UNDERSTANDING THE U.S. EXPORT BOOM

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Working Paper **6438**

NBER WORKING PAPER SERIES

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Working Paper 6438
http://www.nber.org/papers/w6438

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1998

Bernard' s research was supported by the Industrial Performance Center at MIT. Jensen' s research was conducted while he was at the Center for Economic Studies at the Bureau of the Census. All errors are ours. Any opinions expressed are those of the authors and not those of the Bureau of the Census or the National Bureau of Economic Research.

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JEL Nos. F10, F14

ABSTRACT

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January, 1998 v3.0

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KEY WORDS: hysteresis, export supply elasticity, productivity, exchange rate
JEL Classification: F10, F14

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1 Introduction

Exports have been booming. No matter how one slices the data, the results are the same. After seven years of stagnation, the value of total U.S. exports took off after 1987, increasing at an average annual rate of 8.2% from $402 billion to $715 billion by 1994.[1] Growth rates for exports of goods (9.1%), and especially those of durable goods (11.0%), were even more robust. By contrast, annual growth in real GDP and industrial production averaged only 2.2% and 2.8% respectively. (See Figure 1) This resurgence in exports has led to a huge sigh of relief from observers of U.S. manufacturing. Largely gone are the worries and woes of the 1980s that the U.S. had lost its edge. Instead, optimism abounds about the competitiveness of the manufacturing sector.[2]

In this paper, we question whether such a buoyant feeling is justified from the export numbers alone. While it is true that the increase in exports has occurred in every manufacturing sector and in almost every state, we argue that the extraordinary growth in exports is largely a return to trend and a recovery from the overvaluation of the U.S. dollar during the early 1980s. Even though exports merely returned to long run trend levels during the boom, the export intensity of U.S. output increased at an unprecedented rate, both for the manufacturing sector as a whole and for individual plants and firms. It is this increase of export intensity which represents the real export boom of the late 1980s and 1990s.

The widespread nature of the export increase is remarkable. The export boom touched all industries in the manufacturing sector and nearly every state. Every sector saw its exports rise by at least 50% from the 1987 level, while nine industries more than doubled their exports. There was more heterogeneity across states although every one saw a rise in exports. At the firm level, more firms exported in 1992 than in 1987 and the exporters increased their share of shipments going abroad.

There are as many explanations for the rebirth of the export sector as there are new exporters, however, two competing stories dominate the debate. The first attributes the increase in exports to a general renewal of U.S. manufacturing, and in particular to increase in productivity at manufactur-

[1] Economic Report of the President (1996). All values are given in $1992.

[2] Of course, merchandise imports continued to exceed exports, although they rose at a slower rate of 5.6%.

ing establishments. The argument is that manufacturers undertook large restructuring efforts during the mid and late 1980s which improved productivity and thus enabled them to compete in world markets. We consider this hypothesis in terms of shifts of the cost curve for individual producers and ask whether such movements are strongly correlated with increased exports.

The second, and not necessarily mutually exclusive, hypothesis about the export boom focuses on the role of foreign factors, especially exchange rates. Proponents argue that the dollar depreciation of the mid 1980s actually drove the export increase albeit with a lengthy delay. The delay in response to the large exchange rate movements is attributed to the presence of sunk costs of entry into exporting.

The difference in implications of the two hypotheses for the future performance of U.S. exports are quite stark. If exchange rate movements were driving the export increase, then future export growth is likely to moderate.[3] The inevitable conclusion is that the export boom was a temporary phenomenon. However, if renewed U.S. manufacturing productivity was the dominant source of fast export growth rates, then continued rapid growth depends on further productivity improvements and may well continue into the future.

To evaluate these competing hypotheses, we first examine the contributions of new plants and new exporters to the export increases. While there has been an important increase in the numbers of plants exporting, by far the biggest increase in exports has come from existing exporters. We decompose the aggregate increase into two components, one due to increasing export intensity by individual exporters, and the other due to increasing shipments at relatively export intensive plants. Both effects are occurring during the boom but the increase in export intensity is the dominant effect.

As a more formal test, we regress changes in exports and export intensity at the plant level on exchange rate, foreign demand and plant productivity measures. The results suggest that all three variables are playing a role in the export increase but that the productivity effect is relatively small. The depreciation of the dollar coupled with increases in foreign income account for almost 90% of the export increase in the aggregate.

The paper proceeds as follows: the next section details the scope of the

[3]A large appreciation of the dollar and slow foreign income growth would exacerbate the slowdown in export growth.

export boom across industries and regions. Section 3 put the recent increases in exports in a longer historical context. The contributions of new plants and new exporters are discussed in Section 4 as well as the role of increasing export intensity at the plant level. Section 5 contains the tests of the competing hypotheses using plant level data for all plants and continuing exporters. Section 6 presents the relative contributions of exchange rates, foreign income and plant productivity to aggregate export increases. Section 7 concludes.

