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IMPORT COMPETITION AND ITS IMPACT ON DOMESTIC INDUSTRIES

The Ohio State University

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IMPORT COMPETITION AND ITS IMPACT ON DOMESTIC INDUSTRIES

DISSERTATION

Presented in Partial Fulfilment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Hojin Kang, B.A.

The Ohio State University

1983

Reading Committee:
Edward J. Ray
Donald O. Parsons
Robert Driskill

Approved By
Edward J. Ray
Adviser
Department of Economics
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VITA

June 20, 1948
Born - Kimchon City, Korea

1970
E.A., Seoul National University, Seoul, Korea

1970-74
Junior Economist, Korea Development Bank, Seoul, Korea

1974-78
Teaching Associate, Department of Economics, The Ohio State University, Columbus, Ohio

1979-80
Energy Economist, Department of Energy, State of Ohio

1981-82
Research Associate, Center for Human Resource Research, The Ohio State University, Columbus, Ohio

1982-83
Teaching Associate, Department of Economics, The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: Economics

Studies in International Economics

Studies in Econometrics

Studies in Economic Theory and Mathematical Economics
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CHAPTER I

INTRODUCTION

Western industrial economies have become more open to foreign trade in recent years. Even in the United States, once considered an almost closed economy because of its huge internal market, the ratio of exports to GNP as a measure of openness increased from 5% in 1965 to 10% in 1980. The ratio of imports to GNP increased even more, as the U.S trade balance changed from a surplus in 1965 to a deficit in 1980. As international competition has become increasingly pervasive in national markets for manufactured goods, imports and exports have become important factors in demand for domestic industry's output. Many import competing industries turned to government for tariff and non-tariff protection from import competition during business downturns and the protectionist movement has often become a sensitive area in domestic politics. This makes it important to understand what influence import competition exerts on a domestic industry and how a domestic industry adjusts to changing market conditions resulting from significant foreign competition.

A number of authors including Esposito and Esposito(1971), Pagoulatos and Sorensen(1976), Pugel(1978),
and Marvel (1980) have investigated the effect of domestic market structure on import flows and the effect of import competition on a domestic industry's profitability. One common finding of these studies was that import share negatively affects a domestic industry's profitability in a given period. They have emphasized the profit restraining effect of import competition and attributed the negative effect of imports on a domestic industry's profitability to the presence of a monopoly element (or short-run quasi-rents in competitive markets) in the domestic manufacturing sector. However, the relationship observed in cross-sectional studies does not seem to hold over time. The increase in import share during the implementation of the Kennedy Round tariff cuts did not negatively affect the profitability of import competing industries (Table 1). Urata (1979) also reported that the price-cost margin of U.S. textile industries is not negatively related to import share between 1967 and 1977. I explain these seemingly contradictory results by an explicit consideration of the short-run specificity of capital and its adjustment over time.

Since factors of production are temporarily tied to a particular industry, factors in industries that are contracting due to significant competition from imports experience economic losses of a short-run nature. Consequently, imports would negatively affect short-run
domestic industry profitability and the income of labor in the industry (bring about unemployment if wages are unresponsive). If factors of production are not mobile between sectors, the difference in the reward to a given factor between sectors would persist for some time and the welfare loss from the allocative inefficiency would mitigate the gains from trade. This aspect of foreign trade has provided some economic arguments for the tariff and non-tariff protection advocated by several affected groups and accorded by the government. But an increase or decrease in the income of resources provides a signal for resource reallocation when the factors are mobile. The gains from trade are essentially the gains from specialization. An increased specialization of a national economy in those industries where it has a comparative advantage must be accomplished by a reallocation of resources. To the extent that profits serve a resource allocation function, they will affect domestic industry growth over time. Industry growth should be negatively affected by import competition and positively affected by export possibilities. Capital stock growth would be faster in export oriented industries than in import competing industries, given the domestic demand growth. In addition, the number of firms would grow faster in exporting industries than in import competing industries.
The differing roles of factor income changes in the short-run and in the long-run have been recently analyzed in the context of optimal dynamic intervention. Several authors including Lapan(1976), Ray(1979), and Parsons(1980) investigated the question of optimum labor transfer between sectors by government intervention when wages are not responsive. Largely ignored, however, is the role of capital adjustment. Capital is presumably more specific to a given sector in the short-run and slower in adjustment over time than labor. One may argue that, due to the residual nature of the income of capital, there is no significant economic loss associated with the unemployment of capital. Idle capacity constitutes waste of resource just as does unemployment of labor. An extreme view would argue that the existing capacity for one activity cannot be used for an alternative activity. Moreover, an important determinant of labor transfer from one sector to another is whether the growth in capital stock in the expanding sector is rapid enough to absorb workers released by the adversely affected sector. Previous studies on dynamic optimal intervention have shown that, if inter-sectoral resource movements are very slow due to high adjustment costs, government intervention, if costless, may be justified to facilitate allocative efficiency. Then, it is important from a policy point of view to examine what factors affect the speed of adjustment of domestic industries, and what
government can do, if anything, to alleviate a domestic industry's adjustment problems in pursuit of the gains from more liberalized international trade.

While several cross-sectional analyses have reported a negative influence of import share on domestic industry profitability, no systematic attempt has been made to examine: 1) why this is observed, 2) how a domestic industry responds to the erosion of profitability resulting from import competition, 3) what factors affect industry adjustment to import competition, and 4) what government can do, if anything, to alleviate the adjustment problems of domestic industries. My thesis is an attempt to answer these questions based on domestic industry growth between 1967 and 1977. A distinctive feature of this study is an explicit consideration of the short-run specificity of capital and its emphasis on a domestic industry's adjustment to a signal of enhanced or depressed profitability. Consideration of downward adjustment of capital stock of a domestic industry to a slow growing demand over time can explain why no significant effect of import competition on a domestic industry's profitability over time has been observed, contrary to the findings of cross-sectional studies. Then, I investigate the third and fourth question, i.e., what factors affect the speed of adjustment of a domestic industry and what government can do to alleviate adjustment problems of domestic industries,
if anything.

In the next chapter, I briefly discuss a domestic industry's adjustment to the growth in demand, which is presumably affected by import competition. Whenever the adjustment speed of factors of production is not instantaneous, changes in demand affect the incomes of those factors. Then, I review several of the earlier studies on the relationship between trade flows and domestic industry profitability, and discuss the implications for domestic industry adjustment. In Chapter 3, I present a simple two-sector model which shows a short-run decline in the profit of the import competing sector and adjustments in both sectors over time. Based on this model, I develop several hypotheses to be tested including how import competition affects the profitability and growth of import competing industries. I view import competition as a constraint to the growth in demand for the output of a domestic industry. Then, I discuss what is the effect of demand fluctuations on industry profitability and how a domestic industry adjusts to them. First, I explore the empirical linkage between sales growth, import growth, and domestic industry profitability. We hypothesize that

1) the profitability is lower in the industries which experienced slower or negative sales growth,
2) import growth affects the sales growth of a domestic industry negatively, given the growth in domestic
market demand,

3) consequently, profitability is lower in industries which experienced a rapid growth in import share.

Next, we consider why there was no profitability effect over time, i.e. why the rapid growth in import share did not decrease the profitability of import competing industries in 1972 compared with that in 1967. I propose a hypothesis that import competing industries adjusted their capital stock downward over time, in response to the signal of lower profitability.

The following chapter presents the result of an empirical analysis of the impact of import competition on domestic industries, using the U.S. manufacturing industry data between 1967 and 1972. My empirical results are consistent with the hypotheses we proposed in the previous chapter. We establish the empirical linkage between sales growth, import growth, and domestic industry profitability, as hypothesized. Using an interactive specification, I also show that capital stock growth was indeed slower in import competing industries, given the growth in sales.

Most of these results were based on an explicit consideration of the short-run specificity of capital and domestic industry adjustments over time to enhanced or depressed profits. In chapter 5, we investigate what factors affect the speed of capital stock adjustment of a
domestic industry to fluctuations in demand. This should permit us a more informed tariff reduction policy in future years, one that could focus cuts on industries that can most efficiently and quickly adjust to greater import competition. We discuss what would be an optimal tariff cut policy if the speed of adjustment of domestic industries to demand fluctuation is different across industries and over time. Then, we consider two specific hypotheses concerning the speed of adjustment of a domestic industry, i.e. 1) Does an already depressed industry find it more difficult to adjust to downward fluctuation in demand than industries in general? and 2) Does an industry find it easier to adjust to downward fluctuation in the demand for its output when the aggregate economy is growing rapidly?

