NBER WORKING PAPER SERIES

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Working Paper 7264
http://www.nber.org/papers/w7264

NATIONAL BUREAU OF ECONOMIC RESEARCH
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July 1999

The authors would like to thank Donald Davis, Richard Katz, Howard Pack, Jungsoo Park, Joseph Stiglitz, and the participants of the World Bank Workshop on "Rethinking the East Asian Miracle" for comments on earlier drafts of this paper. David Weinstein would also like to thank the Social Science Research Council Japan Advanced Research Grant program and the NTT Fellowship program at the University of Michigan Business School for providing research support for this project. In addition, this paper could not have been written without the excellent research assistance of Pao-Li Chang and Carolyn Evans. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

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ABSTRACT

It is commonly argued that Japanese trade protection has enabled the nurturing and development internationally competitive firms. The results in our paper suggest that when it comes to TFP growth, this view of Japan is seriously erroneous. We find that lower tariffs and higher import volumes would have been particularly beneficial for Japan during the period 1964 to 1973. Our results also lead us to question whether Japanese exports were a particularly important source of productivity growth. Our findings on Japan suggest that the salutary impact of imports stems more from their contribution to competition than to intermediate inputs. Furthermore our results indicate a reason for why imports are important. Greater imports of competing products spur innovation. Our results suggest that competitive pressures and potentially learning from foreign rivals are important conduits for growth. These channels are even more important as industries converge with the market leader. This suggests that further liberalization by Japan and other East Asian countries may result in future dynamic gains. Our results thus call the views of both the World Bank and the revisionists into question and provide support for those who advocate more liberal trade policies.

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Interpretations of the contributions made by international trade and competition to East Asian growth differ widely. [1] First, there is the view associated with authors such as Balassa (1991), Kreuger (1993) and Hughes (1992) that openness to trade was a crucial source of East Asia's rapid growth and that government's principle contribution was to limit protection and ensure that incentives were largely neutral. This stands in sharp contrast to a second position, exemplified by authors such as Amsden (1989) and Wade (1990) who also see trade performance as having a vital role but who emphasize the impact of interventionist policies which changed comparative advantage by "getting prices wrong" as a powerful source of growth. But there are also those who question the particular emphasis placed on trade policies. According to Rodrik (1995) for example, the most important role was played by industrial policies, which created a particularly favorable environment for domestic investment.

In its study of the East Asian Miracle by the World Bank (1993) the authors stake out an intermediate position. The study puts a very strong emphasis on the importance of performance in manufactured goods exports. The study's emphasis on exports goes further than simply arguing that rapid export growth played an important role in permitting East Asian economies to avoid foreign exchange constraints. It suggests that exports and export policies played a crucial role in stimulating growth. The authors challenge the view that simply striving for a neutral incentive structure was adequate. Instead they advocate broad government support for exports as

[1] This is the paper to be presented at a World Bank Workshop on Rethinking the East Asia Miracle in San Francisco, February 16 and 17, 1999.

a "highly effective way of enhancing absorption of international best practice technology, [and] thus boosting productivity and output growth".[2] Exporting is an effective means of introducing new technologies both to the exporting firms in particular and to the rest of the economy.[3] However, the Miracle study did not advocate intervention to promote the export competitiveness of particular sectors. In general it remained skeptical of selective industrial policies -- "policies to alter the industrial structure to promote productivity-based growth" -- although it did find some evidence suggesting these policies had positive effects in the case of Japan. While the Bank study emphasized exports as a channel for learning and technological advancement, conspicuously absent was a discussion of the role of imports and import competition in providing similar benefits.

In this paper, in addition to considering Korea, we will focus our analysis on the determinants of Japanese productivity growth at the sectoral level. Japan is an important case. There are indeed some who support the Miracle study view and argue that Japanese growth was "export-led".[4] By contrast, however, there are others who suggest that Japanese export success merely reflected favorable domestic conditions. Porter (1990), for example, maintains that highly competitive domestic conditions led to innovation in both products and management techniques. He adds that demanding consumers and unusual demand conditions also played a key role, in

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[2]The emphasis on exports in general is interesting, because in some places, it also voices skepticism that selective industrial policy was effective and at others it seems to argue that exports played an important role in making industrial policies effective. See Rodrik (1994)

[3]The study also argues that by making access to credit, industrial licensing and sometimes foreign exchange contingent on export performance, policymakers in Japan and in other East Asian economies were able to create contests which led to rapid growth.

addition to the availability of factors of production, particularly physical and human capital. In this view, Japanese export prowess was the result of rather than the reason for strong domestic productivity growth. [5] There is a related controversy over the contribution of Japanese industrial policies. Some argue that Japanese interventionist policies were crucial for trade performance and for growth[6] while others believe that Japan grew despite these policies which were not particularly effective [Beason and Weinstein (1996)].

In this paper we challenge three of the central conclusions of the Miracle study. First, we are unable to find support for the view that exporting was a particularly beneficial conduit of faster Japanese productivity growth. The positive association between exports and productivity growth appears due to the impact of productivity growth on exports rather than the reverse. Second, with the exception of selective corporate tax rates, we find no support for the view that the direct subsidies or other industrial policies stimulated productivity. In this case, we support the Bank's general conclusion that selective industrial policies were ineffective rather than its particular conclusion that these policies may have achieved some success in the case of Japan. And third, our results suggest that the Miracle study neglected an important channel of growth -- imports. We find that imports and lower tariffs did stimulate productivity. This suggests that the Japanese economy would have been able to grow even faster than it did by reducing domestic

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[4]On Export-led growth see (Blumenthal 1972)

[5] According to Michael Porter "In nearly every industry we studied, exports increased substantially only when the domestic market became mature" page 402. (Porter 1990)

[6] See Ito (1992) Dore (1986) Boltho (1985) Fallows (1994) Itoh, Okuno et al. (1988)

protection and importing more.

There is of course a long-standing debate as to whether today, the Japanese economy remains protected with unusually high invisible barriers, but there is a widespread consensus that in the 1960s the Japanese economy was highly protectionist. While many in Japan today might agree that reducing trade barriers could raise Japanese living standards, it is also commonly thought that the trade barriers in the 1960s contributed positively to Japanese development. It is particularly noteworthy, therefore, that we find that less import protection could have been beneficial during the earlier phases of Japan's development.

In fact, this result suggests that one of the problems in trying to explain why East Asian growth was miraculous is that it could lead us to ignore ways in which East Asian growth might have been even faster and more durable. While our findings on the effects of imports may not explain why Japan grew rapidly, therefore, it may nonetheless have important policy implications for other countries. [7] In particular, this evidence calls into question the view that Japanese sectoral productivity growth benefited from mercantilism. In the rest of this paper, we demonstrate how we reach these conclusions, before doing so, however, we consider briefly the theory and the evidence on the links between international competition and productivity growth.

Trade and Growth: Theory and Evidence

The starting point for understanding the link between trade and growth is the realization

[7]According to Porter p 708 "Japan must import more if vibrant productivity growth is to continue.... Imports stimulate domestic productivity growth."

that international trade theory suggests that there can be both static and dynamic effects from trade. Traditional arguments about why countries gain from trade are typically static in nature. If a country moves from autarky to trade, theory tells us that production and consumption will change in such a way as to raise overall GNP. These gains are static in the sense that once a country has opened to trade, the country will obtain all of the benefits from trade upon liberalization. While traditional trade theory provides strong arguments for reducing trade barriers, these are essentially seen as one-time gains. Once these gains have been achieved, this theory has little to tell us about future performance.