2 Depth and Breadth of the Boom

The recent period of export growth truly was the rising tide that lifted all boats.[4] Every two-digit manufacturing industry had faster export growth than output growth.[5] Every state showed growth in exports and only six had slower export growth than manufacturing growth.[6] In addition, the proportion of manufacturing plants and firms that exported rose substantially and exporters shipped a higher fraction of their output abroad.

The export boom was felt in every industry in the manufacturing sector. Table 1 reports shipments and direct export values for 1987 and 1992 for each two-digit manufacturing sector.[7] Export growth was substantially higher than shipments growth in every industry, even textiles, furniture, and apparel were able to more than double their value of exports. Perhaps not

[4]All our plant and firm level figures come from the Census Bureau's Census of Manufactures (CM) for 1987 and 1992. The CM surveys U.S. manufacturing establishments and collects information on production and non-production employment, production hours, salaries and wages, shipments, value-added, capital measures, ownership structure, and direct exports.The coverage of exports is less than 100%. For details on this issue see Bernard and Jensen (1995). Due to limitations with the 1992 CM, we exclude all plants with fewer than 20 employees. Inclusion of these plants will not substantially change any of our conclusions as these plants are less likely to be exporters and account for a small fraction of U.S. manufacturing output and exports.

[5]Two-digit manufacturing industries are food, tobacco, textiles, apparel, wood, furniture, paper, printing, chemicals, petroleum, rubber, leather, stone, primary metals, fabricated metals, machinery, electronics, transportation, instruments, and miscellaneous manufacturing.

[6]The six, Minnesota, Missouri, Vermont, West Virginia, Wyoming, and South Dakota, accounted for only 6% of direct exports in 1987.

[7]These industry numbers represent direct exports reported by establishments in the Censuses of Manufactures. Actual export volume is higher, as indirect exports are not included.

surprisingly, traditionally strong export sectors continued to dominate the aggregate numbers. The top five exporting industries, transportation, machinery, chemicals, electronics and instruments, accounted for 77% of total exports in 1987 and 72% in 1992 and two-thirds of the total increase. Transportation and machinery remained the top two manufacturing export sectors and increased their exports at more than twice the rate of the increase in shipments. The breadth of the export boom gives clues as to its sources. Every industry participated, including those that were expanding rapidly such as chemicals and electronics as well as declining industries such as leather and stone. This broad scope of the increase suggests that the sources of the boom are likely to be factors that affect all sectors.

The shift into exporting across industries can also be seen in Table 2 which reports the share of exporting firms by industry. Nationally the fraction of exporting plants rose from 21% to 30% in just 5 years. The most export-intensive industries judged by participation rates were instruments, tobacco, chemicals, electronic equipment, and machinery which all had more than 33% of plants involved in the direct export market in 1987. In 1992 participation rates in these sectors had risen to more than 43%. However, striking changes also occurred in less likely areas. Primary metals saw an increase in exporting plants from 28% to 38% while the fraction of furniture exporters rose from 10% to 24%.

The export boom did not just touch all industries, it reached into almost every area of the country, as shown in Table 3. Except for the Northeast where every state had both sluggish or negative growth in shipments and only modest increases in exports, other regions showed substantial export growth. Traditional export states such as California, Ohio, and especially Washington all saw large rises in export volume. However, Idaho, Nebraska, and Georgia were among the fastest growing export states.

The export boom of the late 1980s and early 1990s swept across industries, regions, and firms. Participation rates in the international market soared in all sectors and a large fraction of the growth in manufacturing shipments can be associated with the increase in exports.

3 A Long Run Perspective

There is little question that the increase in exporting after 1987 was felt in every industry and every region of the country. However, the perception that the U.S. has entered a new regime of increasing openness and export growth is due in large part to the contrast between the early 1980's and more recent years. For the seven years from 1980 to 1987, the real value of U.S. exports grew at a rate of only 2.8% per year,[8] while for the seven years from 1987-1994, as noted earlier, export growth averaged 8.0% per year. However, in comparison to earlier periods, the export growth of recent years is less extraordinary.

Figure 2 shows the log-level of U.S. exports in billions of $1992 for the period 1959-1994. Export growth, represented by the change in the log-levels, averaged 6.6% for the entire period from 1959-1994, or only 1.2% lower than the rate for 1987-1994. More remarkably, a log-linear trend fitted to value of exports from 1959-1973 predicts the level of exports in 1994 to within 2% of the actual value. There are three distinct phases in U.S. export performance over the 35 year period: sustained rapid growth from 1959-1980, low or negative growth rates until 1987 and above average growth since 1987. It appears, at least from visual inspection of the data, that the increases in recent years have merely returned the level of exports to where it would have been in the absence of the dollar appreciation of the early 1980's.

