocks in accounting for U.S business cycles appears to turn toward investigating the importance of investment-specific technology shocks as opposed to neutral technology shocks (e.g, Fisher (2002 and 2005) and Greenwood, Hercowitz and Krusell (2000)). It is attribution to the growing literature suggesting that neutral technology account for very little of the actual business cycles (e.g Gali (1999) and Francis and Ramey (2003)).

period when the identified investment specific technology shock plays an important role is the recovery period of the 1981~1982 recession. Fisher's SVAR model identifies a sharp decline in the relative price of PDE after 1982~1982 recession as attributable to positive investment-specific technology shocks and indicates that these positive investment-specific technology shocks pulled the economy out of the 1981~1982 recession. Therefore, the evidence suggesting that factors not related to technology could possibly play a significant role in producing the sharp rise in the relative price of equipment during two major U.S postwar recessions and a sharp decline after the recession of 1981~1982 implies that the growing interest in investment-specific technology shocks as the main generator of economic fluctuations might be misleading.

The remainder of this paper is organized as follows. Section 2 reviews the Fisher's SVAR model. Section 3 demonstrates that the quantitative importance of investment-specific technology shocks obtained from using the full sample depends crucially on the salient countercyclical behavior of the relative price of PDE during two major postwar recessions. Section 4 proposes an alternative explanation for the countercyclical pattern of the relative price of PDE observed during these two recessions as opposed to negative investment-specific technology shocks. Section 5 presents evidence of tougher import-competition faced by producers of equipment after 1982 that could have led to a lower markup. Section 6 concludes.

Ⅱ. Overview of Fisher's SVAR approach

Ⅱ.1 The econometric methodology

The standard baseline SVAR model used to quantify the

importance of investment-specific technology shocks can be specified as the following Wold moving average representation as one can see in Fisher (2002, 2005 and 2006)

$$y_t = \Phi(L)\epsilon_t$$

where $y_t = [\Delta q_t, \Delta a_t, h_t]'$ and $\Phi(L)$ is a matrix of polynomials in the lag operator L. q_t, denotes the log of inverse of the real price of equipment, a_t denotes the log of labor productivity, h_t denotes the log of hours. ϵ_t is a vector of exogenous shocks with ϵ_{i_t} and ϵ_{n_t} as the first two elements. ϵ_{i_t} denotes the investment-specific technology shock and ϵ_{n_t} denotes the neutral technology shock. It is also assumed that technology shock and non-technology shock are orthogonal to each other, which implies $E\epsilon_t\epsilon_t' = \Omega$ is a diagonal matrix. The identifying assumption required to identify investment-specific technology shock and neutral technology shock in this SVAR model[2] are

- (A.1) Only investment-specific technology shocks can affect the real price of equipment in the long run. In other words, this assumption restricts the unit-root in the real price of equipments to originate solely in investment-specific technology shocks.

- (A.2) Only technology shocks, divided into investment-specific technology shock and neutral technology shock, can affect labor productivity in the long run.

---

2) This specification is a natural extension of Gali's (1999) one neutral technology shock SVAR model to two types technology shocks SVAR model. His basement SVAR is composed of labor productivity and hours and identifying assumption is that only (neutral) technology shocks affect the labor productivity in the long run.

The elements of vector y_t in the baseline model using a full sample (1955:1~2000:4) are $y_t = [\Delta q_t, \Delta a_t, h_t]'$. The estimated series of I-shock and N-shock can be obtained by using the instrumental variables (IV) method proposed by Shapiro and Watson (1986). Because the details for estimating this SVAR model appear in many parts of the literature, I move directly to the estimation results.

II.2. Data

All series[3] used are quarterly data from 1955:1~2000:4. The real price of equipment is defined as the quality-adjusted price index for producer durable equipment (PDE) divided by the consumption deflator. For the series on labor productivity and labor input, the BLS series "Index of output per hour, nonfarm business" and "Index of hours in nonfarm business" are used. Labor input on a per capita basis by dividing by the population 16 and over. Inflation is measured with the consumption deflator and the nominal interest rate is the 3-month Treasury Bill rate.

Ⅲ. What makes the idea of investment-specific technology driven business cycles important?

This section begins with briefly highlighting the main results from a baseline model using a full sample. Irrespective of different specification about labor input (hours), Fisher's SVAR model identifies the remarkable increase in the relative price of PDE during the recessions of 1973:4~1975:1 and 1981:3~1982:4 as negative investment-specific technology shocks. The result that

3) Fisher kindly provided the dataset used in his paper.

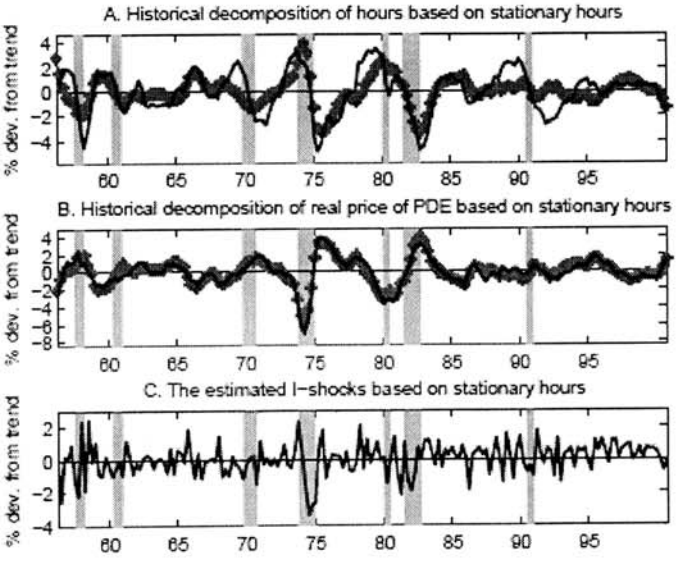
investment-specific technology shocks account for about 50% of the fluctuation in hours is mainly due to the fact that the bulk of these two recessions were driven by these negative investment-specific technology shocks in his SVAR model, in contrast to the conventionally-held view on the source of these recessions (i.e, oil shocks or/and systematic monetary policy to oil shocks).