Other considerations point to dynamic effects that could operate through their impact on competition and profitability. However, it is not obvious whether these effects will be positive or negative. Opening an economy up to trade will increase competition and this could affect innovation, but economists are divided generally on the relationship between innovation and competition. On the one hand, there are those like Hicks, who believe that competition is good for innovation because monopoly leads to lethargy and seeking "the quiet life"; on the other hand, there are those like Schumpeter, who point out that some degree of monopoly is required to stimulate innovation. In fact, it is likely that neither perfect competition nor monopoly are particularly conducive to innovation, and that intermediate market structures which combine rents to innovation with competitive pressures will more stimulative.[8] The effects of increased international competition could depend, therefore, on the degree to which it generates this combination.

[8]The literature suggests that the impact of competition on managerial slack could be positive or negative. See, Scharfstein Rand Journal of Economics, Spring 88.

In general, investment in technological change and innovation will be stimulated by anticipated profits. This might lead us to expect that trade would reduce innovation in import-competing industries and increase it in export sectors. If import competition depresses the returns in certain industries, we might expect *less* rather than more spending and effort on innovation. [9] However, under conditions of imperfect competition, as Baldwin (1992) shows, firms may have an incentive not to innovate, if they derive high profits from existing technologies. Under these circumstances, import competition could actually stimulate innovation by reducing the monopoly profits derived from not innovating.

In addition, scale is often an important factor in the returns to R&D spending since research has a substantial fixed cost component. Again, we might expect generally expect *less* R&D spending in import-competing sectors, whose scale of activity is reduced by trade, and more spending in export sectors whose scale of activity is enlarged because the gains for innovation in global markets are likely to be larger than the gains in local markets.[10] Similarly, if as Lucas (1988) has suggested, one of the reasons why sectors grow is because of learning-by-doing, then we might expect that sectors that produce a lot are likely to grow faster than sectors that produce less. Trade is likely to cause the output of industries with comparative advantage (export sectors) to expand as workers and firms gain proficiency at producing particular products. By contrast, import competing sectors might be adversely affected.

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[9] In the conventional formal theory of trade and growth, import competition has an anti-growth bias since it reduces the profitability of innovation. See for example Grossman and Helpman?

[10] In the presence of imperfect competition, increased trade could reduce aggregate output in import-competing industries but it could also increase capacity utilization of individual firms, thus actually raising the scale at which they operate.

Emulation is another channel by which trade could stimulate productivity growth in both export and import competing industries. Competition and exposure to superior foreign firms could also speed up technological acquisition and thus lead to faster technological change because firms are able to copy. Since it is easier to copy or absorb technology than to innovate, we might expect that more technologically backward countries are likely to be able to grow faster than advanced countries [see Gerschenkron (1952)]. Firms that export are more likely to have contacts abroad, and could have higher rates of productivity growth because they can learn more easily than firms that principally sell in a domestic market. On the other hand, firms in import competing industries tend to be further behind, and may have more room to learn.

The work of Grossman and Helpman (1991), among others, has pointed to another important mechanism by which trade can enhance growth. In a world in which firm output is dependent not only on the quantity of intermediates but also on the variety, access to imports can improve productivity by increasing the variety of intermediates. This may be important in sectors like electronics where there are a large number of specialized inputs. Alternatively, intermediate inputs may enhance productivity by providing domestic firms with access to technologies that are embodied in foreign capital goods that are not available domestically.[11]

There are paradigms which are different from those of traditional profit maximization in which managers may be stimulated to innovate when international competition threatens their rents [e.g. Nelson and Winter (1974)]. This involves the existence of managers who satisfice rather than maximize and behave under conditions of what is sometimes termed bounded

[11] See for example, Bayoumi, Coe and Helpman (1996).

rationality. Basically, they do not innovate continuously, but do so when subject to an unusual stimulus. In this world, import competition may spur competition while the greater profitability of exports could actually do the reverse.

Overall, therefore, theory is actually quite ambiguous on the dynamic effects of trade. There are some reasons to expect that increased international competition could accelerate productivity growth but also some reasons to expect the reverse. "Sometimes" as the saying goes, "a kick in the pants gets you going, and sometimes it just hurts you." Given this ambiguity, it is perhaps not surprising that beliefs on the likely impact of trade on growth remain widely divided.

For a thirty-year period, starting in the 1950's, import substitution was seen by many as a crucial element for development, and protectionist policies were adopted not only in Japan but also in much of the third world. Those favoring these policies typically argued that in order to achieve economic growth, countries had to protect infant industries. Various development experts often advised developing countries that while there may be static efficiency losses associated with protection, the gains from increasing domestic production and moving down the cost curve would more than offset the static inefficiencies arising from protection.

Over the last two decades, however, a considerable amount of empirical evidence has tended to contradict the notion that more protectionist regimes grow faster. In the early 1970's Balassa (1971) and others began exploring the links between trade and growth. Over the next twenty years, a large number of studies found that export growth and export levels were highly correlated with GNP growth [see Edwards (1994) for a survey of the literature]. While it was clear that there was a link between exports and development, the literature was sharply divided

on whether countries that grow faster tend to export more or whether exporting more leads to faster growth.[12] In addition, countries which have rapid export growth also tend to have rapid import growth, so the association between exports and growth could actually be picking up a connection between imports and GDP growth.

In a second generation of studies, Barro and Sala-i-Martin (1992), Beason and Weinstein (1996), Dollar (1992), Edwards (1992), and Krishna and Mitra (1998) explored the relationship between protection and either growth or productivity growth. Beason and Weinstein, examining the case of Japan, and Krishna and Mitra, examining the case of India, found that protection was not positively associated with productivity growth within various industries. Similarly, Barro and Sala-i-Martin, Dollar, and Edwards examined aggregate GNP data and found that countries who followed more protective policies typically grew more slowly. Lawrence (1999) has found that import competition stimulated TFP growth in the United States. The evidence suggests, therefore, that protection tended to reduce, or at best leave unaffected, productivity and output growth.

The literature on the productivity enhancing effects of exports is more ambivalent. Clerides et al (1996) find that relatively efficient firms become exporters but firms' unit costs are not affected by previous export market participation. While they find some evidence that exporters reduce the costs of breaking into foreign markets for other firms, they do not help these producers become more efficient. Similarly, Bernard and Jensen (1999a and 1999b) find that in the United States, firms with high productivity levels become exporters, but that exporters do not

[12] Frankel , Romer, and Cyrus (1996) use simultaneous equation estimation to show that trade stimulates growth rather than the reverse.

have superior productivity and wage growth. Rodrik (1999) provocatively concludes from his survey of the literature that "We have no evidence to believe that a dollar of exports contributes any more (or any less) to an economy than a dollar of any other kind of productive activity". He suggests, however, that imports of capital goods and intermediate goods may impart additional benefits by supplying inputs which would otherwise not be available.[13]

There are important questions that remain unresolved in the literature. To what degree is the positive association between trade and growth due to the fact that trade is disproportionately stimulative of growth and to what degree does it reflect the fact that growth leads to trade? Second, to the degree that trade does induce rapid growth, what are the channels by which this effect operates. Is it primarily due to the impact of exporting or import-competing activity? If it is due to importing or exporting, is it primarily due to effects which stimulate productivity within sectors that are directly engaged in international competition or indirect spillover effects such as the diffusion of technologies acquired through exporting to non-export sectors or the use of superior imported machinery and other inputs in such sectors?