If the export boom has not been an unusual event in terms of growth rates, the question remains why there is the widespread perception that the U.S. has gone through an unprecedented episode of increasing exports. The answer lies in the varying performance of the domestic economy over the same period. Figure 3 shows the export to GDP ratio for the U.S. from 1959-1994.

Again the picture reveals several distinct episodes. Both exports and GDP were growing rapidly during the 1960s and early 1970s, with exports increasing slightly faster, thus raising the export/GDP ratio from 0.032 in 1959 to 0.047 in 1972. Export growth rates rose somewhat in the rest of the 1970s while overall GDP growth rates slipped. By 1980 the export/GDP ratio had climbed to 0.071 where it stagnated during the export doldrums of the next seven years. The largest period of change for the export/GDP ratio

[8] Almost half of the growth for the earlier period occurred between 1986 and 1987.

has been in the 1987-1994 period where it has climbed to an unprecedented 0.108 due to renewed rapid export growth and only modest GDP growth.

This large increase in the share of GDP accounted by exports (and a commensurate rise in the import-GDP ratio) has been the single most important change during the so-called export boom. While the level of exports is not unusually high, at least according to the standards of long run trend growth rates, the export/GDP ratio is at an all-time high, and likely to increase further, unless there is a revival in domestic shipment growth. In the sections that follow we consider competing hypotheses about the source of the increase in exports and also the increase in export intensity.

4 Decomposing Export Growth

In attempting to understand the growth of exports in recent years, we start with a simple accounting exercise, decomposing the growth in aggregate exports into the contributions from existing plants, new plants, and new exporters. Total direct exports reported by plants in the Census of Manufactures increased by $80.9bn from 1987 to 1992 (see Table 4). Of that total increase, 87% came from plants that existed in both years, while 13% came from the net change due to additions from new plants (29%) less the decline from plants that failed in the intervening years (-16%). For plants that existed in both years, exporters in both periods accounted for $49.7bn, or 61%, of the aggregate increase in exports. New exporters added $30.8bn in exports while there was a $9.7bn decline from plants exiting from the export market.

As noted earlier, the percentage of plants exporting increased from 21.5% to 31.2% in just five years (see Figure 4). While these new exporters played an important role in export growth over the period, contributing almost 40% of the total growth, the bulk of the increase came from increased export intensity at existing exporters. The scope of the increase in exports can be seen clearly in Figure 5 which shows the shift in the distribution of exporting establishments to the right. Among plants that export, greater numbers now export a larger fraction of their output, although the vast majority of exporters still ship a relatively small fraction of their output abroad. However, the export boom not only saw the numbers of exporters increase in every part of the distribution, but the increase was largest for plants that shipped a large portion of their output abroad.

Masked by these numbers is the extent to which individual plants increased their export intensity or merely increased their overall shipments, including exports. For any given plant, exports might increase because the plant became more export intensive or because shipments increased, even thought the exports/shipments ratio remained constant. We decompose the increase in aggregate exports into two components,

$$\Delta E = \underbrace{\sum_i \Delta S_i \overline{(E_i/S_i)}}_{\text{Growth Effect}} + \underbrace{\sum_i \Delta\left(E_i/S_i\right)\overline{S_i}}_{\text{Intensity Effect}} \tag{1}$$

for $i = 1, \ldots, I$ plants where ΔE is the aggregate change in exports, ΔS_i is the change in the level of shipments at plant i, $\Delta\left(E_i/S_i\right)$ is the change in the share of exports in shipments at plant i. $\overline{(E_i/S_i)}$ and $\overline{S_i}$ are time averages of (E_i/S_i) and S_i. The total increase in exports can stem from relatively large increases in shipments at export-intensive plants, the *growth* effect, or from increases in export intensity, the *intensity* effect, or some combination of the two.

Table 5 reports the two measures for new exporters (starters), former exporters (stoppers) and plants that export in both years. For all plants taken together as well as for exporters in both periods, increases in export intensity were the largest contributor to aggregate export growth. However, increased shipments at export-intensive firms accounted for more than 37% of the export increase in the aggregate and for more than 42% of the increase for continuing exporters. The decomposition confirms the earlier findings that the dominant characteristic of the export boom was an increase in export intensity, both at the plant level as well as for the economy as a whole.