III.1. Discussion of the main results from baseline model

The task of assessing how much the investment-specific technology shocks identified by using Fisher's specification contributes to explaining business cycle components of actual hours and hours due to investment-specific shocks by using a Hodrick-Prescott filter, one can calculate the relative volatility of hours due to investment-specific shock. This exercise yields a striking result that investment-specific shocks explain about 46 percent of the business cycle volatility of hours. Figure (2) plots the business cycle components of actual hours, hours due to investment-specific shock, actual relative price of PDE, relative price of PDE due to investment-specific shock and the estimated investment-specific technology shocks. Another important result, but not cited widely, from this exercise is that as it is evident in Figure (2), the investment-specific shocks based upon Fisher's specification account for most of the two major postwar U.S recessions of 1973~1975 and 1981~1982 and the sharp rise in the actual relative price of PDE during these recession is entirely due to sequences of negative investment-specific technology shocks.[4]

4) 'Unit-root' specification in hours gives similar results.

【Figure 2】 Decomposing the contribution of I-shock to hours and the real price of PDE (HP filtered) and the estimated I-shock (1956:2-2000:4)



The solid lines of A and B denote the actual hours and the real price of PDE. The starred line of A and B shows the hours and the real price of PDE due to investment-specific shocks based upon stationary hours.

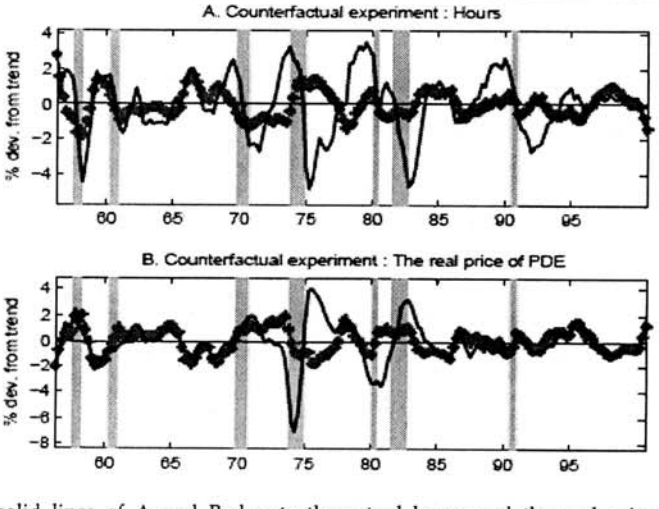
III.2. Quantifying the importance of 1973~1975 and 1981~1982 recession

A careful inspection of Figure (2) suggests that the fact that a large portion of two major postwar recessions are driven by negative investment-specific technology shocks in the SVAR based upon identifying assumption (A.1) and (A.2) makes a significant contribution to generating the strikingly high relative volatility reported in (Ⅲ.1).

Then, how much does a sharp increase in the relative price of PDE during these two recessions (thus, corresponding sequences of negative investment-specific technology shocks) explains 47% of the variation of hours? This paper takes the following approach to this

problem: Re-estimate the SVAR model[5] without taking into account these two recession periods, extract the business cycle component of hours due to investment-specific technology shocks in exactly same manner described in (Ⅲ.1) and calculate by how much the relative volatility of hours declines. The results confirm the previous visual impression. The relative volatility is significantly reduced compared to the case where these recession periods are included. For the stationary hours case, the relative volatility of hours declines by about 77% (from 46% to 11%)

【Figure 3】 Counterfactual experiment based upon stationary hours specification.



The solid lines of A and B denote the actual hours and the real price of PDE. The starred line of A and B shows the hours and the real price of PDE due to investment-specific shocks based upon stationary hours.

An alternative approach is to conduct the counterfactual exercise in the SVAR model. Figure (3) portrays the results of counterfactual exercise. As evident from it, results are similar to what is found from the exercise done above. For the stationary

5) Identifying assumption (A.1) and (A.2) are still maintained.

hours case, the relative volatility declines from 46% to 19%

In sum, these two exercises confirm that a sharp increase in the relative price of PDE during the recessions of 1973~1975 and 1981~1982, identified as driven by negative investment-specific technology shocks, is the main driving factor of the result that investment-specific technology shocks are quantitatively important in explaining the U.S business cycles.