The focus of this study will be too narrow to answer all these questions. In particular, we will concentrate only on the effects that are evident at the level of individual sectors and will therefore not explore the indirect channels through which trade might operate. Nonetheless, we hope to make a contribution both to a better understanding of the links between trade and growth and to the explanation of the role which trade played in East Asian growth.

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[13] Rodrik is similarly skeptical of the role of foreign direct investment. We would expect, however, that FDI would provide similar opportunities for competition and the increased availability of technology and inputs to imports of goods, making the case for liberalization of FDI similar to that for goods. Nonetheless exploring this impact is an important topic further research.

Section III: Empirical Analysis.

Our modeling strategy in this paper is to control for several determinants of TFP growth at the sectoral level and then to test for the effects of trade and industrial policy. On theoretical grounds we are led to include several variables: First, it seems reasonable to expect that the degree of technological backwardness will be important. In particular, we might expect a process of convergence in which sectors which are relatively backward will tend to have relatively faster TFP growth. To measure this effect we will use the estimates of TFP levels made by Jorgenson and Kuroda (1990) for Japan and for the United States, the latter being representative of the global technological frontier.[14] Second, as emphasized by Lucas, we might expect that learning-by-doing could be important. In particular, we might expect experience to generate improvements in productive efficiency. To measure this effect we aggregate the cumulative output growth in each sector starting in 1960. Third, we would expect spending on research and development to be important. To measure this we include a variable measuring the R&D to sales ratio. In addition to these three control variables, we will also include industry and time dummies to capture cycle and sector specific determinants of productivity growth. Finally, we will add in the variables which measure trade involvement, trade policy and industrial policies. These include the share of imports in domestic demand, the share of exports in total output, the level of tariff protection and several industrial policy measures. We will also distinguish between

[14] One problem with the Jorgenson and Kuroda data is that it is constructed under the assumption of constant returns to scale, perfect product and factor markets, etc. While we would have liked to implement a

imported inputs and those which compete directly with final production.

Data.

All of our productivity data, unless otherwise noted, was taken from Jorgenson and Kuroda (1990). This data set was specially constructed to allow for US-Japan comparisons of a variety of industry variables including TFP levels. Our trade variables were all taken from the OECD's STAN database or from OECD trade statistics. Research and Development data for the US were taken from the National Science Foundation Research and Development in Industry, various years. R&D data for Japan was taken from the Survey of Research and Development.

Preliminary Observations

Before we proceed with our regression analysis, it is useful to examine, in a preliminary way the relationships between trade and TFP growth and between relative productivity levels.

Trade. Figure 1 shows a positive relationship between the average export to sales ratio levels over the period 1964 to 1985 and average TFP growth over the same time period. Similarly we see a negative correlation between average import penetration and average TFP Growth in Figure 2. This evidence is certainly consistent with the idea that Japanese growth was "export-led". First TFP growth was relatively higher in sectors with larger export shares. There

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methodology that would have allowed for these real-world phenomena, data limitations precluded that option in this study.

is of course an expectation that a country will export products in which it has relatively high TFP. Thus the association between export growth and TFP growth could mean that faster TFP growth leads to exports. However, one crude way to control for the causal effects of TFP is to plot export shares in 1964 against TFP growth over the following twenty years. As shown in Figure 3, the association between exports and TFP growth remains.

Convergence. As Figure 4 shows, in general there appears to have been some convergence in some sectors. The two tradable non-manufacturing sectors, agriculture and mining, were heavily targeted by the Japanese government and exhibit radical movements in their productivity levels. Because we wanted to focus on manufacturing sectors rather than resource intensive sectors, these industries were dropped from subsequent analysis. Of the remaining sectors about half exhibit convergence, and half divergence. Indeed in some sectors, Japan overtook the US. These results contrast sharply with the findings of Dollar and Wolff (1994) found fast rates of convergence within the Japanese manufacturing sector. This highlights the sensitivity of TFP numbers to data construction issues. We use the Jorgenson and Kuroda (1990) data which was specially constructed and compiled to ensure compatibility, while other studies have used OECD data which has greater compatibility problems.

In sum, the raw data suggest a positive association between export shares and TFP growth and a negative association between import shares and TFP growth. However, we will show, using regression analysis that drawing causal implications from this evidence could be highly misleading.

Regression Analysis

Hypotheses

In the regression analysis we use the annual growth rate in industry (TFPJ) as the dependent variable. In all regressions we enter the lagged dependent variable and a set of industry dummies. This means that we are obtaining estimates which are within (fixed effects) estimates. In addition we include the ratio of the level of Japanese TFP to the US TFP in each industry; the change in the log of cumulative real output with 1960 = 1; and the ratio of R&D to output over the previous three years. We then add various variables representing trade and industrial policy. Precise definitions of the variables are reported in Table 1.

As reported in Table 2, in most of the regressions the three control variables are significant. When Japan is behind, the relative productivity variable is less than one, so a negative coefficient implies that relative backwardness has a positive impact on TFP growth. This is exactly what one would expect from a neoclassical growth model. Moreover, cumulative output growth and R&D spending all boost TFP growth for presumably conventional reasons. However, neither exports as a share of output, (column 1) nor imports (column 2) nor net trade (column 3) nor exports and imports entered separately are statistically significant. These results imply that trade *per se* does not have a positive (or negative) impact on sectoral TFP.

These results are modified in the case of the import variable, however, both when we enter the trade variables in interaction with relative backwardness and when we enter in dummy

variables which split the sample period into two periods. As reported in Table 3, when the export (column 1) and net trade variables (column 2) are entered interacting with relative backwardness they continue not to be significant. However, the variable interacting import share with relative backwardness is now significant and positive while the coefficient on the average import share is negative and almost significant. So what does this say? For sectors whose relative TFP level is just over half that of the US, we find *that higher levels of imports actually cause faster rates of convergence.* This runs contrary to the notion that protection from imports tends to enhance the ability of sectors to catch up.

We also seem to have some evidence that sectors that are extremely backward, with TFP levels that are less than half that of the US, seem to not benefit or even be harmed by higher import levels. This arises because the negative coefficient on the average import share variable dominates the positive coefficient on the interaction term when relative TFP levels are low. However, one should be cautious about reading too much into this effect for a number of reasons. First, the negative impact of imports on productivity growth for very backward sectors is not statistically significant. Hence, one must be very cautious about interpreting this result in terms of an infant industry style argument. Second, most sectors in Japan never fell into the range in which productivity levels were so low that our equations predict that imports were actually harmful. Indeed the three sectors that at times do have relative TFP levels below 0.5 – petroleum and coal products, rubber products not elsewhere classified, and transportation equipment excluding motor vehicles – are not sectors that are usually thought of as potentially benefiting from infant industry protection.