5 Sources of the Boom

The two main competing (but not mutually exclusive) explanations for the resurgence in U.S. exports are the real devaluation of the dollar from 1985-1987 and increased productivity at U.S. manufacturers. In this section we test these hypotheses using the plant level data from the Censuses of Manufactures for 1987 and 1992. We first discuss the differences between plants that export in the beginning of the period and those that are out of the export market initially and then present results for all plants taken together and exporters in both periods.

The theoretical debate over the slow response of U.S. exports to the decline in the dollar during the mid-1980s has focussed on the existence of entry or sunk costs for potential exporters. As argued by Dixit (1989), Baldwin and Krugman (1989) and Krugman(1989), if firms face one-time costs upon beginning to export, there will be a range of inaction in the face of seemingly favorable exchange rate shocks. Bernard and Jensen (1997) use plant-level data to test for the existence of such entry costs in the U.S. and find strong evidence in favor of sunk costs of exporting. A plant that is not exporting today is 40% less likely to be in the export market next year than a comparable plant that is an exporter today. Those results also show a positive but small increase in the probability that a firm will export when faced with favorable exchange rate movements. As a result of the presence of sunk costs, we would expect that the export-exchange rate elasticity for all firms taken together would be substantially smaller than that of today's exporters.

Firms already participating in the export market account for the bulk of the increase in exports. Starting from the assumption that individual exporters face downward sloping foreign demand for their products and that domestic supply shifts are uncorrelated with changes in demand, we can represent the quantity of exports from any individual plant as

$$E_i = F(D, S) \tag{2}$$

where D is a vector of demand shifters including, but not limited to, increases in foreign income and movements in the exchange rate. S includes variables that shift the export supply, or cost, curve of the plant and can be represented by measures of plant level productivity. The simplest exposition of these two effects can be seen in Figure 6. Changes in exports from the plant can result from shifts in demand, as seen in the upper diagram, or shifts in supply, as represented in the lower box. If the plant faces very elastic demand for its product, as is likely in an industry with multiple producers, then small outwards shifts in the supply (from S^1 to S^2) may result in large increase in exports. Similarly if plants are producing in a flat, or even downward sloping, segment of their average cost curve then small shifts in foreign demand may induce a large supply response.

Normally, identification of supply and demand shocks is difficult and requires the use of appropriate instruments. In the case of exports at the plant level, however, the problem is substantially mitigated by the separation of

factor markets, which are typically local, and demand which is generated abroad. Especially for an economy of the size of the U.S., it seems reasonable to assume that favorable changes in exchange rates and foreign income do not shift down the cost curves of individual domestic firms.[9] Similarly, foreign demand is very unlikely to be affected by domestic supply shocks.

A greater problem lies in the construction of suitable measures of changes in foreign demand. The use of aggregate exchange rate and foreign GDP measures is infeasible as they do not vary in interesting ways across plants, or even industries. Instead to capture changes in foreign demand, we construct industry specific (4 digit SIC) exchange rate and foreign income measures given as follows

$$XR_j = \sum_m \left(\frac{E_{jm}}{E_j} \right) \cdot XR_m \tag{3}$$

$$Y_j = \sum_m \left(\frac{E_{jm}}{E_j} \right) \cdot Y_m \tag{4}$$

where m indexes countries, E_{jm} is the value of exports from industry j to country m, E_j is the total value of exports from industry j, and XR_m and Y_m are the real exchange rate index and PPP-converted GDP of country m respectively. These industry variables are weighted exchange rate and income measures, where the weights represent the share of exports from the industry to the country.[10]

Our preferred measure of shifts in the supply curve is a measure of labor productivity at the establishment. We use valued-added per worker, VA/N, as the labor productivity measure and use plant level changes from 1987-1992 to represent shifts of the cost curve. A potential problem with such a variable arises if changes in export quantities or export intensity are sources of, rather than responses to, shifts in productivity. While we recognize this problem, recent work has found no positive feedback from exporting to productivity (see Bernard and Jensen 1998).

[9] In fact, if some fraction of intermediate inputs are imported then a depreciation will raise unit costs.

[10] We have industry export information for the top 25 US export destinations and use the average shares from 1984-1992 as the weights. The nominal country exchange rates are adjusted using GDP deflators and converted into indices where 1987=100. Foreign incomes are converted into constant dollars using 1990 PPP exchange rates.