These questions are related to the question of whether industry specific relief measures such as tariff and non-tariff protection are the only policy instruments available to alleviate a domestic industry's adjustment problems. If the second hypothesis is correct, then the timing of tariff cuts for cyclical boom period will be important to reduce the adjustment costs of import competing industries. We examine whether these factors actually affected the speed of adjustment of a domestic industry to the fluctuation of

---

1 These two hypotheses were examined for labor transfer function by Parsons (1980).
demand as hypothesized, using the U.S. manufacturing industry data during the period of 1973 and 1977. My empirical results support the latter hypothesis but not the former one. This suggests that government should time tariff cuts for cyclical boom periods during which the resources released from the declining sector can be more readily absorbed by the rest of the economy. Then, we conclude with a brief summary of our findings.
CHAPTER II

REVIEW OF LITERATURE AND RELATED ISSUES

Import competition constrains the growth in demand for a domestic industry's output and displaces demand for a domestic industry's output if the domestic market does not grow. Business firms adjust to changes in economic environment, particularly changes in demand for their products. An increase in demand is likely to cause an increase in output and demand for factors of production. However, the relative fixity of various factors of production will cause the adjustment to the ultimate equilibrium position to take place more or less slowly. For example, if units of capital adjustment become more expensive to acquire and install as the volume of capital adjustment rises in a given period, profit maximizing firm will spread out capital adjustment over time. Consequently, the return on capital remains above the equilibrium until the new long-run equilibrium is attained. As Eisner and Strotz (1963) put it, whatever causes firms to desire an increase in output also enhances their present profits. Correspondingly, whatever causes firms to desire a decrease in output will negatively affect their present profits. To the extent that import competition negatively
affects a domestic industry's sales growth, it will negatively affect a domestic industry's profitability. Therefore, it is not surprising that early empirical studies have focused on the impact of import competition on a domestic industry profitability.

Esposito and Esposito (1971) made one of the first attempts to examine the influence of foreign competition on domestic industry profitability. Their theoretical argument is based on the so-called barriers to entry. They argue that firms with established markets elsewhere in the world can potentially avoid two of the standard sources of disadvantage to market newcomers - the need to produce large quantities in order to reap substantial scale economies in production and absolute-cost disadvantages with regard to the purchase of essential inputs. In addition to this weakened effect of entry barriers on imports, they also argue that the speed with which foreign firms react to domestic firms will be greater than new domestic entrants because they are already selling in their own markets. They report regression results on profits in response to industry characteristics and imports, which show that imports have a significant and negative impact on industry profits. But this does not imply that imports constrain only the profits of industries with high barriers to entry unless it is also shown that import competition has no effect on the profit of industries with no barrier
Khalilzadeh-Shirazi (1974) found a significant and positive effect of exports on domestic industry profits in a study which primarily attempted to investigate the influence of market structure on price-cost margins in United Kingdom manufacturing industries. He argued that exports face more uncertainties associated with operating in foreign markets than domestic sales. As evidence, he cites the fact that large firms account for a high proportion of a country's export. He argues that since exporting is a risky undertaking, it must be rewarded by a risk premium. Therefore, exports should increase industry profitability and the price-cost margin. But, according to his argument, the risky activity is the exporting activity, not the activity of producing a commodity whose production cost happens to be lower at home than abroad so it is exported. Therefore, in a given industry, more exports may be accounted for by large firms for which the price of risk may be lower than for their smaller counterparts. This argument does not imply that an industry producing exportables faces more uncertainties than other industries. If exporting per se is risky, one would have to explain why firms producing exportable commodities perform export activities themselves instead of selling their output to trading companies whose activities include exporting.
Pagoulatos and Sorensen (1976) argue that a noncompetitive market structure is more likely to allow higher imports than a perfectly competitive industry, since domestic firms are likely to collude and obtain higher prices than would have prevailed under perfect competition. Domestic firms may fear that it would be costly to engage in price cutting to forestall imports, because that would destroy the agreed upon price structure. Therefore, they may be willing to sacrifice some portion of the domestic market to foreign competition.

While the studies just mentioned have focused either on the impact of market structure on trade flows or the impact of trade on the profitability of a domestic industry, Marvel (1980) argued that the two questions are closely related and that the simultaneous determination of profits and trade flows suggests that earlier work may have underestimated the linkages between domestic competition and foreign trade. He reasons that not only will imports increase as a response to above-normal profits but they will also constrain the profits of domestic firms. He recognizes that the negative impact of imports on profits does not necessarily imply that imports constrain only the profits of highly concentrated industries. So he splits his sample into three strata by concentration ratio and shows that the negative effect of imports on profitability is stronger in the highest concentrated strata than in the
least concentrated strata. However, his results did not support the monopoly argument. On the other hand, Pugel (1978) showed that the effect of imports on profits is stronger in a more concentrated industry, using an interactive specification.

Most authors have emphasized the competitive effects of imports such as promoting competitive pricing and restraining the profits of concentrated domestic industries. This provides a further argument for trade liberalization. The gains from trade with domestic monopoly consists of two components: the conventional gains from trade and the gains from forcing the monopoly to stop extracting monopoly rents. Similarly, the removal of trade restrictions would enhance the ability of imports to promote competitive pricing in domestic markets to the benefit of consumers in general, which would be reflected in the lower profit of import competing industries along with a higher import share.

However, the relationship observed in cross-sectional studies does not seem to hold over time. After the Kennedy Round tariff cuts were implemented, the import share in the U.S. manufacturing sector rose from 3.3% in 1967 to 6.7% in 1972. From the cross section results one would predict that the substantial increase in import competition would have affected domestic industry's
profitability significantly. One would expect that the more intense import competition would have forced down the profit rate of import competing industries and that the dispersion of profit rates across industries in the manufacturing sector would have increased substantially. But domestic industry's profitability measured in terms of the ratio of overhead cost (OH) to the gross book value of depreciable assets (GBV), and its dispersion across industries varied very little. As is shown in Table 1, the average profitability of domestic industries in the manufacturing sector was 0.77 in 1967 and 0.78 in 1972 and its dispersion was 0.552 in 1967 and 0.561 in 1972. Surprisingly, the ratio for the profitability of industries in the import sector rose from 0.67 in 1967 to 0.74 in 1972, while the same ratio for the industries in the export sector fell from 0.86 to 0.84. Similar anomalous findings were also reported by Urata (1979). He reported that price-cost margin is positively related to import share when he used pooled cross-section and time-series data for the U.S. textile industries between 1967 and 1977.

One explanation of this phenomenon would be that the import increase was accompanied by a simultaneous increase in export, i.e. intra-industry trade, and that, consequently, import increase did not affect the profitability of import competing industries negatively. This does not appear to have played a significant role.
Table 1
Selected Market Characteristics (1967 - 1972)

<table>
<thead>
<tr>
<th></th>
<th>All Industries</th>
<th>Import Sector</th>
<th>Export Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Share</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>0.0334(0.0503)</td>
<td>0.0637(0.0724)</td>
<td>0.0160(0.0197)</td>
</tr>
<tr>
<td>1972</td>
<td>0.0656(0.1121)</td>
<td>0.0991(0.0945)</td>
<td>0.0279(0.0338)</td>
</tr>
<tr>
<td>Export Share</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>0.0501(0.0533)</td>
<td>0.0242(0.0342)</td>
<td>0.0670(0.0595)</td>
</tr>
<tr>
<td>1972</td>
<td>0.0663(0.1092)</td>
<td>0.0267(0.0416)</td>
<td>0.0819(0.0789)</td>
</tr>
<tr>
<td>Increase in Import Share</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>0.0332(0.0979)</td>
<td>0.0326(0.0481)</td>
<td>0.0142(0.0238)</td>
</tr>
<tr>
<td>Increase in Export Share</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>0.0208(0.0947)</td>
<td>0.0017(0.0201)</td>
<td>0.0206(0.0457)</td>
</tr>
<tr>
<td>C4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>39.8(22.5)</td>
<td>41.7(24.4)</td>
<td>39.3(20.7)</td>
</tr>
<tr>
<td>1972</td>
<td>40.7(23.1)</td>
<td>43.5(25.7)</td>
<td>39.3(20.7)</td>
</tr>
<tr>
<td>Number of Firms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>1171.1(1958.0)</td>
<td>1321.6(2302.4)</td>
<td>1077.7(1888.6)</td>
</tr>
<tr>
<td>1972</td>
<td>1286.4(2101.1)</td>
<td>1316.2(2203.0)</td>
<td>1121.5(2024.2)</td>
</tr>
<tr>
<td>% Change in VS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31.1(33.7)</td>
<td>35.7(25.9)</td>
<td>27.5(32.9)</td>
</tr>
<tr>
<td>% Change in OH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33.4(41.6)</td>
<td>33.6(42.4)</td>
<td>30.5(38.9)</td>
</tr>
<tr>
<td>% Change in GBV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37.7(33.2)</td>
<td>32.3(30.3)</td>
<td>39.3(33.7)</td>
</tr>
<tr>
<td>Industry Profitability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>0.7708(0.5516)</td>
<td>0.6663(0.4383)</td>
<td>0.8647(0.6514)</td>
</tr>
<tr>
<td>1972</td>
<td>0.7832(0.5605)</td>
<td>0.7408(0.4907)</td>
<td>0.8423(0.6507)</td>
</tr>
</tbody>
</table>

Note 1) Standard deviation in parentheses.
2) Import sector consists of industries whose import was greater than its exports in both 1967 and 1972.
3) Number of industries equals 304, and 98 in import sector, 150 in export sector respectively.
4) All the figures are weighted averages, where the value added in 1967 was used as the weight variable.