Ⅳ. An alternative explanation for the countercyclical movement of the real price of PDE during two major postwar recession

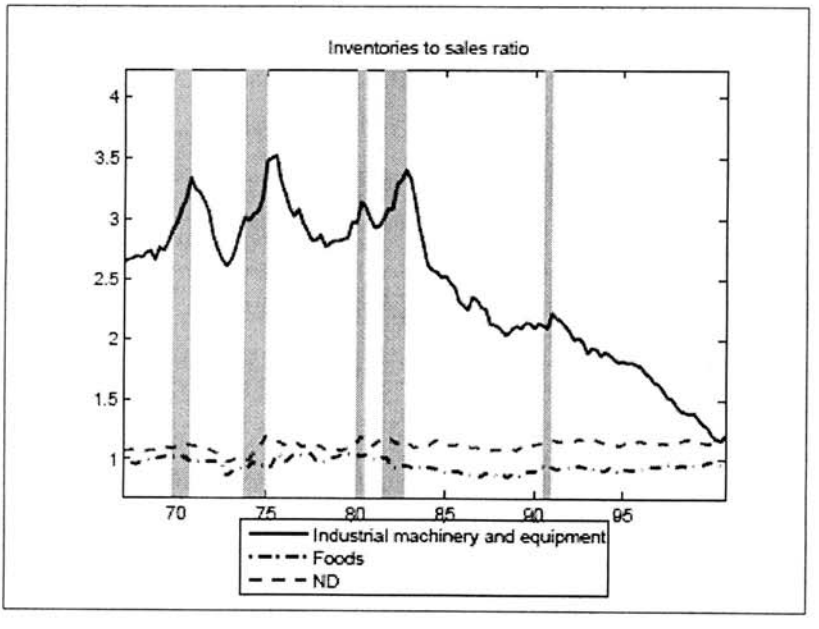
This section investigates whether oil shocks and systematic monetary policy in response to oil shocks, widely believed to be a source of these recessions, can be consistent with the salient countercyclical behavior of the relative price of PDE. It also analyzes an effect of price control on machinery, lifted at the end of April 1974, on the relative price of PDE. As highlighted in introduction, doing so permits one to subject investment-specific technology shocks to a test of whether they can be quantitatively important in accounting for the economic fluctuation. Furthermore, it re-examines the conventionally-perceived nature and propagation mechanism of oil shocks and systematic monetary policy.

Ⅳ.1. The cost-channel of contractionary monetary policy in response to oil shocks

Because the dollar share of energy in the total industrial machinery and equipment sector (SIC35) is only in average about 1%[6], it seems hard to believe that an oil shock itself could generate an increase in costs to sufficiently explain the observed

rise in the equipment deflator. Therefore, this paper pays special attention to the role of the Federal Reserve's contractionary response to oil shocks in accounting for the rise in nominal equipment prices. The big oil shocks associated with these major postwar recessions were followed by a rise in the federal funds rates. Several dynamic stochastic general equilibrium models incorporate the cost channel of this increase in interest rates through its effect in working capital. For example, Christiano, Eichenbaum and Evans (1997) capture the cost-side effect of this tight monetary policy by assuming that firms must borrow to hire labor inputs. If firms have to borrow to produce output, then an increase in interest rates raises the cost of hiring labor.

【Figure 4】 Inventories (total) to sales ratio across sectors



Though short-term debt is used to finance some component of labor input, however, this paper attempts to find evidence of the

6) The calculation is based upon Jorgenson's 35-KLEM dataset.

cost-channel of tight monetary policy in response to oil shocks present in the equipment sector through investigating its role in financing inventories. This avenue is motivated by the salient countercyclical pattern if the total inventories to sales ratio[7] observed in the industrial machinery and equipment sector (SIC35) compares to the foods sector (SIC20) and the nondurable goods sector. Figure (4) depicts the real total inventories to real sales ratio of these three sectors using the series from BEA and clearly shows this remarkable difference in the real inventories to real sales ratio across sectors. Then how does this strong countercyclical inventories to sales behavior of industrial machinery and equipment help explain the cost-channel of tight monetary policy during these recessions? To provide an insight into question, consider the following thought experiment:

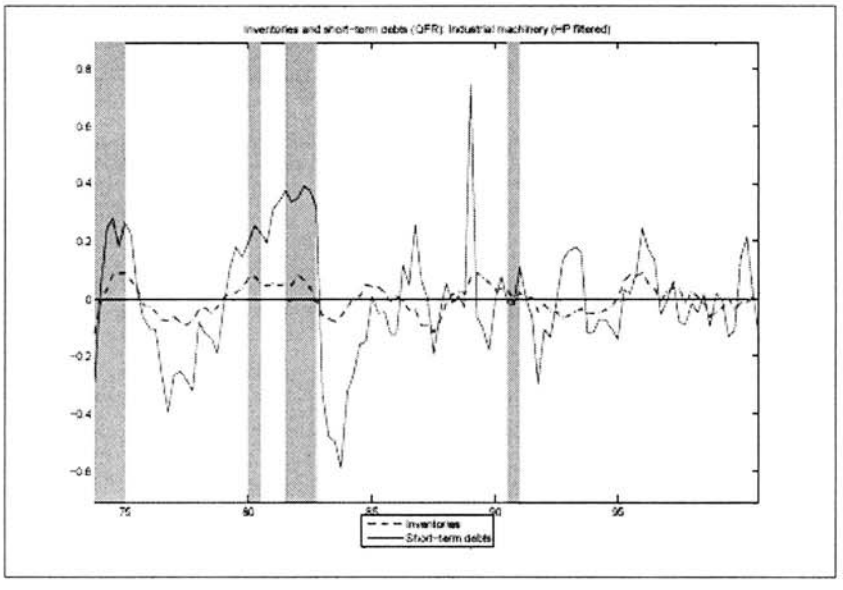
Because short-term debt is highly relevant in financing inventories, the fact that inventories rise significantly relative to sales in the equipment sector during recessions seems to strongly suggest that short-term debts in the equipment sector increase remarkably relative to sales. Taking accounts of the fact that interest rates are precisely rising when the short-term debt to sales ratio rises, it implies that firms in the equipment sector seem to experience a significant increase in borrowing costs per sales.