In Table 4 we introduce a dummy variable that takes on the value of one for the period after 1973. In this regression the controls variables have lower levels of significance, suggesting that in part they could be capturing a pre-1973 effect rather what we think they capture. Relative backwardness still matters but less powerfully (and is not significant) and neither cumulative output nor R&D variables are significant. The first regression indicates an appreciable slowdown in productivity growth after 1973 by an annual average of 3.8 percent. In the early period, exporting has a negative impact, which becomes even larger after 1973. So this certainly does not suggest that exports have stimulated TFP. By contrast, we find that imports have a positive impact in the early period and in the specification with imports, the R&D variable becomes significant. In the second half of the period, the impact of imports continues to be significant but it is now cut by about half. These results also clearly suggest a positive role for imports. Furthermore, they suggest that import liberalization in the early period had an even more important positive impact on productivity growth than later liberalization. Since Japanese industries tended to be relatively further behind during the earlier period, this result contrasts with that obtained earlier.

We have seen that exporting does not cause productivity growth, but it would be very distressing if, in our data, higher productivity levels were not associated with greater levels of exports and production. In a Ricardian model one would expect to find that higher productivity levels should result in both higher levels of output and greater exports. We explore this conjecture explicitly in Table 5. Here we regress the log of output and the export to output ratio on TFP levels as well as lagged dependent variables to assess the relationship between

productivity and exports. We find that contemporaneous TFP is very tightly correlated with both output and exports, and lagged TFP is also strongly associated with exports. These results strongly suggest that the direction of causality is from TFP to exports and not the reverse.

It is also instructive to ask if effective tariff protection promoted or inhibited productivity growth. In Table 6 we explore the effects of a number of industrial policy variables. We add to our basic specification variables which include average corporate taxes, the proportion of loans granted by the Japan Development Bank, the effective rate of protection less the industry average, and subsidies less taxes. Among these variables only the tax rate variable is significant. Once again, when export and import shares are introduced into this specification the import variable is significant and positive, while the export variable is not. Hence, even controlling for various industrial policy tools, we find that imports are important for productivity growth but exports are not.

In Table 7 we test the robustness of our contention that effective rates of protection are not associated with greater productivity growth. In particular, it is often alleged that during the 1960's in Japan, protection was an important part of Japan's industrial policy. To see if protection was more important in the early period, we once again introduce our LATE dummy and interact it with the relative level of protection. Contrary to conventional wisdom we find that increasing protection in the early period actually was associated with lower rates of productivity growth and higher protection had virtually no impact after 1973.

It might be argued that Japan only lowered its tariffs once industries were sufficiently productive, so the negative relationship between tariffs and TFP growth could actually reflect

reverse causation. However, this concern would result in a negative relationship between productivity levels and tariffs and not between tariff levels and productivity growth rates. Therefore, we do not believe this interpretation of our results is plausible. Finally, in Table 8 we examine whether the protection of more backward sectors improved productivity growth. The data militates against this view. No matter how we specify our regressions, we seem to find no impact or negative impacts from protection.

In sum this analysis suggests that while exporting did not promote TFP growth. Import protection actually retarded productivity growth and imports enhanced it.

Why do Imports Matter?

One major question that remains unanswered is what is the mechanism by which imports affect TFP growth. Our results show that there is a positive relationship between import shares and productivity growth, but we have not answered why this is the case. We have suggested two possible mechanisms by which this is likely to occur. The first is that the quality of firms in the industry might rise because of the added competition from foreign firms. This might occur because domestic firms learn by examining foreign imports or because the foreign competition spurs innovation. Alternatively, it may be that access to better intermediates that is important. For example, Japanese apparel producers may benefit from importing higher quality cotton from abroad. This would be an example of superior intermediates in the same sector spurring productivity growth.

In order to separate these two hypotheses, we need to be able to separate imports within a sector that compete with the output of firms in that sector and imports that are used as intermediates. Fortunately it is possible to achieve that dichotomy by using the import input output table of Japan. We obtained these tables from the OECD Input-Output Database for the years 1970, 1975, and 1980. Using these tables, we were able to estimate the share of imports into a sector that were used by firms in that sector and the share of imports was sold to other sectors. The former we classified as "non-competing imports" while the latter we called "competing imports." We then reran our basic regression separating competing from non-competing imports.

The results are presented in Table 9. The impact of non-competing imports on productivity growth is extremely small and statistically insignificant. Competing imports, however, have a significant impact. The magnitudes of the coefficients indicate that for most sectors and time periods in our sample, higher past levels of competing imports are associated with more rapid productivity growth. It is important to remember that this result is not a product of the fact that sectors that import more have lower initial levels of productivity because we are already controlling for the initial relative productivity level. Rather, it appears that higher import levels have an independent effect.

In addition to being statistically significant, the impact of competing imports is economically significant as well. In order to assess the economic significance of competing imports, for each sector we first calculated the standard deviation in competing imports as a share of total imports. For a sector that is 80% as productive as a US sector the median one standard

deviation increase in the share of competing imports would raise TFP by about 3 percentage points. This understates the importance of competing imports in some sectors. For example, in electrical machinery, progressive liberalization caused competing imports to rise from 68% of imports in 1970 to 99% in 1985. We estimate that this increased competition from imports raised productivity in electrical machinery by about 35%. This suggests that competing imports were very important in understanding the success of that sector.

It is interesting to note that the effect of competition is larger for sectors that have converged than for sectors that are further behind. When competing imports enter a sector that is technologically backward there is relatively little impact on productivity growth. This may be due to the inability of backward firms to compete with their more sophisticated foreign counterparts. On the other hand, as sectors converge the importance of imports rises. As we suggested in the beginning, "sometimes a kick in the pants gets you going and sometimes it just hurts."

Results from Other Countries

Korea

Korea is the third largest East Asian economy in GNP terms. It would be interesting to see if our Japan results are applicable to other economies as well. Unfortunately, data problems preclude making as careful an analysis of Korea as we performed for Japan. TFP indices are considerably more crude and we had difficult finding sectoral Korean trade data prior to 1970. However, Lee (1995) has performed a similar analysis on Korean data and we were able to use

some of his data to replicate parts of our experiments on Japan.

Table 10 presents the results of Lee's attempt to assess the impact of industrial policy on productivity growth in Korea. The results are quite similar to those reported in Beason and Weinstein (1996) and in this paper. Practically all forms of industrial policy had either negative or insignificant impacts on Korean productivity growth. Hence there appears to be little systematic evidence that greater levels of targeting improved productivity growth in Korea as well.

Lee did not examine the impact of trade *per se* in his analysis. We import and export data from the World Trade Database [see Feenstra, Lipsey, and Bowen (1997)] and production data from the STAN database to calculate import and export to production ratios. We then merged these numbers with Lee's database. Lee provides productivity growth rate data for three five-year periods (1968-1973, 1973-1978, and 1978-1983). For each of the sectors in Lee's analysis we matched the import to production number for the year at the start of the period with the productivity and other data for the remaining years. Since our trade data started in 1970, we were forced to match trade data for this year with the earlier sample. Unfortunately the data for Korea, was more limited than that for Japan, and hence we were only able to use 69 observations and could not calculate relative productivity levels.