Variable definition
C4 = Four firm domestic concentration ratio
OH = Overhead cost
GBV = Gross book value of depreciable assets
VS = Value of shipment
Profitability = OH divided by GBV
Table 1 shows that the import growth was greater in the traditional import sector and export increase was not significant in that sector.

One may attribute this lack of profitability effect to the political process of trade restrictions. Marvel and Ray (1983) argued that U.S. tariff cuts were structured to minimize the costs to historically protected groups including declining industries, while non-tariff trade restrictions were used to offset any remaining adverse effect on these groups. Thus, substantial tariff reductions had little or no impact on the structure of imports into the U.S. This argument does not directly address the issue of why the substantial increase in import share had little impact on a domestic industry's profitability over time. An extension of the Marvel-Ray hypothesis would be that trade restrictions were so restructured as to minimize the effect of the expected increase in import share on a domestic industry's profitability. In other words, imports were allowed to increase more in those industries where domestic industry's profitability would be least sensitive to import share increases. A natural question arises, what affects the sensitivity of a domestic industry's profitability to import competition. If import share reflects the industry's international competitiveness, an industry with a higher import share faces declining industry demand.
relative to other domestic industries with potential export markets. Therefore, this becomes a question of what determines an industry's adjustments to fluctuations in industry demand.

If factors of production are temporarily tied to a particular industry, factors in contracting industries experience economic losses of a short-run nature. In a two-sector model where capital has been postulated to be immobile between two industries in the short-run and relative factor prices perfectly flexible, Mayer (1974) and Mussa (1974) contrast the short-run distributional effects of a change in relative commodity price to the long-run distributional effects. He demonstrates that even if capital in each sector may gain in the long-run, capital in the import sector temporarily loses in the short-run due to its slow adjustment. But the difference in the reward to capital between the two sectors induces a movement of capital from the import sector to the export sector and the reward to capital in the import sector increases over time. The finding in several studies that import share negatively affects the domestic industry's profitability can be better interpreted as a manifestation of the domestic industry's adjustment process to changing market conditions. It does not have to rely solely on the presence of a monopoly element in the domestic manufacturing sector. In equilibrium, there is no a priori reason to expect that the
return on capital in the import competing sector is lower than in export or non-tradable goods industries in a competitive economy. However, in the disequilibrium argument, the negative impact of imports on domestic industry profitability is a signal for contraction in the domestic industry and its magnitude will be determined by the speed of adjustment of the domestic industry and the rapidness with which import share increases. If the adjustment process is slower, the effect of import share on profit is larger than on output. An import increase will be reflected in lower profits unless the adjustment is instantaneous.
CHAPTER III

METHODOLOGY

Import competition forces a domestic industry to reduce the price of its output to maintain an optimum volume of sales, given other constraints, and an industry's ability to export enables the industry to raise its output price above the level that would have prevailed under an autarky situation. This change in relative commodity price affects rewards to factors of production, one of which is profit. If the reward to a given factor is different between sectors, then the factor will move in search of its highest reward. We will describe this adjustment process in a simple two-sector model analyzed in Mayer (1974) and Mussa (1974), discuss its implications for industry adjustments and develop empirical hypotheses to be tested.

A. Commodity Price Change and the Distribution of Income
   - in the Short-run and Long-run

   (1) Stolper-Samuelson Theory
   The effects of changes in relative commodity prices on the distribution of income among factors of production in the context of a simple two-good and two-factor economy are embodied in the Stolper-Samuelson theory in the international trade literature.
Assume that

i) there are two perfectly mobile factors of production capital, $K$, and labor, $L$, which are used in the production of two commodities $X$ and $Z$.

ii) The production functions for the two commodities are each linear homogeneous in their respective inputs and are twice differentiable with positive and declining marginal physical products for each of the inputs. That is,

$$ X = F (L_x, K_x), $$

$$ Z = G (L_z, K_z). $$

iii) The total quantity of labor and capital used in both industries is equal to the fixed aggregate supply of labor and capital, respectively, that is,

$$ L_x + L_z = L, $$

$$ K_x + K_z = K. $$

iv) perfect competition: There is perfect competition in both commodity and factor market.

v) Within the relevant range of factor prices, the capital-labor ratio in the production of $X$ is higher than in the production of $Z$.

From the zero profit restrictions under perfect competition for the two industries, the following relationship holds between the prices of $X$ and $Z$, ($P_x$ and $P_z$) and the prices of the services of labor and capital ($w$ and $r$).
Then, let's consider the effect of a change in the price of $X$ on the price of factor service. Let's express the percentage change in $P_x$, $P_z$, $w$ and $r$ as $\Delta P_x$, $\Delta P_z$, $\Delta w$, and $\Delta r$, respectively.

A simple differentiation of the long-run equilibrium condition gives

$$\theta_L^x w + \theta_k^x r = \Delta P_x,$$

$$\theta_L^z w + \theta_k^z r = \Delta P_z = 0,$$ by assumption.

The notation $\theta_{1m}^i$ denotes the distributive share of factor $i$ in the value of output in industry $m$. For example, $\theta_L^x = \frac{w L_x}{P_x X}$ denotes the distributive share of labor in the value of output in industry $X$. Solving for $\Delta w$ and $\Delta r$ yields

$$\Delta w = \frac{\theta_k^z}{\theta_L^x - \theta_L^z} \Delta P_x,$$

$$\Delta r = -\frac{\theta_L^z}{\theta_L^x - \theta_L^z} \Delta P_x.$$

Since $\theta_L^x < \theta_L^z$, if industry $X$ is more capital intensive than industry $Z$, as $P_x$ increases, $w$ declines and $r$ increases. The direction of change in factor incomes induced by an increase in $P_x$ depends only on the relative factor intensities of $X$ and $Z$: $K$(capital) gains in terms of both goods, and the other factor loses in terms of both goods.
This theory envisions an economy in which factors of production are costlessly and instantaneously mobile between productive activities and emphasizes the effects of differences in relative factor intensities. So this may explain the long-run general equilibrium interaction between factor prices and commodity prices. But in the short-run, some factors may be more or less specific to a given industry at a moment of time. Then, the short-run and long-run determinants of the behavior of factor incomes may be very different. Mayer (1974) and Mussa (1974) consider the effect of a change in relative commodity price on the income of factors of production in a model where capital is treated as a fixed factor that is specific to the industry in which it is used, while labor is assumed to be free to move between industries. A distinguishing feature of this model is that there are two specific factors, capital in X and capital in Z, which are used only in their respective industries, and which are fixed in supply to those industries.

Under the assumption that X is a relatively capital intensive good, the Stolper-Samuelson theorem shows that an increase in the price of X raises the income of capital and lowers that of labor. But under the assumption of short-run specificity of capital, an increase in the price of X affects the income of capital in different industries differently. And the income of labor gains in terms of Z
and loses in terms of \( X \).

(2) The Income of Labor

The labor-market equilibrium condition is given as

\[
L_x^d \left( \frac{w}{P_x}, K_x \right) + L_z^d \left( w, K_z \right) = L,
\]

where \( L_x^d \) and \( L_z^d \) are the labor-demand functions for the two industries (the inverse of the value of marginal product of labor curve).

Differentiation of this relation, holding \( K_x \) and \( K_z \) constant, gives

\[
\hat{w} = n \hat{P}_x,
\]

where

\[
n = \frac{L_x \zeta_x}{L} + \frac{L_z \zeta_z}{L},
\]

and \( \zeta_i \) is the elasticity of demand for labor in industry \( i \).

Since \( \zeta_i = \frac{\sigma_i}{1 - \theta L_i} \),

where \( \sigma_i \) is the elasticity of substitution between labor and capital in industry \( i \) and \( \theta L_i \) is the distributive share of labor in the value of output in industry \( i \),

\[
n = \frac{L_x}{L} \left( \frac{\sigma_x}{1 - \theta L_x} \right)
\]

Since \( 0 < n < 1 \), the percentage increase in the wage rate is positive but less than the percentage increase in \( P_x \). So labor gains in terms of \( Z \) but loses in terms of \( X \).
As \( \sigma_x \) becomes larger and \( \sigma_z \) smaller, the wage rate closely follows the behavior of \( P_x \). As \( \theta_{Lx} \) is larger and \( \theta_{Lz} \) smaller, the same result obtains. So both factor intensity and substitutability affect the responsiveness of the wage rate.