This thought experiment is consistent with the findings of Barth and Ramey (2001) which show that the effect of monetary policy on the price-wage ratio is driven by rising nominal prices, not by falling nominal wages and might be directly related to financing costs.

---

7) The finished goods inventories to sales ratio in equipment sector displays a salient countercyclical pattern as well.

[Figure 5] The cyclical components of inventories (dashed line) and short-term debts (solid line) for the industrial machinery and equipment sector



The Quarterly Financial Report (QFR) permits one to verify whether or not the thought experiment conducted above is consistent with the actual data. The QFR reports information about short-term debt, inventories and net sales dating back to the fourth quarter of 1973 for two-digit (SIC) manufacturing industries. Let us first consider the patterns of short-term debts and inventories for the industrial machinery and equipment sector. Figure (5) depicts the cyclical component of short-term debts and inventories for the industrial machinery and equipment sector. The contemporaneous correlation between the two is 0.60. This implies that short-term debts are pertinent to financing inventories. In particular, it appears that short-term debts moved more closely with inventories during the recessions of 1973~1975 and 1981~1982. Accordingly, the pattern of the short-term debts to net sales ratio mirrored that of inventories to net sales ratio during these two recessions and the contemporaneous correlation between the two is

0.43.

【Figure 6】 The cyclical components of inventories to net sales (dashed line) and short-term debts to net sales ratios (solid line) for the industrial machinery and equipment sector

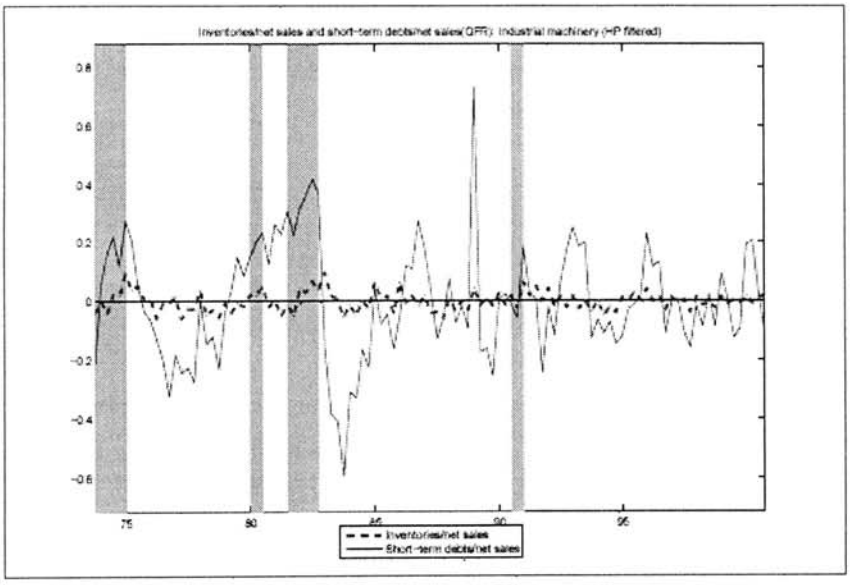
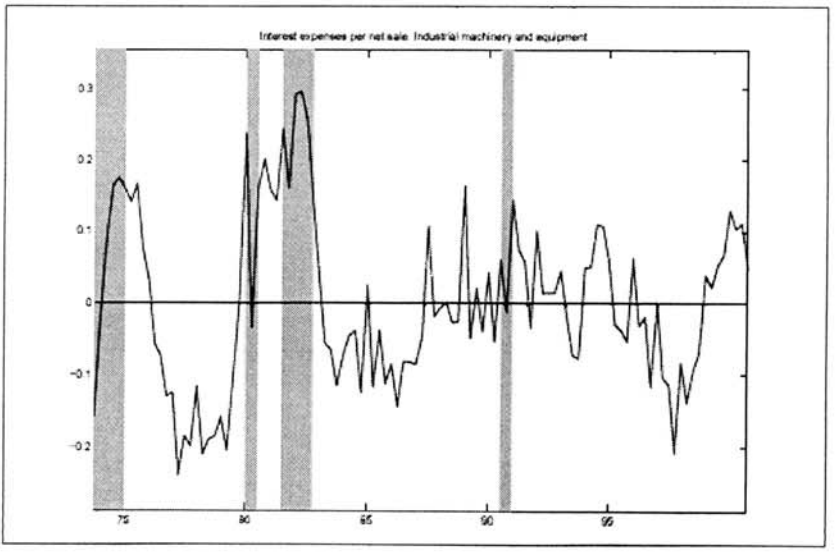