To measure the growth in exports, we use two indicators. First we consider the percentage increase in exports as given by the percentage change in exports (Δ lnexports). However this measure is defined only for plants that export in both years, so we also use a measure of export growth at the plant given by

$$\frac{E_t - E_{t-1}}{0.5\,(E_t + E_{t-1})}.$$

This measure is defined for all plants whether or not they export in a given year and ranges from $[-2, 2]$.[11]

Finally, since the increase in export intensity at the plant level is the major contributor to the aggregate increase in exports, we also consider the determinants of the change in export intensity at the plant, given by the increase in the exports to shipments ratio,

$$\Delta\left(\frac{E_i}{S_i}\right).$$

We regress each of these measures of the increase from 1987 to 1992 in export activity at the plant on percentage changes in the exchange rate, productivity, and foreign income measures described above,

$$\Delta\text{Exports Measure}_{ij} = \beta_1 \Delta XR_j + \beta_2 \Delta \ln Y_j + \beta_3 \Delta \ln\left(\frac{VA}{N}\right)_{ij} + \epsilon_{ij}. \quad (5)$$

The expected coefficients are negative for β_1(a positive change in XR_j indicates an appreciation of the U.S. currency), positive for β_2, and positive for β_3.

Table 6 contains regression results for the change in exports and the exports-shipments ratio for all plants taken together over the period 1987-1992. By necessity, we include only plants for which we have observations in both years, eliminating all plants that fail during the interval and those that enter after 1987. The resulting sample accounts for 89% of exports in both years.

For the export growth measure, we find significant coefficients on all three variables with the expected sign in each case.[12] Both the exchange rate and

[11]Davis, Haltiwanger, and Schuh (1996) use this measure in their work on gross job creation and destruction.

[12]For the panel of all plants, we do not report the regression for Δ lnexports since by construction it includes only plants that export in both periods. See Table 7.

foreign income quasi-elasticities are quite large, point estimates of -0.92 and 0.75 respectively, indicating that firms respond strongly to foreign demand shocks.[13] As noted above, this is to be expected if establishment supply and demand curves are relatively flat. The export response to productivity improvements is significant and positive, but substantially smaller in magnitude with a point estimate of 0.033.

Using the change in export intensity as the dependent variable, we find again that the foreign variables have significant coefficients with the expected sign and of substantial magnitude. A 10% depreciation of the industry exchange rate is associated with a 0.4% increase in export intensity at the average plant. Foreign income changes have even larger effects on the composition of output. Productivity improvements at the plant have no significant effects on the composition of output across foreign and domestic shipments, the sign of the coefficient is negative but not significant.

Since we would eventually like to be able to describe the aggregate export response to exchange rate movements, we rerun our specifications for the sample of plants that export in both 1987 and 1992. These continuing exporters account for over 70% of total exports in both years and the bulk of the increase in aggregate exports. Since this group of plants has already incurred any sunk costs in the decision to enter the foreign market, our estimates of the export responses should be greater than those for the sample of all plants taken together and should give us a "cleaner" estimate of the true export supply elasticities.

In Table 7, we report regression results for all three export measures and find, as expected, a much stronger supply response in this sample of plants. Both exchange rate and output supply elasticities are substantially greater than one. Even the productivity elasticity is more than four times larger for this group of plants, suggesting that both supply and demand curves are quite flat once firms have entered the export market.

For these exporting plants, the share of goods shipped abroad responds much more strongly to changes in exchange rates and foreign income. A 10% deprecation shifts 1.5% of output towards foreign sales. However, productivity increases are now negatively related to export intensity suggesting the shifts of the supply curve increase domestic shipments faster than foreign

[13]The use of this measure for export growth, i.e. $[E_t - E_{t-1}] / [0.5 (E_t + E_{t-1})]$, underestimates the true elasticities since it is bounded between -2 and 2 by construction.

shipments.

These results indicate that, to some degree, both changes in foreign demand, working through exchange rates and income, and changes in productivity played a role in the increase in exports from 1987 to 1992. However, to the extent that the export boom was associated primarily with increasing export intensity, the depreciation of the dollar and increases in foreign income were the most significant factors. To quantify the relative importance of the various factors, we calculate their contributions to aggregate export growth in the next section.

6 Contributions to Aggregate Export Growth

To assess the contributions of changes in exchange rates, foreign demand and domestic productivity to aggregate export growth, we assess the role of the three variables in export growth at each plant and then aggregate back up to determine the overall impact.

To start we make use of the decomposition reported in Equation 1,

$$\Delta E = \underbrace{\sum_i \Delta S_i \overline{(E_i/S_i)}}_{\text{Growth Effect}} + \underbrace{\sum_i \Delta \left(E_i/S_i\right) \overline{S_i}}_{\text{Intensity Effect}}.$$

The contribution of each plant to the aggregate increase in exports is given by the sum of the *growth* and *intensity* effects, i.e. the change in plant exports due to increased output with a constant export-shipments ratio and the change in plant exports due to increasing export intensity.