(3) The Income of Specific Capital.

By definition, the income of capital in each sector is given as

\[
Y_{kx} = P_x X - w L_x,
\]

\[
Y_{kz} = Z - w L_z.
\]

Then,

\[
\frac{dY_{kx}}{Y_{kx}} = \frac{1}{\theta_{kx}} \left( 1 - \theta_{Lx} \right) \cdot \hat{P}_x,
\]

\[
\frac{dY_{kz}}{Y_{kz}} = \frac{-1}{\theta_{kz} \theta_{Lz} \cdot \hat{P}_x}
\]

An increase in \( P_x \) increases the income of capital in the X industry and decreases the income of capital in Z. Since \( (1 - \theta_{Lx} \cdot \eta) > \theta_{kx} \), as \( 1 > \theta_{Lx} > 0 \) and \( 1 > \eta > 0 \) by definition, the percentage increase in the income of capital is greater than the percentage increase in commodity price. The greater \( \sigma_x \), the smaller \( \sigma_z \), \( Y_{kx} \) follows more closely the movement of the price \( P_x \).

Also, if \( \eta \) is constant, i.e. given the effect of commodity price changes on the wage rate,

\[
\frac{dY_{kx}}{d\theta_{kx}} = \frac{(1 - \eta)}{(\theta_{kx})^2} \cdot \hat{P}_x, \quad \text{where} \quad \theta_{kx} = 1 - \theta_{Lx}
\]

\[
\frac{dY_{kz}}{d\theta_{kz}} = \frac{-\eta}{(\theta_{kz})^2} \cdot \hat{P}_x, \quad \text{where} \quad \theta_{kz} = 1 - \theta_{Lz}
\]
The greater the intensity of capital in an industry, the more closely the income of that capital mirrors the price of its output (i.e. the greater $\theta_{kx}$, the closer $Y_{kx} / P_x$ is to unity). And the smaller the intensity of capital in a particular industry, the more strongly the income of that capital responds to the price of its output, i.e. a percentage change in the price of its output will result in a greater percentage change in its profit. Therefore, a fall in its commodity price will decrease the profits of firms in less capital intensive industries more. If, in the same industry, capital intensity is systematically different between firms, as Oi(1981) argued, then a fall in its commodity price will decrease the profits of less capital intensive firms by the greatest amount.

(4) The Long-run Adjustment of Capital

In the long-run, capital is mobile between industries and our model reduces to the Stolper-Samuelson model in which the direction of change in factor incomes induced by an increase in $P_x$ depends only on the factor intensities of $X$ and $Z$. If we assume that relative commodity prices are given exogenously under a small country assumption, as capital moves from industry $Z$ to industry $X$, the import share will increase in industry $Z$ and the return on capital in the import sector, $Z$, will increase over time, while the profit rate remains lower in the import sector than in the
non-traded or export sectors. This shows how important consideration of domestic industry adjustments is for the relationship between the change in import share and change in profit over time. During the adjustment period, profit is positively related to import growth, while the initial impact of import growth on profit is negative.

B. Implications for Empirical Work

Our model shows that in the short-run, where capital is fixed in each industry, a fall in a commodity price decreases the income of capital. Profit measured in terms of the income of capital is negatively affected by any change in market conditions which has an adverse effect on the relative price of its output. Therefore, we will explore the empirical linkage between sales growth, import growth, and domestic industry profitability, to explain how import competition affects a domestic industry profitability.

One of the obvious changes in market conditions which would adversely affect the relative price of a domestic industry's product is a slow or negative growth in demand. A decrease in demand is likely to cause a decrease in equilibrium price, in the short-run. In the long-run, a domestic industry adjusts to slow or negative growth in demand for its output by adjusting the capital stock of the industry downward. However, the relative fixity of capital
will cause the adjustment to the ultimate equilibrium to take place more or less slowly. Consequently, the return on capital remains below equilibrium until the new equilibrium is attained. Therefore, the return on capital is higher in an industry which experienced a rapid increase in sales, and lower in an industry which experienced a slower or negative growth in sales. Then, we can formulate the following hypothesis.

Hypothesis 1: The profitability is lower in industries which experienced slow or negative sales growth. (Table 2)

Import competition is an alternative source of supply which affects the demand for a domestic industry's output. Import competition constrains the growth in sales of a domestic industry and displaces a domestic industry's sales if the domestic market does not grow. Therefore, it is plausible to assume that import growth negatively affects the sales growth of a domestic industry, if other things are equal.

Import growth affects the sales growth of a domestic industry negatively, given the growth in domestic market for the commodity. (Table 3)

Then, from the above two relations, we deduce the next hypothesis.
Hypothesis 2: Profitability is lower in industries which experienced rapid growth in import share. (Table 4)

Next, we consider why there was no profitability effect over time, i.e., why the rapid growth in import share did not decrease the profitability of import competing industries in 1972 compared with that in 1967. One major change in the international trade environment between 1967 and 1972 was the implementation of the Kennedy Round tariff cuts, which were accompanied by a rapid increase in the import share in the U.S. manufacturing sector. Marvel and Bay (1983) argued that due to political influences tariff cuts did not significantly affect the U.S. import structure. If a similar argument can be made for foreign country tariff cuts, the U.S. export structure would not have changed much either. Then, we may assume that domestic industry's response was based on the expectation that the same import and export structure would prevail but the volume of trade would increase. This may imply that industries faced with significant import competition would have more readily adjusted. Even if import growth initially occurs due to a shift in the foreign supply curve and negatively affects the price of a domestic industry's output, it does not imply that a domestic industry's profitability deteriorates as import growth continues. Profits in the import sector may improve over time if
capital adjustment is sufficiently rapid, despite continuing import growth. This may be one of the reason why the rapid growth in import share between 1967 and 1972 did not decrease the profit rate measured in terms of the ratio, OH/GBV, in the import sector. Since the adjustment of capital stock to the long-run equilibrium position takes place more or less slowly, the return on capital in the declining sector remains below the equilibrium until the new long-run equilibrium is attained. However, our discussion of the long-run adjustment of capital shows that, during the adjustment period, the growth in capital stock is slower but the change in profit rate is not necessarily negative in the import sector. If there was no negative profitability effect of import growth over time, we suspect that capital stock growth might have been slower relative to sales growth in the import sector. Therefore, we propose a hypothesis that import competing industries over time adjusted downward their capital stock, responding to the signal of lower profitability.

Hypothesis 3: Given the growth in sales of a domestic industry, the growth in capital stock was slower in the import competing sector. 

(Table 5)
CHAPTER IV

THE EFFECT OF IMPORT COMPETITION ON
DOMESTIC INDUSTRIES - AN EMPIRICAL ANALYSIS

This chapter presents the result of an empirical test of several hypotheses developed in the previous chapter. Most cross-sectional studies of the relationship between a domestic industry's profitability and trade flows show that imports negatively affect a domestic industry's profitability. However, they do not readily explain why the same relationship was not observed over time, i.e. why the rapid growth in import share did not decrease the profitability of import competing industries in 1972 compared with that in 1967. We proposed a set of hypotheses which provide a more coherent explanation of why import competition negatively affects a domestic industry's profitability and why there was no profitability effect over time, based on capital stock adjustment of a domestic industry to fluctuations in demand. We, first, investigate empirically the linkage between sales growth, import growth, and domestic industry profitability. We hypothesized that profitability is lower in industries which experienced slower or negative sales growth. As is

For variable definitions, see Appendix A.

-32-
shown in Table 2, cross-section regression of profit on industrial characteristics and sales growth for 1972 confirms that relationship. The data used were obtained from the Census of Manufactures for 1967 and 1972 and the estimation method employed was ordinary least squares. The specification of the estimated equation is similar to Marvel (1980). The dependent variable is the overhead cost or capital share. The overhead cost or capital share is defined as value added less total labor cost. Then, one of the most important determinants of capital share is the stock of physical capital (GBV). Holding the amount of capital stock constant, capital share will be higher if profitability is higher. In addition to the stock of physical capital (GBV), the value of inventory (INV), central administration payrolls (CAC), consumption goods ratio (CONS), and advertising sales ratio (AS) were included as explanatory variables to capture their role as capital components or rent yielding assets. The four firm concentration ratio (C4) and the number of companies (NO) were included to capture the effect of market structure. The growth in sales variable has a significant and positive effect. The profitability was lower in a domestic industry which experienced slower or negative growth in sales.