Table 11 presents results from two simple specifications regressing productivity growth against import and export shares. The results reveal that, as in the Japanese data, higher levels of imports are associated with greater productivity growth. Although the results are not statistically significant, the signs are consistent with the Japanese results. Turning to exports we actually find

the reverse of "export-led" growth. Sectors that started by exporting more actually recorded lower rates of productivity growth. When we add in several trade policy measures, tariffs and NTB's our results do not change much. We find a positive, but not statistically significant, impact from imports and a negative but not significant impact from exports. Interestingly, we find a negative relationship between protection and productivity growth in Korea. Higher tariffs have a statistically significant negative impact on TFP. Thus, as in the case of Japan it appears that tariff protection in Korea retarded TFP.

US

Lawrence (1999) estimates the impact of international competition on total factor productivity in over 100 US manufacturing industries in the 1980s. After controlling for spending on research and development and the degree of industry concentration, he finds that a higher share of imports in domestic consumption is associated with a statistically significant positive effect on subsequent total factor productivity growth. These effects are apparent for both imports from developed and developing countries. Lawrence similarly finds no evidence of a positive association between the share of exports in domestic production and subsequent productivity growth. Thus the evidence for the United States appears consistent with that found for Japan and Korea. Imports stimulate domestic productivity growth while exports apparently do not.

Conclusion

Currently, neoclassical arguments about free trade have convinced many developing countries to liberalize unilaterally. In addition, there is a growing view within Japan itself that more liberalization and deregulation are called for. But revisionist critics argue that Japan's spectacular growth was not achieved by following *laissez-faire* precepts. On the contrary, Japan officially maintained high levels of protection during the 1950s and 1960s when its growth was most rapid and, even though official barriers were lowered considerably in the 1970s and 1980s, Japan continued its mercantilist practices through more subtle mechanisms (Lawrence 1993). In the revisionist view, Japanese trade protection has enabled the nurturing and development internationally competitive firms -- a lesson which today developing countries ignore at their peril. [15] Moreover, since its domestic protection promotes growth, those foreigners advocating a more open, market-oriented Japanese market today are suggesting that Japan should take steps which are not in its domestic interest.

In fact, the results in our paper suggest that when it comes to TFP growth, this view of Japan is seriously erroneous. We find that lower tariffs and higher import volumes would have been particularly beneficial for Japan during the period 1964 to 1973. Our results also lead us to question whether Japanese exports were a particularly important source of productivity growth. In our study we support the conclusion of Rodrik (1999) that export fetishism is unwarranted.

[15] Protection did not mean eliminating competition. While external competition was blocked, internally, according to Yoshitomi, there was fierce competition between rivals. [See World Bank (1993), p. 22]

However, our findings on Japan suggest that the salutary impact of imports stems more from their contribution to competition than to intermediate inputs. Instead, this paper suggests that Japan's performance was perhaps even more of a miracle than we thought, since it occurred despite the maintenance of protectionist barriers.

Furthermore our results suggest a reason for why imports are important. Greater imports of competing products spur innovation. Our results suggest that competitive pressures and potentially learning from foreign rivals are important conduits for growth. These channels are even more important as industries converge with the market leader. This suggests that further liberalization by Japan and other East Asian countries may result in future dynamic gains.

While our analysis has principally focused on Japan, we have also provided corroborating evidence suggesting that our conclusions apply more broadly. Imports into the US seem to be an important factor in promoting productivity growth. The evidence for Korea suggests similar impacts from imports and tariffs and no evidence that exports promoted productivity. Our results thus call the views of both the World Bank and the revisionists into question and provide support for those who advocate more liberal trade policies.

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Table 1

Variable definitions

GROWTFP	Growth rate of TFP
TFPJ(-1)	Japanese TFP level lagged one year
RELTFP	Lag of level of Japanese TFP relative to the US level
CUMOUT	Change in log cumulative real output (1960 real output = 1)
AVERD	Average R&D expenditures divided by output over the past three years
AVEX	Average exports to output ratio over the past three years
AVENET	Average net trade to output ratio over the past three years
COMPIM	Average competing imports over the past three years
NCOMPIM	Average non-competing imports over the past three years
AVIM	Average imports to output ratio over the past three years
RELTFP*AVEX	Interaction of average RELTFP over the past three years with AVEX
RELTFP*AVENET	Interaction of average RELTFP over the past three years with AVENET
RELTFP*AVEIMP	Interaction of average RELTFP over the past three years with AVEIMP
RELTFP*CUMOUT	Interaction of RELTFP with CUMOUT
RELTFP*AVERD	Interaction of average RELTFP over the past three years with AVERD
TAX	Average corporate tax rate less tax rate for the industry
LOAN	JDB loans divided by total loans for industry less manufacturing average
DELTAERP	Effective rate of protection less industry average
SUBSIDY	Subsidies less taxes divided by sales for industry less manufacturing average
ERP	Effective rate of protection
LOGOUT	Log of output
EXOUT	Exports divided by output

Table 2

Dependent variable : GROWTFP

TFPJ(-1)	-0.083 (-0.077)	-0.082 (0.077)	-0.070 (0.0763)	-0.077 (0.078)
RELTFP(-1)	-0.274 (0.098)	-0.273 (0.097)	-0.283 (0.097)	-0.277 (0.098)
CUMOUT	0.263 (0.093)	0.267 (0.094)	0.276 (0.094)	0.272 (0.095)
AVERD	5.105 (2.114)	4.989 (1.788)	3.586 (1.500)	4.327 (2.402)
AVEX	-0.092 (0.133)			-0.057 (0.143)
AVENET		-0.095 (0.109)		
AVEIMP			0.266 (0.300)	0.221 (0.143)
Adjusted R^2	0.151	0.152	0.152	0.149

Table 3

Dependent variable : GROWTFP

TFPJ(-1)	-0.075 (0.075)	-0.064 (0.073)	-0.066 (0.078)	-0.077 (0.075)
RELTFP(-1)	-0.210 (0.89)	-0.200 (0.087)	-0.298 (0.098)	-0.309 (0.098)
CUMOUT	0.225 (0.73)	0.226 (0.073)	0.214 (0.095)	0.215 (0.075)
AVERD	2.975 (1.686)	3.286 (1.457)	1.775 (2.402)	1.519 (1.866)
AVEX	-0.197 (0.275)			-0.169 (0.273)
AVEIMP			-0.956 (0.687)	-0.169 (0.689)
AVENET		-0.070 (0.253)		
RELTFP*AVEX	0.176 (0.312)			0.220 (0.309)
RELTFP *AVEIMP			1.760 (0.848)	1.773 (0.852)
RELTFP*AVENET		-0.020 (0.292)		
Adjusted R^2	0.151	0.153	0.171	0.167