For the sample of all plants, we regress each of these components of plant export growth on our three explanatory variables and report the results in Table 8.

$$\Delta\text{Growth Effect}_{ij} = \delta_1 \Delta XR_j + \delta_2 \Delta \ln Y_j + \delta_3 \Delta \ln \left(\frac{VA}{N}\right)_{ij} + \epsilon_{ij}.$$

$$\Delta\text{Intensity Effect}_{ij} = \delta_4 \Delta XR_j + \delta_5 \Delta \ln Y_j + \delta_6 \Delta \ln \left(\frac{VA}{N}\right)_{ij} + \epsilon_{ij}.$$

For the *intensity* effect, all the variables have the expected signs and are significant, confirming the results from the previous regressions. Once again the magnitude of the foreign variables is substantially larger than for the

productivity measure. Interestingly, for the *growth* effect regression, only the foreign demand and productivity changes are significant. The exchange measure is insignificant with the wrong sign.

To compute the contributions of the three variables to aggregate exports, we rerun the regressions for five quintiles of plants, ranked according to their employment size in 1987, and compute the contribution of the intensity and growth effects for each quintile to the aggregate increase in exports

$$\widehat{\Delta E} = \sum_q \sum_{i \in q} \left(\delta_1 \Delta XR_j + \delta_2 \Delta \ln Y_j + \delta_3 \Delta \ln \left(\frac{VA}{N} \right)_{ij} \right) \quad (6)$$

$$+ \sum_q \sum_{i \in q} \left(\delta_4 \Delta XR_j + \delta_5 \Delta \ln Y_j + \delta_6 \Delta \ln \left(\frac{VA}{N} \right)_{ij} \right) \quad (7)$$

The results are reported in Table 9, with the actual change in exports by quintile in the upper part of the table and the estimated exchange rate, foreign income and productivity contributions by quintile in the lower panel. As expected, the largest quintile of plants is by far the most important in terms of export quantities accounting for well over 80% of the total change in exports. Also, as reported earlier, the *intensity* effect accounts for almost two thirds of the aggregate export increase.

For the estimated changes, we can now assess the relative contribution of exchange rate, foreign income and productivity changes to the *growth* and *intensity* effects. The largest plants again dominate the aggregate but looking across the size groups we find relatively little variation in the relative contribution of the three explanatory factors.

For the *growth* effect, the dominant component is foreign demand with productivity changes contributing about one quarter of the total. The exchange rate contribution is actually negative (remember the insignificant coefficient with the incorrect sign) but even adding the effects from the two foreign variables they still account for the bulk of the export increase.

The results for the *intensity* component are even stronger. The two foreign measures now make up over 97% of the total. In aggregate, changes in the exchange rates and especially foreign income account for over 90% of the change in exports. Productivity improvements do show up as significant but play a much more minor role in the overall export boom.

7 Conclusions

In this paper, we attempt to discriminate between competing explanations for the U.S. export boom after 1987. We consider two hypotheses, one which posits that the export boom was a response to favorable exchange rate and demand changes and another which argues that improved productivity in U.S. firms was the source of the increased exports.

We start by placing the export boom in a broader historical context. While export growth rates were somewhat above average after 1987, the value of real exports appears to have merely returned to long run trend levels. The truly unusual component of the recent export experience has been the unprecedented increase in export intensity at all levels of the economy. Both individual firms and industries are shipping greater fractions of their goods abroad than at any previous time.

We use comprehensive plant-level data to investigate the source of both the rapid growth in exports and the increased intensity. Improvements in exchange rates (real depreciation) and foreign income are strongly associated with both increases in quantities of exports and especially increased export intensity. On the other hand, while productivity increases are indeed associated with increased exports at the plant level, they are not systematically related to increased export intensity. Finally we present an attempt to quantify the importance of the various factors and find that, in aggregate, productivity gains from 1987-1992 accounted for under 10% of overall export growth. Foreign income growth and exchange rate changes were the dominant sources of the export boom.

These results have both positive and cautionary implications for predictions about export growth in the near future. On the positive side, to the extent that foreign income is the most important determinant of export growth and does not slow dramatically, we should expect to see export growth rates similar to the long run average of about 6% per year. On a more cautionary note, the large depreciation of the mid 1980s has most probably run its course. This means that the 8% average growth of recent years is less likely to be repeated. In addition, slower income growth of U.S. trading partners and a large appreciation of the dollar are likely to lead to substantially slower export growth rates. Finally, this paper provides evidence that the rapid export growth, while associated with gains in firm productivity, is more a return to a long run trend than evidence of improved manufacturing

competitiveness.