The next step of our investigation is what determines the sales growth of a domestic industry, if profitability is higher in industries which experienced a rapid growth in
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.2628</td>
<td>1.33</td>
</tr>
<tr>
<td>Four Firm Concentration Ratio</td>
<td>0.0053</td>
<td>3.46</td>
</tr>
<tr>
<td>Consumption Goods Ratio</td>
<td>0.2822</td>
<td>4.90</td>
</tr>
<tr>
<td>Log of Central Administration Payroll</td>
<td>0.1752</td>
<td>5.77</td>
</tr>
<tr>
<td>Log of Year End Inventory</td>
<td>0.2634</td>
<td>8.40</td>
</tr>
<tr>
<td>Log of Gross Book Value of Depreciable Assets</td>
<td>0.4200</td>
<td>12.60</td>
</tr>
<tr>
<td>Advertising Sales Ratio</td>
<td>2.9644</td>
<td>4.21</td>
</tr>
<tr>
<td>Log Number of Companies in the Industry</td>
<td>0.1812</td>
<td>7.24</td>
</tr>
<tr>
<td>Growth in Sales (1967 - 1972)</td>
<td>0.2071</td>
<td>3.73</td>
</tr>
<tr>
<td>R-square</td>
<td>0.9168</td>
<td></td>
</tr>
<tr>
<td>F value</td>
<td>417.2</td>
<td></td>
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</table>

\[\text{note}\]

1) Absolute value of t-ratios is in parenthesis.
2) Number of industries equals 312.
3) Dependent variable is log of overhead cost, where overhead cost is defined as Value Added - Total Payroll - Other Employer Payments.
4) For variable definition, see Appendix A.
sales. One of the most important determinants of the sales growth of a domestic industry is an increase in demand for its product. An increase in demand for a commodity is presumably affected by changes in income, prices of substitutes and complementary goods, and various elasticities. It will also be affected by the import growth, given the growth in the domestic market for the commodity. In Table 3, we examine an intuitively plausible hypothesis that, given the growth in the domestic market, the growth in sales is negatively affected by the growth in import share. One practical problem with an empirical investigation of this hypothesis is how to measure the growth in the domestic market for the product. We constructed a measure of the growth in the domestic market for each industry from the Input-Output Tables for major industries for 1967 and 1972, based on the growth in customer industries. Assuming that an industry was able to sell the same proportion of its output to other industries in 1972 as it did in 1967, the growth in each customer industry represents the growth in the domestic market demand for the output of the industry under consideration.

---

3 One may argue that the growth in the sales of a domestic industry increases import share. As Caves (1974) argues, foreign suppliers have established markets elsewhere. Then, import demand in domestic market is residual demand to them and the supply elasticity of import tends to be higher than that of domestic suppliers. Therefore, an increase in domestic demand will bring about an increase in both sales of a domestic industry and import share.
<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>T-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.072</td>
<td>1.536</td>
</tr>
<tr>
<td>Growth in Domestic Market</td>
<td>0.754</td>
<td>6.426</td>
</tr>
<tr>
<td>Growth in Import Share</td>
<td>-0.779</td>
<td>5.279</td>
</tr>
<tr>
<td>R-square</td>
<td>0.181</td>
<td></td>
</tr>
<tr>
<td>F-value</td>
<td>32.25</td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>294</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) Absolute values of t-ratios are in parenthesis.
2) Dependent variable is percentage growth in the value of shipment of domestic industry.
3) For the construction of the growth in domestic market demand, see the text.
The result reported in Table 3 shows that the growth in sales of a domestic industry is positively affected by the growth in the domestic market and negatively affected by the increase in import share, as expected. The coefficient estimates for both variables are statistically significant. Then, it is not surprising that the growth in import share negatively affects a domestic industry's profitability for 1972, as reported in Table 4. Profitability is lower in industries which experienced a rapid growth in import share.

Theoretical analysis in the previous chapter suggests that the negative effect of import growth on the profitability of a domestic industry will be stronger in labor intensive industries than in capital intensive industries. We examine whether labor intensity causes differential effect of import growth on the profitability of a domestic industry, using the interactive dummy variable technique. We define $D_1=1$ if the labor intensity of the industry is above the average of the manufacturing sector as a whole, and $D_1=0$, otherwise. If the negative effect of import growth on the profitability of a domestic

However, I treated the import growth as exogenous to the growth in the sales of a domestic industry between 1967 and 1972, because we can reasonably assume that the Kennedy Round tariff cuts shifted the foreign supply curve to the right, and consequently, resulted in the increase in import share.
industry is stronger in labor intensive industries, the coefficient of the interactive term, $D1 \times CH\_IMP$ (Growth in Import Share), will be negative. The result in equation (2) of Table 4 shows that the coefficient estimate of the interactive term, $D1 \times CH\_IMP$, is negative but statistically insignificant. The result reported in Table 2A (in Appendix) also shows that the effect of sales growth on the profitability of a domestic industry is not significantly different in labor intensive industries than in industries in general. Then, one may suspect that the speed of capital stock adjustment to fluctuations in demand may be different across industries, because our model predicts that demand fluctuation affects the income of capital in labor intensive industries more strongly when the speed of adjustment is uniformly zero. In the next chapter, we investigate some factors which affect the speed of adjustment of capital stock of a domestic industry to demand fluctuation.

We established the empirical linkage between sales growth, import growth, and profitability of a domestic industry. Profits tend to be lower in industries which experienced slow or negative growth in sales. A rapid

4 I focus on the speed of adjustment as a function of industry specific versus aggregate economic phenomenon. I have not developed an explicit test of the differential effect of import on slow versus fast speed of adjustment industries.
Table 4. Determinants of Industry Profitability in 1972

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-value</th>
<th>Coefficient</th>
<th>T-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.4598</td>
<td>2.21</td>
<td>-.3358</td>
<td>1.66</td>
</tr>
<tr>
<td>Four Firm Concentration Ratio</td>
<td>0.0051</td>
<td>3.38</td>
<td>0.0047</td>
<td>3.28</td>
</tr>
<tr>
<td>Consumption Goods Ratio</td>
<td>0.3405</td>
<td>5.52</td>
<td>0.3238</td>
<td>5.29</td>
</tr>
<tr>
<td>Log of Central Administration Payroll</td>
<td>0.1918</td>
<td>6.60</td>
<td>0.1806</td>
<td>6.41</td>
</tr>
<tr>
<td>Log of Year End Inventory</td>
<td>0.2368</td>
<td>7.35</td>
<td>0.2671</td>
<td>8.43</td>
</tr>
<tr>
<td>Log of Gross Book Value of Depreciable Assets</td>
<td>0.4401</td>
<td>13.11</td>
<td>0.4047</td>
<td>12.22</td>
</tr>
<tr>
<td>Advertising Sales Ratio</td>
<td>3.2043</td>
<td>4.40</td>
<td>2.3366</td>
<td>3.23</td>
</tr>
<tr>
<td>Log Number of Companies in the Industry</td>
<td>0.1628</td>
<td>6.45</td>
<td>0.1910</td>
<td>7.61</td>
</tr>
<tr>
<td>Growth in Domestic Market</td>
<td>0.9089</td>
<td>3.68</td>
<td>0.7971</td>
<td>3.33</td>
</tr>
<tr>
<td>Changes in Import Share (1967 - 1972)</td>
<td>-0.7403</td>
<td>2.74</td>
<td>-0.6269</td>
<td>2.07</td>
</tr>
<tr>
<td>D1* CH_IMP</td>
<td>-0.3316</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>-0.2042</td>
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<td></td>
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</tr>
<tr>
<td>R-square</td>
<td>0.9244</td>
<td></td>
<td>0.9303</td>
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<tr>
<td>F value</td>
<td>385.85</td>
<td></td>
<td>342.05</td>
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</table>

Note: 1) Absolute value of t-ratios is in parenthesis.
2) Number of industries equals 294.
3) Dependent variable is log of overhead cost, where overhead cost is defined as Value Added - Total Payroll - Other Employer Payments.
4) For variable definition, see Appendix A.
5) CH_IMP is change in import share (1967-1972).
6) D1 = 1 if labor intensity > .4655, which is the average for the manufacturing.
    = 0 otherwise.
growth in import share negatively affects the growth in the sales of a domestic industry and is induced by high profits. Therefore, profits tend to be lower in industries which experienced a rapid growth in import share, irrespective of market structure.