Table 4

Dependent variable : GROWFTP

TFPJ(-1)	-0.144	-0.167	-0.129	-0.145	-0.099
	(0.069)	(0.069)	(0.067)	(0.069)	(0.067)
RELTFP(-1)	-0.110	-0.111	-0.118	-0.121	-0.119
	(0.076)	(0.075)	(0.076)	(0.075)	(0.077)
CUMOUT	0.023	0.038	0.119	0.072	0.103
	(0.115)	(0.112)	(0.112)	(0.115)	(0.113)
AVERD	2.021	2.661	2.751	0.649	2.772
	(1.812)	(1.577)	(1.313)	(1.947)	(1.302)
AVEX	-0.309			-0.032	
	(0.182)			(0.218)	
AVEIMP			0.949	0.943	
			(0.322)	(0.376)	
AVENET		-0.346			
		(0.131)			
LATE	-0.038	-0.025	0.008	0.943	-0.008
	(0.016)	(0.013)	(0.016)	(0.376)	(0.012)
LATE*AVEX	0.322			0.196	
	(0.115)			(0.127)	
LATE*AVEIMP			-0.449	-0.467	
			(0.224)	(0.229)	
LATE*AVENET		0.324			
		(0.096)			
Adjusted R^2	0.210	0.221	0.211	0.226	0.226

Table 5

Dependent variable : LOGOUT		
LOGOUT(-1)	0.754 (0.024)	0.788 (0.027)
RELTFP	0.494 (0.097)	
RELTFP(-1)		0.089 (0.104)
Adjusted R^2	0.986	0.984
Dependent variable : EXOUT		
EXOUT(-1)	0.834 (0.030)	0.845 (0.029)
RELTFP		0.067 (0.022)
RELTFP(-1)	0.070 (0.022)	
Adjusted R^2	0.962	0.962

Table 6

Dependent variable : GROWTFP

GROWTFP	-0.117 (0.069)	-0.116 (0.071)	-0.120 (0.070)	-0.116 (0.069)
RELTFP(-1)	-0.127 (0.077)	-0.128 (0.077)	-0.126 (0.077)	-0.129 (0.076)
CUMOUT	0.263 (0.085)	0.266 (0.085)	0.262 (0.085)	0.294 (0.085)
AVERD	2.932 (1.422)	2.582 (1.854)	3.419 (1.642)	1.094 (1.958)
AVEX	0.038 (1.855)			0.136 (0.137)
AVEIMP				0.561 (0.255)
AVENET			0.061 (0.102)	
TAX(-1)	0.012 (.004)	0.012 (.004)	0.012 (0.004)	0.012 (0.004)
LOAN(-1)	-0.001 (0.003)	-0.002 (0.003)	-0.002 (0.003)	0.000 (0.003)
DELTAERP(-1)	0.000 (.001)	0.000 (0.001)	0.000 (.001)	0.000 (0.001)
SUBSIDY(-1)	0.000 (.002)	0.000 (0.002)	0.000 (.002)	0.002 (0.003)
ERP(-1)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Adjusted R^2	0.221	0.217	0.232	0.232

Table 7

Dependent variable : GROWFTP

TFPJ(-1)	-0.088 (0.067)	-0.085 (0.068)
RELTFP(-1)	-0.149 (0.078)	-0.149 (0.078)
CUMOUT	0.080 (0.113)	0.079 (0.113)
AVERD	2.685 (1.384)	2.026 (1.829)
AVEX		0.071 (0.129)
DELTAERP(-1)	-0.002 (0.001)	-0.002 (0.001)
LATE	-0.012 (0.012)	-0.012 (0.013)
LATE*DELTAERP(-1)	0.0014 (0.0006)	0.0014 (0.0006)
Adjusted R^2	0.198	0.195

Table 8

Dependent variable : GROWTFP

TFPJ(-1)	-0.113 (0.69)	-0.112 (0.069)	-0.117 (0.069)	-0.116 (0.069)	-0.111 (0.069)
RELTFP(-1)	-0.147 (0.077)	-0.147 (0.077)	-0.145 (0.077)	-0.146 (0.077)	-0.147 (0.077)
CUMOUT	0.258 (0.077)	0.258 (0.077)	0.259 (0.077)	0.274 (0.077)	0.278 (0.077)
AVERD	2.283 (1.458)	2.105 (1.862)	2.828 (1.666)	1.796 (1.471)	0.764 (1.954)
AVEX		0.019 (0.128)			0.107 (0.133)
AVEIMP				0.466 (0.240)	0.529 (0.253)
AVENET			0.068 (0.100)		
TAX(-1)	0.014 (.004)	0.014 (0.004)	0.014 (0.004)	0.014 (0.004)	0.013 (0.004)
LOAN(-1)	0.000 (0.003)	0.000 (0.003)	0.000 (.003)	0.000 (0.003)	0.000 (0.003)
DELTAERP(-1)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)	0.002 (0.002)
SUBSIDY(-1)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)	-0.003 (0.003)
RELTFP*DELTAERP(-1)	-0.004 (0.002)	-0.004 (0.002)	-0.004 (0.002)	-0.003 (0.002)	-0.003 (0.002)
Adjusted R^2	0.221	0.228	0.229	0.241	0.241

Table 9

Dependent variable: GROWTFP

TFPJ(-1)	-0.087	-0.101	-0.094
	(0.077)	(0.082)	(0.072)
RELTFP(-1)	-0.292	-0.297	-0.289
	(0.097)	(0.010)	(0.092)
CUMOUT	0.202	0.200	0.195
	(0.077)	(0.079)	(0.073)
AVERD	1.694	1.690	1.727
	(1.254)	(1.889)	(1.229)
AVEX		-0.167	
		(0.287)	
AVEX*RELTFP		0.193	
		(0.331)	
NCOMPIM	-0.063	-0.089	
	(1.207)	(1.227)	
COMPIM	-1.808	-1.692	-1.909
	(1.157)	(1.207)	(1.081)
NCOMPIM*RELTFP	0.285	0.250	
	(1.995)	(2.048)	
COMPIM*RELTFP	2.939	2.835	3.081
	(1.518)	(1.554)	(1.363)
Adjusted R^2	0.168	0.163	0.175

Table 10

Regression for Growth Rate of Korean TFP: Four Five Year Periods from 1963 to 1983 for 38 manufacturing industries, WLS (Source: Lee (1995))

	Sample 63-83	Sample 68-83	Sample 68-83	Sample 68-83	Sample 68-83
Fixed Effects	Yes	No	Yes	No	Yes
Log(Initial Value Added)	-0.144 (0.146)				
Log(Initial Capital)	0.071 (0.017)				
Non-Tariff Barrier	-0.072 (0.032)				
Tariff	-0.079 (0.069)				
Tax Incentive	0.044 (0.110)				
Bank Loans	-0.019 (0.138)				
Imports/Gross Output		0.032 (0.021)	0.077 (0.064)		
Exports/Gross Output				-0.007 (0.041)	-0.203 (0.097)
Number of Obs.	146	69	69	69	69

Table 11

Regression for Growth Rate of Korean TFP: Four Five Year Periods from 1963 to 1983 for 38 manufacturing industries, WLS (Source: Lee (1995))

	Sample 68-83	Sample 68-83
Fixed Effects	Yes	Yes
Non-Tariff Barrier	0.137	0.140
	(0.085)	(0.084)
Tariff	-0.230	-0.253
	(0.107)	(0.104)
Imports/Gross Output	0.053	0.057
	(0.064)	(0.064)
Exports/Gross Output	-0.102	
	(0.102	
Number of Obs.	69	69
Adj. R^2	0.038	0.040

Figure 1

Vertical Axis: Average TFP Growth (1964-1985)
Horizontal Axis: Ave Export/Sales Ratio (1964-1985)