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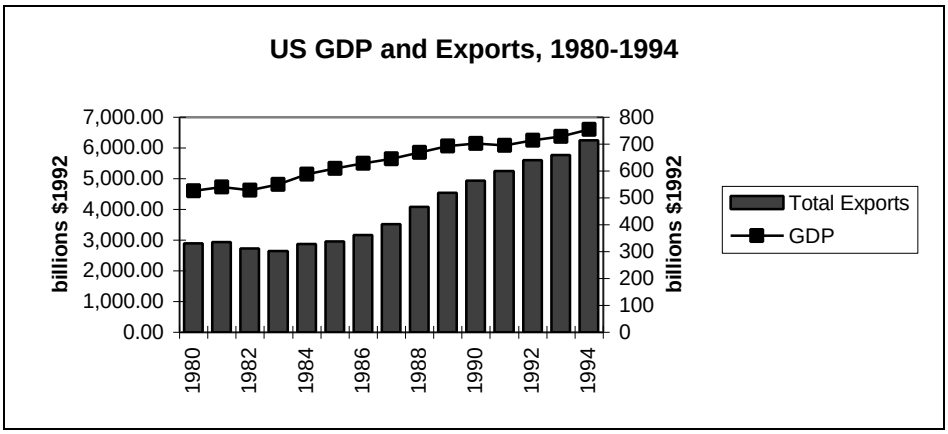
Figure 1



Source: Economic Report of The President, 1996

Table 1: Shipments and Direct Exports by Industry: 1987, 1992[1]

(Plants with >20 employees)

Industry	Shipments						Direct Exports					
	1987		1992		Growth		1987		1992		Growth	
	Value ($Millions)	Rank	Value ($Millions)	Rank	Change	Rank	Value ($Millions)	Rank	Value ($Millions)	Rank	Change	Rank
Food	308,516	2	380,136	2	21%	6	5,790	6	12,457	6	77%	8
Tobacco	20,715	19	34,793	18	52%	1	1,804	11	4,362	11	88%	4
Textiles	59,752	13	67,798	13	13%	14	805	16	1,907	16	86%	5
Apparel	54,510	15	59,275	15	8%	18	422	18	1,129	18	98%	3
Wood	56,645	14	63,358	14	11%	16	1,759	12	2,959	12	52%	15
Furniture	34,426	17	38,913	17	12%	15	220	20	938	19	145%	1
Paper	106,724	9	129,301	9	19%	7	4,633	7	7,695	8	51%	16
Printing	98,937	11	118,224	11	18%	9	482	17	1,523	17	115%	2
Chemicals	210,670	3	280,765	3	29%	2	17,320	3	27,278	3	45%	18
Petroleum	121,298	7	139,140	7	14%	12	1,390	13	2,588	13	62%	10
Rubber	80,981	12	105,021	12	26%	3	2,410	10	4,919	10	71%	9
Leather	8,520	20	8,442	20	-1%	19	373	19	582	20	45%	19
Stone	52,765	16	52,023	16	-1%	20	1,388	14	2,376	14	54%	14
Primary Metals	115,173	8	131,203	8	13%	13	2,668	9	6,126	9	83%	6
Fabricated Metals	130,871	6	146,030	6	11%	17	4,474	8	8,045	7	59%	13
Machinery	198,662	4	228,064	4	14%	11	19,527	2	36,098	2	61%	11
Electronics	164,070	5	206,887	5	23%	4	11,922	4	21,661	4	60%	12
Transportation	326,723	1	383,158	1	16%	10	34,377	1	52,639	1	43%	20
Instruments	103,326	10	127,467	10	21%	5	11,400	5	18,109	5	46%	17
Miscellaneous	26,918	18	32,363	19	18%	8	854	15	1,926	15	81%	7
Total	2,280,201		2,732,362		18%		124,019		215,318		55%	

Source: Census of Manufactures, 1987 and 1992. Growth is calculated as the difference in natural logs.

[1] As mentioned above, direct exports systematically undercount total industry exports and are reported here to indicate the relative magnitude of the changes that took place during the period.