Figure (6) depicts the cyclical component of the short-term debts to net sales and inventories to net sales ratios for the industrial machinery and equipment sector. Notice that the inventories to net sales ratio and short-term debts to net sales rise simultaneously and persistently throughout these two recessions. In order to verify whether this resulted in an increase in borrowing cost per net sales during these two major recessions as previously discussed, I plot Figure (7) showing the cyclical component of interest expense per net sales[8] for the industrial machinery and equipment sector. Figure (7) makes it clear that the two major postwar recessions are associated with a sharp increase in interest expense normalized by

8) Actual industry interest expense has only been reported in the QFR since 1998. Therefore, I constructed the industry interest expense series by following the procedure suggested by Barth and Ramey(2001).

net sales in the industrial machinery and equipment sector. This constitutes an alternative plausible mechanism that explains tight monetary policy in response to oil shocks, not related to technology shocks, could lead to a sharp rise in nominal equipment price level which itself rises during the two major postwar recessions. Obviously, the extent to which firms in the industrial machinery and equipment sector could pass along, in their prices the higher interest costs per net pales depends on the structure of the market and requires further investigation. Since the industrial equipment and machinery sector is traditionally characterized by firms with market power and high rents (Borjas and Ramey, 1995), however, it seems reasonable to argue that firms in this sector could pass the bulk of this increase in financing costs to buyers.

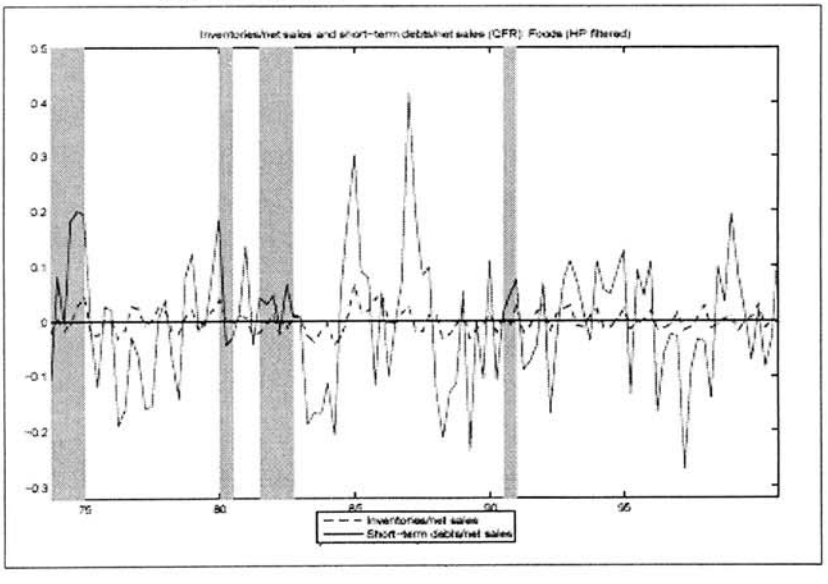
【Figure 7】 The cyclical components of interest expenses per net sales for the industrial machinery and equipment sector



There is no reason to believe that the close relationship between short-term debts and inventories is restricted to the industrial

machinery and equipment and transportation equipment sectors. Gertler and Gilchrist (1994) show that irrespective of the size of firms inventories and the inventories to sales ratio after Romer dates closely mimic the pattern of short-term debt and the short-term debt to sales ratio, though their main finding is that the effect if monetary policy of inventory demand depends on the size of forms. Since their classification of firm sizes takes into account firms from all sectors, it seems plausible to anticipate that this positive correlation between inventories and short-term debt, the inventories to sales ratio and the short-term debt to sales ratio is expected to hold not only across sizes of firms but also across sectors. Motivated by this, I perform the same exercise done above for the case of the foods sector, selected to represent the nondurable consumption sector.

【Figure 8】 The cyclical components of inventories to net sales (dashed line) and short-term debts to net sales (solid line) ratio for the foods sector



【Figure 9】 The cyclical components of interest expenses per net sales for the foods sector

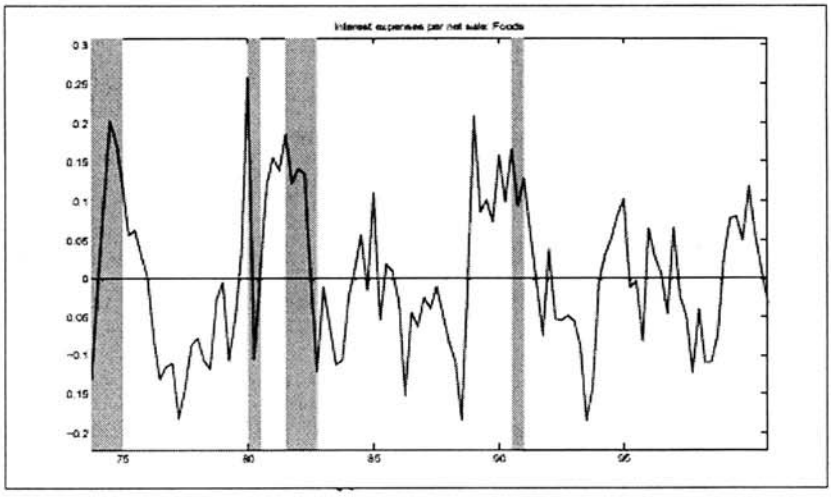


Figure (8) plots the cyclical component of short-term debt to net sales and inventories to net sales ratio. As in the industrial machinery and equipment sector, the inventories to net sales ratio mimics the pattern of the short-term debt to net sales ratio during the two major postwar recessions. Unlike the industrial machinery and equipment sector, however, the inventories to net sales ratio and the short-term debt to net sales ratio during the recessions 1973~1975 in the foods sector behaved quite differently than what was observed during the recession of 1981~1982. While the inventories to net sales and short-term debt to net sales ratios increased during the recession of 1973~1975, they did not exhibit this countercyclical pattern during the recession of 1981~1982. As a result, interest expense per net sale increased during the recession of 1973~1975, but it declined substantially throughout the recession of 1981~1982 and eventually dropped below the trend toward the end of the recession (Figure (9)). This provides a possible explanation for the pattern of the consumption deflator during these two postwar recessions. First for the case of the recession of