While most cross-sectional studies have shown that import competition negatively affects a domestic industry's profitability, the increase in import share between 1967 and 1972 did not seem to have negatively affected the profitability of the import sector. Table 1 shows that the profit rate measured in terms of the ratio OH/GBV increased in the import sector while it fell in the export sector. In the previous chapter, we proposed a hypothesis which is closely related to the profitability effect of import competition. The negative effect of imports on a domestic industry's profitability in a cross-sectional study provides a signal for domestic resource reallocation over time and domestic industries will respond to it. During the adjustment period, the capital stock growth is slower but the change in profit rate is not necessarily negative in the import sector. We examine this hypothesis that import competing industries adjusted their capital stock downward between 1967 and 1972, responding to the signal of lower profitability.

A glance at Table 1 indicates that there is evidence of
the domestic industry's response to import competition in the import sector. While the growth in the value of shipment in the import sector was above the average of the manufacturing sector, the growth in capital stock was far below the average for the manufacturing sector. Also the average number of firms in the industry increased in the manufacturing sector as a whole between 1967 and 1972, but fell from 1322 in 1967 to 1316 in 1972 in the import sector. Depressed profitability in the import competing sector decreased capital stock growth and discouraged new firms from entering the industry while encouraging existing firms to leave. Therefore, the growth in both capital stock and the number of firms in the import sector was slower relative to the growth in sales.

Table 5 presents the result of a regression analysis of the growth in capital stock for the U.S. manufacturing industries between 1967 and 1972. While the investment literature emphasizes various cost factors in business investment from the theoretical considerations, most empirical investment studies show that the growth in sales is the most important determinant of capital stock growth (Eisner (1978)). Higher profitability will also positively affect capital stock growth, reflecting resource allocational effect of profits. Firms in highly profitable industries will expand faster. Higher profitability will induce more new firms to enter the industry. Equation (1)
in Table 5 shows that coefficient estimates for both the sales growth and profitability variables are positive and statistically significant.

In equation (2) we examine whether capital stock growth in the import sector was slower relative to sales growth than in the rest of the manufacturing sector. We test this hypothesis by using an interactive specification. If domestic industries adjusted their capital stock to the growth in sales at the same speed, the coefficient of the growth in sales will be the same across industries. If the growth in capital stock was slower relative to the growth in sales in the import sector, the coefficient estimate of the interactive term, PCH_VS * IMP67, will be negative. The result reported in Equation (2) of Table 5 shows that the coefficient estimate of the interactive term, PCH_VS * IMP67, is indeed negative and statistically significant. Capital stock growth was slower in import competing industries, given the growth in sales.
Table 5  
**Growth in Capital Stock**  
(1967-1972)

<table>
<thead>
<tr>
<th>Equation</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constant</strong></td>
<td>-0.02215</td>
<td>-0.02132</td>
</tr>
<tr>
<td>(0.65)</td>
<td>(0.63)</td>
<td></td>
</tr>
<tr>
<td><strong>PCH_D (Growth in Sales)</strong></td>
<td>0.91037</td>
<td>0.9590</td>
</tr>
<tr>
<td>(20.14)</td>
<td>(17.48)</td>
<td></td>
</tr>
<tr>
<td><strong>PCH_D * IMP67</strong></td>
<td></td>
<td>-0.8590</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.43)</td>
</tr>
<tr>
<td><strong>PCH_D * EXP67</strong></td>
<td></td>
<td>0.0766</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.14)</td>
</tr>
<tr>
<td><strong>PI67 (Profitability in 1967)</strong></td>
<td>0.12053</td>
<td>0.1145</td>
</tr>
<tr>
<td></td>
<td>(3.62)</td>
<td>(3.45)</td>
</tr>
<tr>
<td><strong>R-Square</strong></td>
<td>0.5818</td>
<td>0.5901</td>
</tr>
<tr>
<td><strong>F-value</strong></td>
<td>214.9</td>
<td>110.51</td>
</tr>
<tr>
<td><strong>Sample Size</strong></td>
<td>312</td>
<td>312</td>
</tr>
</tbody>
</table>

Note 1) Absolute value of t-ratio is in parenthesis.  
2) Dependent variable is the percentage change in capital stock.
CHAPTER V

THE SPEED OF ADJUSTMENT AND GOVERNMENT POLICY

In the previous chapter, we have examined what influence import competition exerts on a domestic industry and how a domestic industry adjusted to import competition. We established an empirical linkage between sales growth, import growth, and domestic industry profitability. A domestic industry's adjustment to import competition is essentially its adjustment to the fluctuation of industry demand. The speed of adjustment of capital stock to demand fluctuation is not instantaneous so relative contraction in industry demand from import competition results in lower profitability. The lower profitability, on the other hand, provides a signal for domestic industry adjustment over time. We showed that import competing industries over time adjusted downward their capital stock, responding to the signal of lower profitability.

The speed of adjustment of capital stock of domestic industries to demand fluctuation may be different across industries and over time. A decrease in demand due to import competition will be more strongly reflected by a decline in the profit (or an increase in idle capacity) of existing firms in slow adjusting industries than a decrease
in capital stock. If the speed of adjustment of capital stock is sufficiently slow (or the adjustment cost of domestic industries to import competition is extremely large), it could mitigate welfare gains from import liberalization. Government intervention, if costless, might be rationalized to alleviate the adjustment problems of domestic industries. In this chapter, we investigate what factors affect the speed of adjustment of a domestic industry to fluctuations in demand. This should permit a more informed tariff reduction policy in the future, one that could focus cuts on industries that can most efficiently and quickly adjust to greater import competition. This chapter proceeds as follows: We discuss what would be an optimal tariff cut policy if the speed of adjustment of domestic industries to demand fluctuation is different across industries and over time. Then, we consider two specific hypotheses concerning the speed of adjustment of a domestic industry and proceed to examine whether these factors actually affected the speed of adjustment of a domestic industry to the fluctuation of demand as hypothesized.

1. Planner's Problem

We can pose our problem in the following way: Opening up trade or liberalization of imports improves social welfare through a more efficient allocation of resources. However, the welfare gains from import liberalization are
mitigated by the costs involved with the reallocation of resources. What can government do to maximize the net welfare gain? Specifically, assume that, after an international tariff negotiation, governments agree upon some given percentage cuts in average tariff within a given period of time. Then, the domestic government has to decide upon the magnitude of the tariff cuts for each industry and the timing of those cuts. If the private sector has rational expectations, an industry's speed of adjustment of capital to changes in demand for its output will ultimately depend upon the cost of capital reallocation of the industry. If there is no difference in the speed of adjustment across industries, uniform tariff cuts for all industries would be implemented. However, if there is a sufficient difference across industries, uniform tariff cuts may not be optimal. Correspondingly, if there is a difference in the speed of adjustment over time, it may be productive to time the implementation of tariff cuts for a high speed of adjustment period.

The speed of adjustment has implications pertaining to what government should do, if anything, to alleviate a domestic industry's adjustment problems, while pursuing welfare gains from more liberalized international trade. The consideration of timing of tariff cuts is related to whether industry specific relief measures such as tariff and non-tariff protection are preferred to other measures,
to alleviate a domestic industry's adjustment problems. Tariff and non-tariff protection may reduce the adjustment costs associated with reallocation of resources, in its most justifiable case, but it invariably distorts the relative price structure and results in misallocation of resources. Furthermore, once tariffs are set, it is politically difficult to repeal existing tariffs even if they are no longer justified. Then, an economywide stabilization policy may be preferred, if it increases the speed of capital stock reallocation across industries and reduces adjustment costs of the import competing industries.

2. Demand Fluctuation and the Speed of Adjustment

In this section, we will investigate whether there are differences in the speed of adjustment of capital stock to the fluctuation of demand across industries and over time. Specifically, we investigate an important policy issue of whether the speed of adjustment of a domestic industry to demand fluctuation is significantly lower i) when the industry is depressed, and ii) when the economy as a whole is depressed.

The first hypothesis is that an already depressed industry will find it more difficult to adjust to a decline in demand due to more intense import competition than a less depressed industry (specificity argument). An
economic rationale underlying this hypothesis is that the specificity of capital plays an important role in the long-run adjustment. It may be more costly to adapt more specialized capital for other uses. As a greater proportion of the capital stock is unemployed, the proportion of specialized capital to total unemployed capital increases, resulting in an increase in the per unit cost of capital movement. If this argument is correct, what government should do to minimize adjustment costs is to control the rate of release of these specialized resources that would be more costly to move elsewhere in the economy. Therefore, tariff cuts should be less for an already depressed industry.