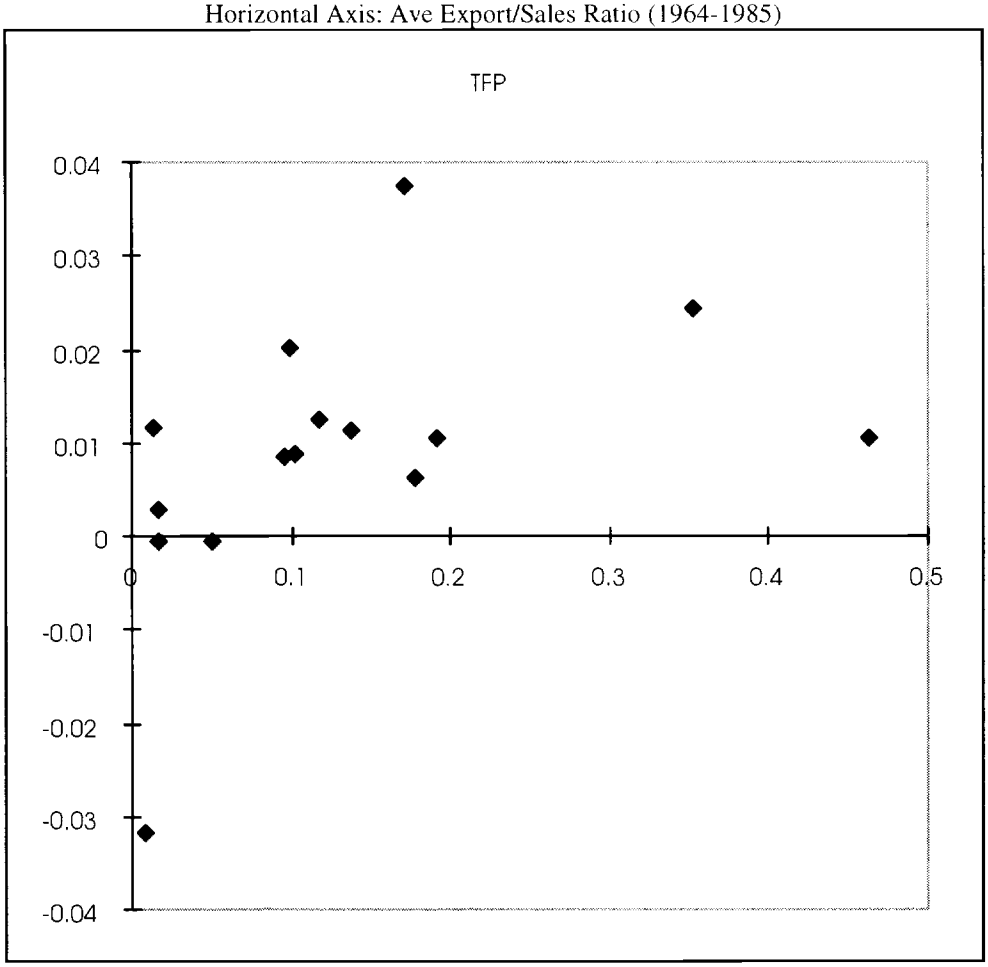


Figure 2

Vertical Axis: Average TFP Growth (1964-1985)
Horizontal Axis: Ave Import/Sales Ratio (1964-1985)

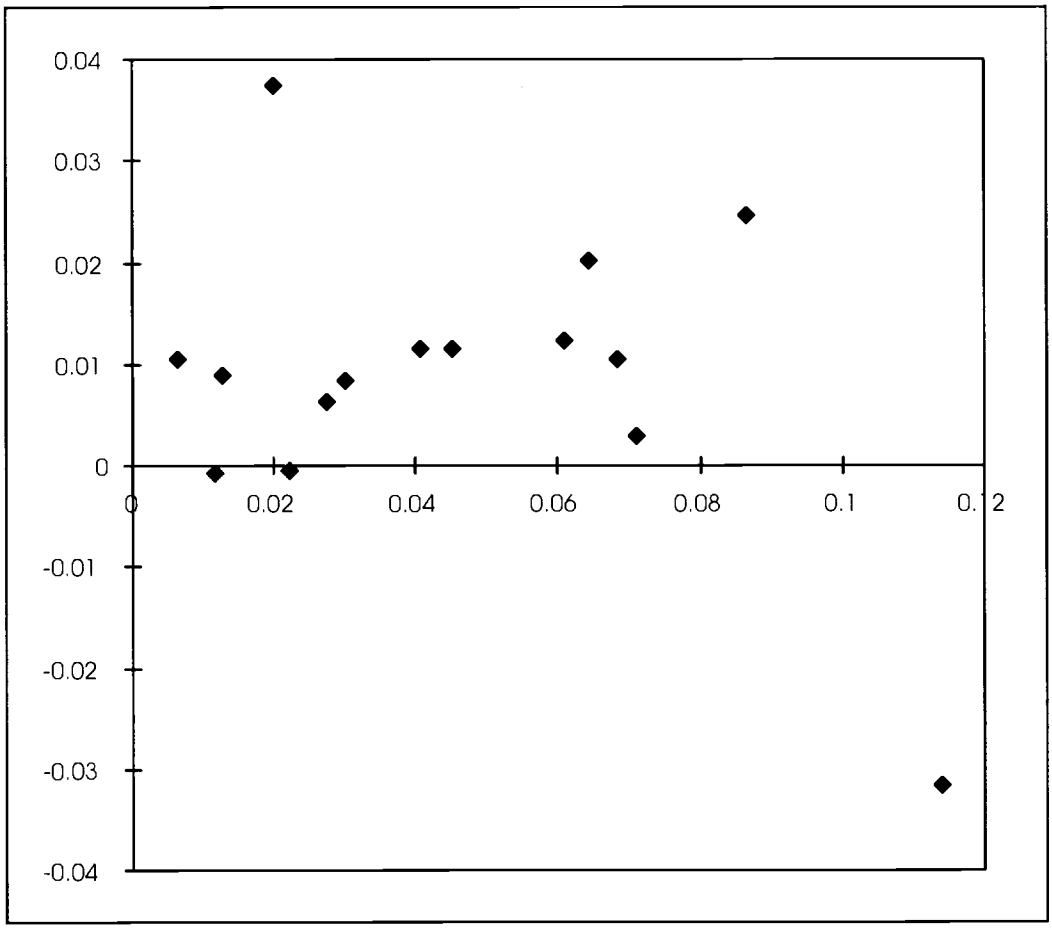


Figure 3

Positive relationship between Productivity Growth and Export Shares ($\rho = 0.31$)