1973~1975, there is evidence of a cost-channel of tight monetary policy in the foods sector that might possibly explain why the consumption deflator rises during the recession of 1973~1975. Second, in contrast to the recession of 1973~1975, there is no evidence of a cost-channel in the foods sector during the recession of 1981~1982, which suggests that tight monetary policy affects the foods sector only through the demand side. This might explain why the consumption deflator declines during the recession of 1981~1982.

IV.2. The effect of price controls on the industrial machinery and equipment sector

The previous subsection has concentrated on common features of the two major postwar recessions in the industrial machinery and equipment sector: tight monetary policy in response to oil shocks and a persistent increase in the short-term debt to net sales ratio associate with a persistent rise in the inventories to net sales ratio. Despite this commonality, the recession of 1973~1975 has its own unique characteristics, absent during the recession of 1981~1982, that might lead to an additional increase in nominal equipment prices. This is obviously attributable to the effect of Nixon's price controls from August 1971 to April 1974. As the basic economics tells, the side-effect of Nixon's price controls was to create excess demand. Particularly, Business week (May 11 1974, page 104) reports that shortages in materials, machinery and equipment sector were to look at the ratio of unfilled order to shipments. This is because when the ratio of unfilled orders to shipments increases rapidly, it may indicate that demands are exceeding producer's present supply capabilities. Figure (10) plots nominal shipments, new order, unfilled orders and the ratio of unfilled

order to shipments for the industrial machinery and equipment sector[9]. As is evident in Figure (10), starting from around the second quarter of 1972, new orders begin to grow much faster than shipments do. This might be due to the following two factors. First, price controls might have encouraged producers to ship goods overseas at higher uncontrolled prices, exacerbating the domestic shortage. More importantly, price controls might have reduced producers incentive to expand their capacity. Accordingly, the ratio of unfilled orders to shipments rose on an unprecedentedly sharp fashion and reaches at record-high level by the time price controls on machinery were lifted, April 1974. This indicates the clear presence of enormous excess demand and upward price pressures in the industrial machinery and equipment sector when controls were lifted. Furthermore, the upward price pressures seem to persist throughout the third quarter of 1975. The reason for this is that even after a massive decline in new orders in the industrial machinery and equipment sector in the third quarter of 1974, the ratio of unfilled orders to shipment ratio declined slightly but stayed at a historically high level throughout the third quarter of 1975. It was not until the third quarter of 1975 that a massive downward adjustment of the ratio of unfilled orders to shipments occurs. This implies that a significant decline in new orders only prevented excess demands from increasing farther and excess demands began to be eliminated only after the third quarter of 1975, consistent of 1975, consistent with the fact that nominal equipment prices started to decline at the third of 1975.

---

9) All these data are drawn from U.S Census Bureau, Manufacturing, Mining, and Construction statistics. They are quarterly and SIC-based. New orders are net of order cancellation and includes orders received and filled during the quarter as well as orders received for future delivery.

【Figure 10】 The nominal shipments, new order, unfilled order and the ratio of unfilled order to shipment for SIC 35

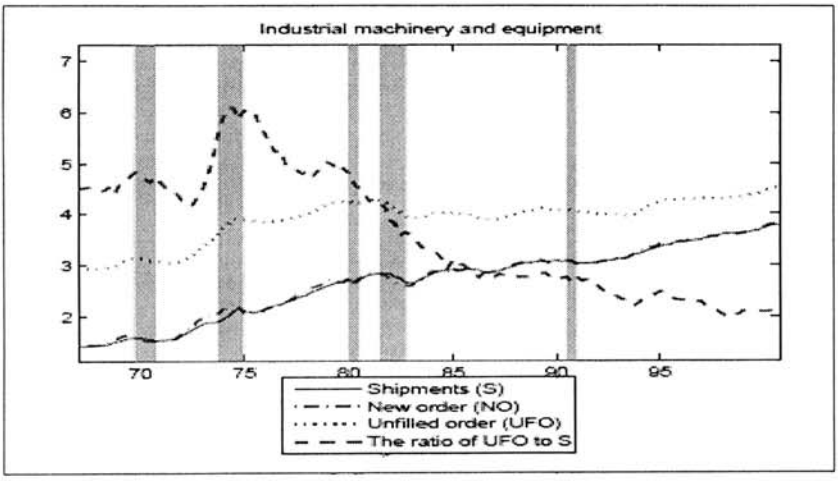


Figure (10) additionally reveals interesting aspects that might not only work as another factor contributing to an increase in equipment price up to the third quarter of 1974, but also resolve the puzzles regarding the recessions of 1973~1975 raised by several authors. Hamilton and Herrera (2004) raise the point that the biggest effects of an oil shock do not appear until three of four quarters after the shock. Following up on this point, Aguiar-Conraria and Wen (2006) argue that one of the major puzzles associated with the 1973~1975 recession is why the trough of the recession was delayed for 4-6 quarters after oil prices increased significantly in late 1973. They show that a model that allows for externalities among firms and endogenous capital utilization could generate the 4-6 quarters delay of the trough of recession assuming that an oil shock works through depressing investment demands. As is evident in Figure (10), however, the real force that delays the trough of the 1973~1975 recession is attributable to the string flow of new orders in the industrial machinery and equipment sector that persisted until the middle of the 1973~1975 recession. The source of these strong demands