The second hypothesis is that a domestic industry will more easily adjust to a decline in demand for its output when there is cyclically high demand elsewhere in the economy (cyclical argument). Even if the rate of resource movement is independent of the unemployment rate of the resource across industries, it can be shown that it is productive to time the release of excess resources for cyclically high demand elsewhere in the economy if transfer rates are higher in such periods (Parsons, 1980). One implication of this hypothesis is that the government should not control the rate of release of resources in contracting industries but increase the rate of absorption of resources elsewhere in the economy, if possible.
Empirical Procedures and Results

As we have seen in section 1, the optimal plan for trade liberalization will depend on the shape of the capital stock adjustment function. We will attempt to obtain the estimate of factors which would affect the speed of adjustment of capital stock of each industry. Business firms adjust to changes in economic environment by adjusting their use of factors of production, one of which is capital stock. The investment literature suggests two major elements in the explanation of capital stock adjustment: output and price of final product, and prices of factors of production. If product price and factor cost elasticities of investment demand are low, or if the relevant relative price movements are small, we may expect movements of investment to be dominated by changes in final demand (Eisner, 1978). If the speed of adjustment of capital stock to demand fluctuation is constant, the simple form of capital stock adjustment function can be presented as

\[ \text{PCH}_K(t) = a_c + a_1 \text{PCH}_D(t) + a_2 \text{PI}(t-1), \]

where \( \text{PCH}_K(t) \) is percentage change in capital stock,
\( \text{PCH}_D(t) \) is percentage change in demand,
\( \text{PI}(t-1) \) is profit rate in the previous period.

Profit rate in the previous period, \( \text{PI}(t-1) \), represents a lagged adjustment of capital stock to demand fluctuation. Since capital stock adjustment is not instantaneous,
incomplete adjustment of capital stock to demand fluctuation in the previous period is reflected in changes in the profit rate, $\pi_t$. Higher or lower profit rate, in turn, brings about upward or downward capital stock adjustment in the next period.

Our discussion in the previous section indicates the importance of determining whether the speed of adjustment, $a$, is constant over varying economic conditions. The speed of adjustment of capital stock presumably depends upon the relative costs of faster and slower adjustment. Eisner (1978) suggested that higher profits make possible more rapid increases in capital stock when those are in order, since the cost of relatively large acquisition of outside funds would slow down spending, particularly if low profits occasion not only shortages of internal funds but also difficulty in raising funds outside. One may expect that more profitable firms expand faster in growing industries. This consideration suggests that higher profit rates are associated with faster increase in capital stock in response to more rapidly rising demand. The specificity argument assumes similar role of profit rates in the speed of adjustment of capital stock to falling demand. It argues that depressed industries would find it more difficult to adjust their capital stock downward to falling demand than less depressed industries. The cyclical argument assumes that the speed of capital stock adjustment
to demand fluctuation will be faster if the level of general economic activity in the whole economy is higher. Then, the speed of adjustment, \( a_1 \), can be represented as

\[
a_1 = b_0 + b_1 \text{PI}(t-1) + b_2 \text{PCH}_\text{MFG}(t),
\]

where \( \text{PCH}_\text{MFG} \) is demand growth in the manufacturing sector as a whole.

Since we are interested in the speed of adjustment of capital stock to downward fluctuation, we want to make the distinction between the speed of adjustment to rising demand and to falling demand. Therefore, we specify a separate coefficient for the speed of adjustment to rising and falling demand, using a dummy variable for each case.

\[
a_1 = b_0 + b_1 \text{PI}(t-1) \cdot \text{D}(+) + b_2 \text{PI}(t-1) \cdot \text{D}(-) + b_3 \text{PCH}_\text{MFG} \cdot \text{D}(+) + b_4 \text{PCH}_\text{MFG} \cdot \text{D}(-),
\]

where \( \text{D}(+) = 1 \) if demand is increasing

\[
D(-) = 1 \text{ if demand is decreasing}
\]

For the specificity argument for government protection to hold, \( b_2 > 0 \); for the cyclical argument, \( b_4 > 0 \). We substitute two variants of the equation for \( a \) into the capital stock adjustment equation and estimate two variants of the full equation.

The data used for estimation were obtained from the Annual Survey of Manufactures from 1972 and 1977. Demand growth, \( \text{PCH}_D \), is measured by the annual percentage growth
in value added (VA). Profit rate, PI, is measured by OH/K, where OH is the overhead cost or capital share and K is value of physical assets. Capital share is obtained by value added (VA) less total labor cost. Since this measure varies across industries due to the exclusion of other rent-yielding assets, we used the value expressed in the ratio to its average for 1970-1972, to purge industry specific measurement bias from PI. The estimation technique employed is the dummy variable method of the pooled cross-section of time-series model. The results of the dummy variable estimate of the capital stock adjustment function for the 273 manufacturing industries during 1973 and 1977 are reported in Table 6.

The first equation estimated assumes that the role of profits and the level of general economic activity in the speed of adjustment of capital stock is symmetric in both rising and falling demand. The second equation estimates separate coefficients of the speed of adjustment to rising and falling demand. The results in Table 6 indicate that the speed of adjustment of capital stock to demand fluctuation is different over varying economic conditions. Equation 1 shows that both higher profit rates and a higher level of general economic activity are associated with rapid capital stock adjustment to demand fluctuation. Coefficient estimates for both interactive terms, PI with PCH_D and PCH_MFG with PCH_D, are positive and
Table 6
Speed of Capital Stock Adjustment
(1973-1977)

<table>
<thead>
<tr>
<th>Equation</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCH_D</td>
<td>0.2324</td>
<td>0.2521</td>
</tr>
<tr>
<td></td>
<td>(5.75)</td>
<td>(6.07)</td>
</tr>
<tr>
<td>PI(t-1) * PCH_D</td>
<td>0.2757</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(13.78)</td>
<td></td>
</tr>
<tr>
<td>PI(t-1) * PCH_D * D(+)</td>
<td></td>
<td>0.3056</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.76)</td>
</tr>
<tr>
<td>PI(t-1) * PCH_D * D(-)</td>
<td></td>
<td>0.1166</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.59)</td>
</tr>
<tr>
<td>PCH_MFG * PCH_D</td>
<td>0.8855</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.67)</td>
<td></td>
</tr>
<tr>
<td>PCH_MFG * PCH_D * D(+)</td>
<td></td>
<td>0.7619</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.13)</td>
</tr>
<tr>
<td>PCH_MFG * PCH_D * D(-)</td>
<td></td>
<td>1.4334</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.36)</td>
</tr>
<tr>
<td>PI(t-1)</td>
<td>0.2119</td>
<td>0.1960</td>
</tr>
<tr>
<td></td>
<td>(16.78)</td>
<td>(11.25)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.3058</td>
<td>0.3092</td>
</tr>
<tr>
<td>F-value</td>
<td>149.87</td>
<td>101.38</td>
</tr>
<tr>
<td>Sample Size</td>
<td>273</td>
<td>273</td>
</tr>
</tbody>
</table>

Note 1) Absolute value of t-ratio is in parenthesis.
2) Estimation method used is the dummy variable method of the pooled cross-section of time-series model.
3) Dependent variable is percentage change in capital stock.
4) PCH_D is industry demand growth measured by value added.
5) PI(t) is profitability measure.
6) PCH_MFG is demand growth for the manufacturing sector as a whole.
7) D(+) = 1, if industry demand growth is positive = 0, otherwise.
8) D(-) = 1, if industry demand growth is negative = 0, otherwise.
statistically significant at the 5% level. However, when we separate out the situations of rising and falling demand, the role of profits on the speed of adjustment of capital stock turns out to be significant only in rising demand (Equation (2)). Although the coefficient estimate of the interactive term, PI with PCH_D, to falling demand remains positive, it is not statistically significant. The effect of profits on the speed of downward adjustment of capital stock to falling demand is not significant. This indicates that high profit industries adjust their capital stock more rapidly to rising demand but not necessarily to falling demand. Our result does not support the hypothesis that downward adjustment of capital stock is slower in depressed industries than in less depressed industries. It indicates that depressed industries as a group during the period did not seem to have significantly different adjustment problems than industries in general.5

The cyclical argument assumes that the speed of downward adjustment of capital stock to falling demand of an

5 Although I named the first hypothesis the specificity hypothesis, the only industry specific effect I considered is the interaction of profitability and demand. Therefore, our results do not necessarily imply that there is no industry specific adjustment problem. Presumably, industries which use specialized capital equipment more heavily tend to have slower speed of adjustment. If more specialized equipment is used to substitute for skilled labor, low-skill industry may have slower speed of adjustment of capital stock.
industry is faster during the cyclical boom period for the economy as a whole. On the other hand, equation (2) in Table 6 shows that the effect of the level of general economic activity on the speed of adjustment, the interactive term PCH_MPG * PCH_D, continues to be positive and statistically significant in both rising and falling demand. This indicates that the speed of capital stock adjustment to falling and rising demand is faster when the economy as a whole is growing faster (or in cyclical boom).