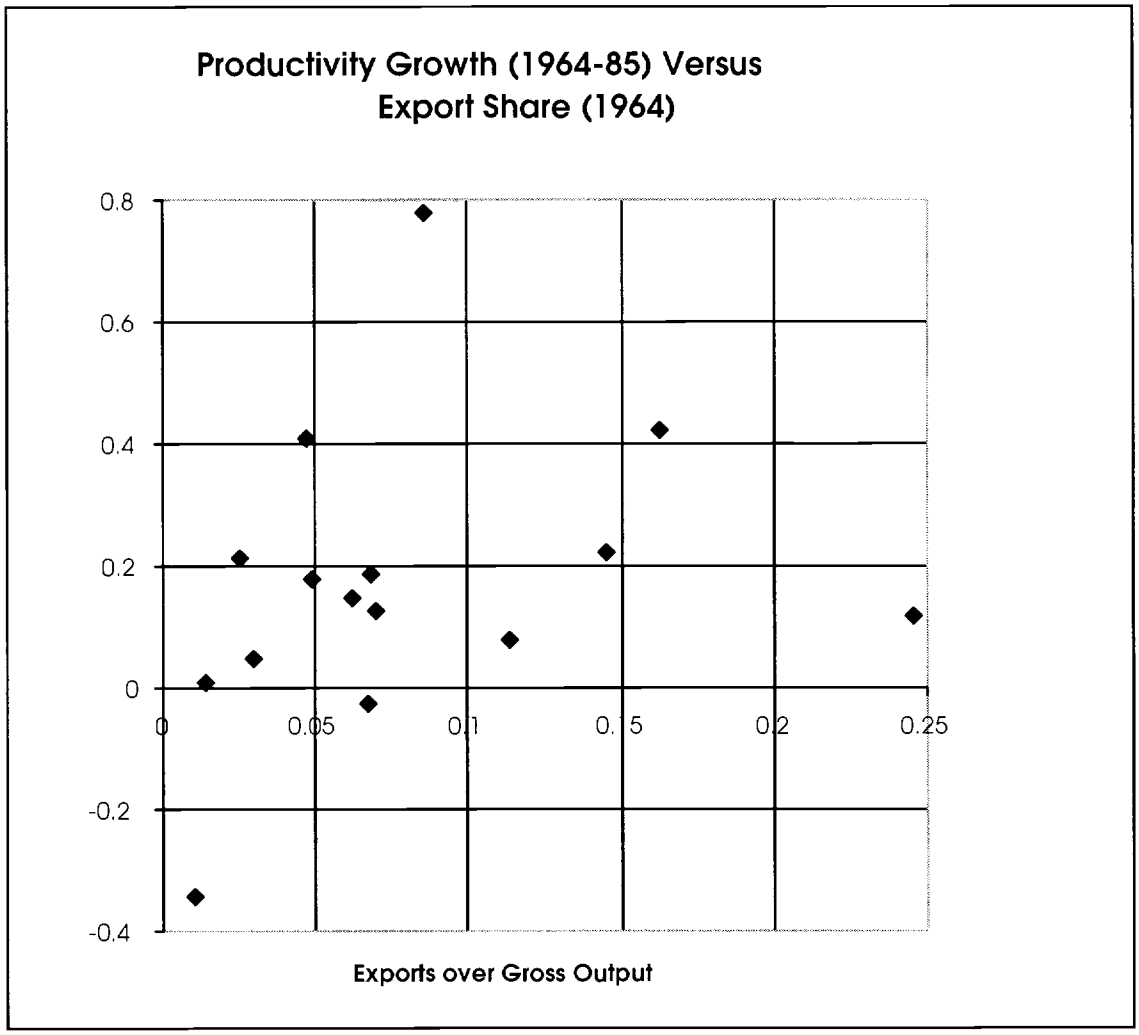
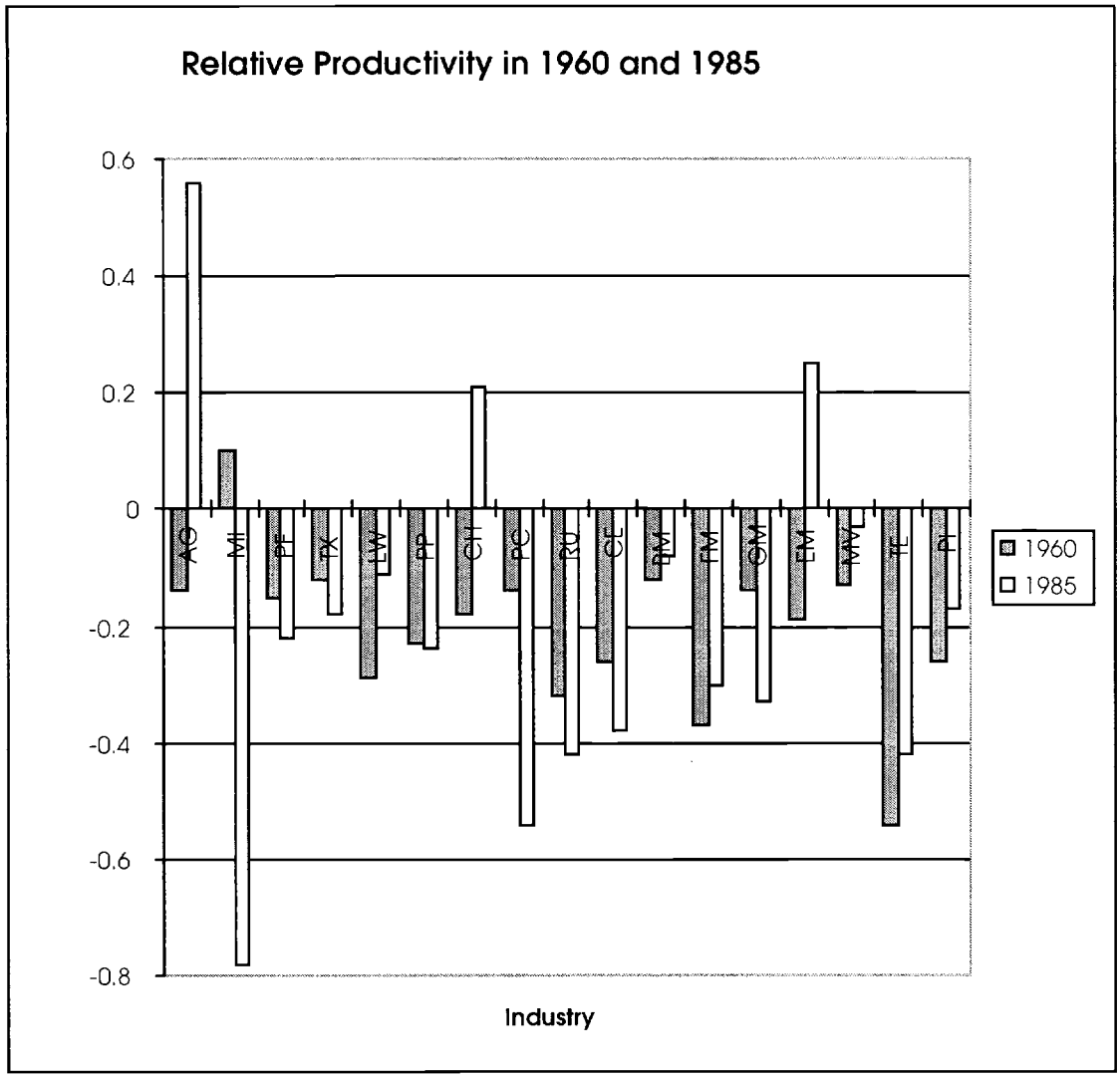


Figure 4


Relative Productivity in 1960 and 1985
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
AG
MI
PF
PX
LW
PP
CH
PC
RU
CE
BM
FM
OM
EM
MM
TE
PI
1960
1985
Industry