seems to have something to do with the fact that firms in the material and machinery sector, where shortages exacerbated by the price control were worst, would expand their capacities when they become free to post is consistent with the following report from the Business week : "Business plan to spend $119.1 billion dollars for new plant and equipment this year-an increase of 19.4% over the 1973 total and the largest percentage increase in 18 years. Leading the way in the capital booms are nonferrous metals, with 71% increase over the last year, petroleum (52%), paper and pulps (49%), mining(41%) and machinery(41%)" (May 4 1974, page 20).

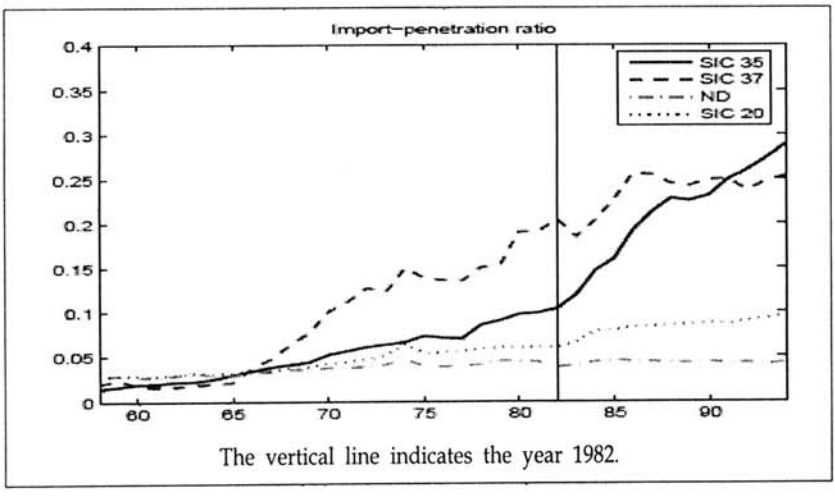
V. An alternative explanation for a sharp decline in the relative price of PDE after 1982

Besides the two major postwar recessions, the period when identified investment-specific technology shock plays a significant role in accounting for the economic fluctuation is the recovery period of the 1981~1982 recession. According to Fisher's SVAR model, the sharp decline in the relative price of PDE after the recession of 1981~1982 is entirely attributed to positive investment-specific technology shocks. More surprisingly, these positive technology shocks account for most of the recovery after the recession of 1981~1982, as one can see from Figure (2). However, it is also after the recession of 1981~1982 that manufacturers in the producer equipment sector face tougher import competition. To see this, Figure (11) plots the import-penetration ratio[10] for the industrial machinery and

10) The series used in calculating the import-penetration ratio of each sector are annual and drawn from NBER International Trade data maintained by Robert C. Feenstra,

equipment sector, transportation equipment sector, foods sector and nondurable good sector. While the foods and nondurable goods sectors did not exhibit any significantly different pattern in the import-penetration ratio after 1982, the industrial machinery and equipment and the transportation equipment sectors exhibit an import-penetration ratio that increases more rapidly during the recovery period from the recession of 1981~1982, relative to the one observed before 1982. Figure (11) clearly from the force that could have led to more rapid erosion of market power and thus a significant decline in markups in the producer durable equipment sector after the recession of 1981~1982.

【Figure 11】 The import-penetration ratio of the industrial machinery equipment sector(SIC35), transportation equipment (SIC 37), nondurable sector(SIC 20)



The vertical line indicates the year 1982.

Ⅵ. Conclusion

Evidence presented in this paper indicates that a) a persistent rise in the inventories to sales ratio in the industrial machinery and equipment and transportation equipment sectors during two

major postwar recessions caused an enormously high borrowing cost normalized by net sales and b) the severe shortages in the industrial machinery and equipment sector induced by Nixon's price controls persisted throughout the recession of 1973~1975 and deserves serious attention. As this paper has shown, the extent to which investment-specific technology shocks account for the business cycles of hours reported in the literature using the SVAR approach crucially depends on the fact that the SVAR model identifies the countercyclical movement of the relative price of PDE as entirely driven by negative investment-specific technology shocks. Thus, the evidence presented in this paper casts serious doubt on a striking finding by Fisher(2002, 2005) that investment-specific technology shocks account for about 50% of the fluctuation in hours at business cycle frequency.

◈ *References* ◈

Auiar-Conraria, L. and Wen, Y. (2006), Understanding the Large Negative Impact of Oil Shocks, Forthcoming *Journal of Money, Credit, and Banking.*

Barth Ⅲ, M. J. and Ramey, V. A. (2002), The Cost Channel of Monetary Transmission, NBER *Macroecomomics Annual.*

Bernanke, B. S., Gertler, M. and Watson, M. W. (1997), Systematic Monetary Policy and the Effects of Oil Price Shocks, *Brooking Papers on Economic Activity*, 1997(1).