Our results for the effect of profits on the speed of adjustment of capital stock are consistent with the results obtained by Eisner (1978). Based on the individual firm level data, he reports that "higher ratios of gross profits are associated with faster increases in capital expenditure in response to more rapidly rising sale. ... the gross profits ratio has little to do with capital expenditures in the case of declining sale." Our result for cyclical effect is consistent with the findings for labor transfer by Parsons (1980). He found that transfer rate of unemployed workers to other industries was higher in cyclical boom periods. Our result shows that the speed of capital stock reallocation between industries is also higher in cyclical boom periods.

We have investigated empirically the speed of adjustment of capital stock to demand fluctuation. We examined two
hypotheses concerning the speed of adjustment which recommend two different tariff reduction policies. If lower profit industries find it difficult to adjust their capital stock downward to falling demand and high profit industries can adjust faster, the government may focus tariff cuts on high profit industries and continue to protect depressed industries. If a higher level of general business activity in the economy as a whole increases the speed of downward capital stock adjustment to falling demand, the government may time the implementation of tariff cuts for cyclical boom periods. Our empirical results for the capital stock adjustment function over the period 1973-1977 support the latter hypothesis but not the former one. The speed of adjustment of capital stock to falling demand was not significantly affected by the profit rate of each industry. On the other hand, the speed of adjustment of the capital stock to demand fluctuation was positively and statistically significantly affected by the growth rate in demand for the manufacturing sector as a whole. In this context, it is not surprising that the most dramatic increase in protectionist pressure in the post-World War II accompanied the world economic slowdown beginning in 1974.
CHAPTER VI

SUMMARY OF FINDINGS AND CONCLUSION

We examined what influence import competition has on a domestic industry and how a domestic industry adjusted to it. We examined a set of hypotheses which provide a systematic explanation of the impact of import competition on domestic industry, based on the capital stock adjustment of a domestic industry to fluctuations in demand. We viewed import competition as a constraint to the growth in demand for a domestic industry's output. A rapid increase in import share negatively affects the growth in the sales of a domestic industry. Therefore, a domestic industry's adjustment to import competition is essentially its adjustment to demand fluctuations. A domestic industry adjusts to changes in market conditions including slow or negative growth in demand for its output resulting from a rapid increase in import share. However, the relative fixity of various factors of production makes the adjustment to the ultimate equilibrium take place more or less slowly. Then, the income of factors of production in the declining sector remains below the equilibrium rate until the new long-run equilibrium is attained. Lower profitability in the declining sector, on the other hand, provides a signal for downward adjustment of capital stock...
in that sector. During the adjustment period, the growth in capital stock is slower but the changes in profit is not necessarily negative in the declining sector.

Following the presentation of a two sector model, which describes the adjustment of capital stock in both sectors, we examined empirically a set of hypotheses, using the U.S. manufacturing industry data between 1967 and 1972. Our results confirmed the empirical linkage between sales growth, import growth, and domestic industry profitability. Industry profitability was lower in industries which experienced slower or negative growth in sales. The growth in import share negatively affected the growth in sales of domestic industries, given the growth in domestic market. Consequently, profitability was lower in industries which experienced a rapid growth in import share. We also found that capital stock growth was indeed slower relative to sales growth in import competing industries. It reflects downward capital stock adjustment in those industries, responding to the signal of lower profitability. This explains why a rapid growth in import share did not decrease the profitability of import competing industries between 1967 and 1972, contrary to the findings of cross-sectional studies. To the extent that domestic industries adjust their capital stock downward rapidly in response to slow growth in sales, profitability does not decrease over time in the import sector.
Then, a natural question arises, i.e. what determines the speed of adjustment of a domestic industry to fluctuations in demand. This has important implication pertaining to what government should do, if anything, to alleviate adjustment problems of domestic industries, while pursuing welfare gains from liberalization of international trade. We considered two specific hypotheses concerning the speed of adjustment, i.e. 1) does an already depressed industry find it more difficult to adjust to downward fluctuation in demand than industries in general? and 2) Does an industry find it easier to adjust to downward fluctuation in the demand for its output when the aggregate economy is growing rapidly? We investigated empirically whether these factors had significant effect on the speed of adjustment of domestic industries, using the U.S. manufacturing data for the period of 1973 and 1977. Our results supported the latter hypothesis but not the former one, which is consistent with the result obtained for labor transfer by Parsons (1980). In this context, it is not surprising that the most dramatic increase in protectionist pressures in the post-world war II period accompanied the world economic slowdown beginning in 1974. Then, it is recommended that government time tariff cuts for cyclical boom periods during which the resources released from the declining sector can be more readily absorbed by the rest of the economy.
REFERENCES


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A. DATA APPENDIX

- Definition of Variables and Data Source

ADC = Apparent Domestic Consumption, which is the sum of the Value of Shipment and Import less Export.

AHE = Average Hourly Earning of Production Workers. Calculated from Production Worker Payroll/Production Man Hour from Census of Manufactures.

AS = Advertising Sales ratio from Input-Output Table.

CAO = Central Administration Payrolls from Enterprise Statistics

CAPINT = A measure of capital intensity. Calculated from GBV/VA.

CONS = Consumption Goods Ratio. Output attributed to Personal Consumption Expenditure divided by Total Commodity Output from the Input-Output Table.

C4 = Four Firm Domestic Concentration Ratio by the Value of Shipment from Census of Manufactures.

EXP = Export divided by the Value of Shipment. Export data from the U.S. Commodity Exports and Imports as Related to Output.

GBV = Gross Book Value of Depreciable Assets from Annual Survey of Manufactures.

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Most of the data were kindly provided by Professors Marvel, Parsons, and Ray.
GDI = Geographic Dispersion Index to measure the geographic concentration of production of an industry. Calculated by using the procedure by Collins and Preston (1968).

\[ GDI = \sum_{i} \left( \frac{S_i}{P_i} \right) \]

where \( S \) and \( P \) are the proportion of output originated from and the proportion of population in each of four Census regions, respectively.

IMP = Import divided by the Apparent Domestic Consumption, which is the sum of Value of Shipment and Import less Export. For data source, see EXP.

INV = Value of Inventory at the end of each year. The sum of the Value of Raw Material, Work in Progress, and Finalized Products from Annual Survey of Manufactures.

LABINT = A measure of Labor Intensity, Production Worker Payroll/Value Added.

MGMT = A measure capturing the importance of management function. Calculated from \((\text{CAO} + \text{TPA} - \text{PPA})/\text{CAO} + \text{TPA})\).


NO = Number of Companies in the industry from Census of Manufactures.

NTBUS = An index of the incidence of Non-Tariff Barriers in the U.S. Available from the U.S. ITC Data Bank.
OH = Contribution to Overhead, a measure of Profit. Calculated from Value Added - Total Payroll (TPA) - Other Employer Payments.

PPA = Production Worker Payroll from Census of Manufactures.

SKLPC = Proportion of Skilled Workers in total industry employment in 1970.

TARIFF = Calculated from Duties collected/Import.

TPA = Total Payroll from Census of Manufactures.

VA = Value Added in million dollars from Census of Manufactures.

VS = Value of Shipment in million dollars from Census of Manufactures.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.1231</td>
<td>(0.64)</td>
</tr>
<tr>
<td>Four Firm Concentration Ratio</td>
<td>0.0048</td>
<td>(3.33)</td>
</tr>
<tr>
<td>Consumption Goods Ratio</td>
<td>0.2530</td>
<td>(4.60)</td>
</tr>
<tr>
<td>Log of Central Administration Payroll</td>
<td>0.1683</td>
<td>(5.84)</td>
</tr>
<tr>
<td>Log of Year End Inventory</td>
<td>0.2960</td>
<td>(9.78)</td>
</tr>
<tr>
<td>Log of Gross Book Value of Depreciable Assets</td>
<td>0.3752</td>
<td>(11.52)</td>
</tr>
<tr>
<td>Advertising Sales Ratio</td>
<td>2.0802</td>
<td>(3.04)</td>
</tr>
<tr>
<td>Log Number of Companies in the Industry</td>
<td>0.2129</td>
<td>(8.76)</td>
</tr>
<tr>
<td>Growth in Sales (1967 - 1972)</td>
<td>0.2097</td>
<td>(2.39)</td>
</tr>
<tr>
<td>D1 * Growth in Sales</td>
<td>-0.0327</td>
<td>(0.30)</td>
</tr>
<tr>
<td>D1</td>
<td>-0.2526</td>
<td>(4.28)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.9257</td>
<td></td>
</tr>
<tr>
<td>F value</td>
<td>375.2</td>
<td></td>
</tr>
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Note:
1) Absolute value of t-ratios is in parenthesis.
2) Number of industries equals 312.
3) Dependent variable is log of overhead cost, where overhead cost is defined as Value Added - Total Payroll - Other Employer Payments.
4) For variable definition, see Appendix A.
5) D1 = 1, if labor intensity > 0.4655, which is the average for the manufacturing. = 0, otherwise.