_____ (2004), Oil Shocks and Aggregate macroeconomic Behavior: The Role of Monetary Policy: A Reply, *Journal of Money, Credit and Banking*, 36(2).

Bils, M. and Kahn, J. A. (2000), What Inventory Behavior Tells Us about Business Cycles, *American Economic Review*, 72(3).

Borjas, G. J. and Remay, V. A. (1995), Foreign Competition, Market

Power, and Wage Inequality, *Quarterly Journal of Economics*, 110(4).

Christiano, L., Eichenbaum, M. and Vigfussion, R. (2004), What Happens After a Technology Shock? Northwestern University Manuscript.

Christiano, L. J., Eichenbaum, M. and Evans, C.L. (1997), Sticky Price and Limited Participation Modes of Money: A Comparison, *European Economic Review*, 42(6).

Cummins, J.G. and Violante, G.L. (2002), Investment-specific Technical Change in the United States (1947-2000): Measurement and Macroeconomic Consequences, *Review of Economic Dynamics*, 5(2).

Domowitz, I., Hubbard, R. and Petersen, B.C. (1988), Market Structure and Cyclical fluctuation in U.S. Manufacturing, *Review of Economics and Statistics*, 70(1).

Eckstein, O. and Sinai, A. (1986), The Mechansims of the Business cycle in the Postwar Era. in the *The American Business Cycle: Continuity and Change*, Robert J. Gordon, ed. (Chicago: University of Chicago Press.

Finn, M.G. (2000), Perfect Competition and the Effects of Energy Price Increases on Economic Acticity, *Journal of Money, Credit, and Banking*, 32(3). Part 1.

Fisher, J. (2003), Technology Shocks Matter, Working Paper, Federal Reserve Bank of Chicago.

_____ (2005), The Dynamic Effects of Neutral and Investment-Specific Technology Shocks. Working Paper, Federal Reserve Bank of Chicago

_____ (2006), The Dynamic Effects of Neutral and Investment-Specific Technology Shock, *Journal of Political Economy*, 114(3).

Francis, N. and A. Ramey, V. (2001), Is the Technology-Driven Real Business Cycle Hypothesis Dead? Shocks and Aggregate Fluctuations Revisited, Forthcoming *Journal of Monetary*

Economics.

Gali, J. (1999), Technology, Employment and the Business Cycle: Do Technology Shocks Explain Aggregate Fluctuation? *American Economic Review*, 89(1).

Gertler, M. and Gilchrist, S. (1994), Monetary Polocy, Business Cycles, and the behavior of Small manufacturing firms, *Quarterly Journal of Economics*, 109(2).

Greenwood, J., Hercowitz, Z. and Krusell, P. (2000), The Role of Investment-Specific Technology Change in the Business Cycle, *European Economic Review*, 44(1).

Hamilton, J. and Herrera, A. M. (2004), Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy, Journal of Money, Credit and Banking, 36(2).

Hamilton, J. D. (1983), Oil and the Macroeconomy Since World War II, *Journal of Political Economy*, 91(2).

_____ (2003), What is an Oil Shock? *Journal of Econometrics*, 113.

Justiano, A. and Primiceri, G. (2006), The Time Varying Volatility of Macroeconomic Fluctuations. Northwestern University manuscript.

Ramey, V. A. (1996), Comment on "Can Technology Improvements Cause Productivity Slow-downs?", *NBER Macroeconomics Annual*.

Shaprio, M. and Watson, M. (1986), Sources of Business Cycle Fluctuations. NBER Macroeconomics Annual.

Shea, J. (1993), Do Supply Curves Slope Up? *Quarterly Journal of Economics*, 108(1).

자본재 상대가격과 미국의 경기변동

김 광 환*

논문초록

본고는 경기역행적인 자본재의 상대가격의 움직임이 미국경기변동에 미치는 효과에 대해서 분석하였다. 특히 전후 주요한 경기침체기 (1973-75, 1981-82)에 관찰되고 있는 큰 폭의 자본재 상대가격 상승과 1982-83년도에 관찰되고 있는 큰 폭의 하락이 구조 VAR 모형에서는 자본재 생산부문에서 발생한 기술충격으로 판별하는 데 반해 본고에서는 비(非) 기술적 요인들이 이런 자본재 상대가격의 움직임을 설명할 수 있음을 보이고 있다. 유가충격으로 인한 인플레이션 우려로 중앙은행의 금리를 올림에 따라 기업의 금융비용 증가 및 닉슨 대통령 재임 시 가격통제로 인한 자본재 공급 부족으로 인해 자본재 상대가격이 상승하였음을 보이고 있다. 또한 1981년 이후에는 미국에서 자본재 부문에서 다른 외국과의 증가된 경쟁으로 인해 자본재 가격이 하락됨을 보이고 있다. 이러한 결과가 의미하는 바는 구조 VAR에서 도출된 자본재 부문의 기술충격이 미국 경기변동을 설명하는 정도가 과장되고 있음을 보이고 있다.

주제분류 : B030300
핵심 주제어 : 구조 VAR모형, 자본재 상대가격

* 동국대학교 사회과학대학 경제학과 조교수