Table 2: Export Participation by Industry - 1987 and 1992

Share of Plants that Export by Industry, Industry Share of Total Output and Exports 1987 and 1992[2]						
	1987			1992		
Industry	% Plants Exporters	Industry Share of All Shipments	Industry Share of All Exports	% Plants Exporters	Industry Share of All Shipments	Industry Share of All Exports
All	.210	1.00	1.00	.302	1.00	1.00
Food	.152	.135	.047	.228	.139	.058
Tobacco	.451	.009	.015	.513	.013	.020
Textiles	.160	.026	.006	.249	.025	.009
Apparel	.045	.024	.003	.094	.022	.005
Wood	.115	.025	.014	.176	.024	.014
Furniture	.101	.015	.002	.247	.014	.004
Paper	.191	.047	.037	.305	.047	.035
Printing	.048	.044	.004	.099	.044	.007
Chemicals	.400	.094	.141	.490	.104	.127
Petroleum	.220	.053	.011	.300	.050	.012
Rubber	.257	.035	.019	.364	.038	.023
Leather	.186	.004	.003	.282	.003	.003
Stone, Clay	.143	.023	.011	.208	.019	.011
Pri. Metal	.271	.050	.021	.387	.047	.028
Fab. Metal	.210	.058	.036	.314	.055	.040
Machinery	.330	.087	.157	.431	.085	.172
Electr. Eq.	.374	.072	.096	.463	.075	.098
Transport.	.291	.142	.276	.398	.138	.243
Instruments	.479	.045	.092	.549	.046	.081
Misc. Mfg.	.197	.012	.007	.341	.012	.009

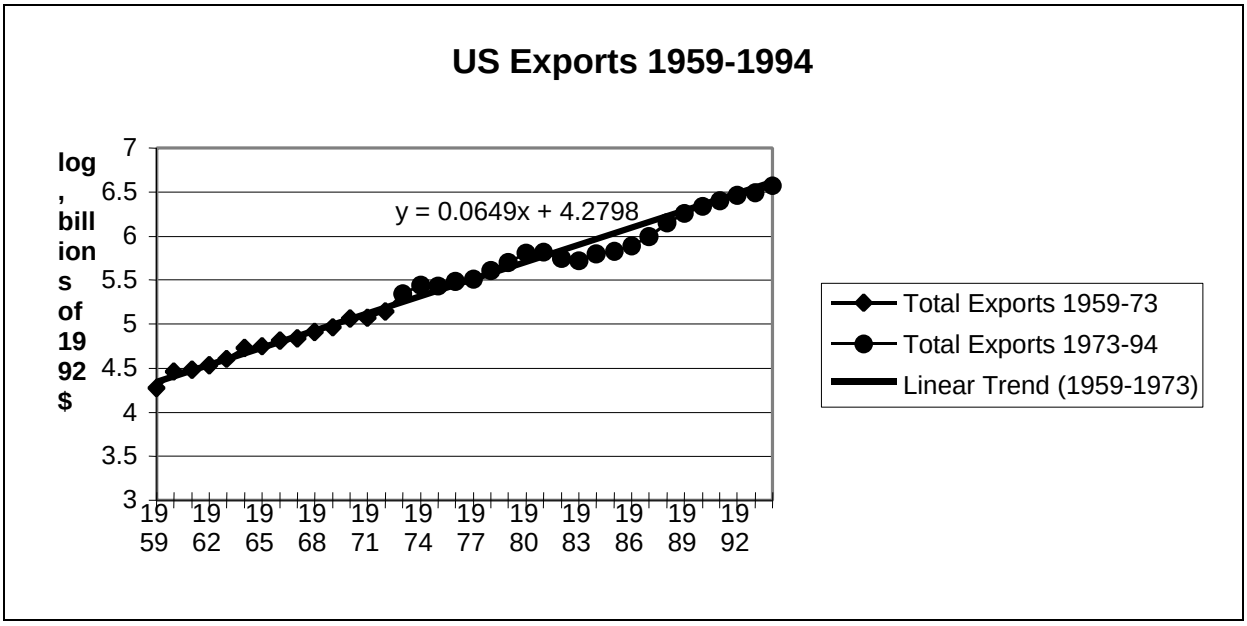
[2] Plants with fewer than 20 employees are excluded from this analysis.

Table 3: Shipments and Direct Exports By State (1987,1992)

(Plants with >20 employees)

	Shipments						Direct Exports					
	1987		1992		Growth		1987		1992		Growth	
State	$mil.	Rank	$mil.	Rank	Change	Rank	$mil.	Rank	$mil.	Rank	Change	Rank
Maine	9,909	39	10,516	38	6%	44	520	36	852	39	49%	31
New Hampshire	11,374	35	10,183	39	-11%	48	684	34	979	37	36%	40
Vermont	4,289	42	5,791	43	30%	10	329	42	428	43	26%	42
Massachusetts	57,162	13	58,016	18	1%	47	3,730	10	5,711	12	43%	35
Rhode Island	11,062	36	8,323	41	-28%	49	411	39	468	42	13%	45
Connecticut	34,472	24	36,970	25	7%	43	3,229	14	4,693	15	37%	39
New York	121,910	6	124,896	7	2%	46	7,022	6	10,778	6	43%	34
New Jersey	75,139	10	77,032	12	2%	45	2,224	20	3,920	20	57%	27
Pennsylvania	109,910	7	127,586	6	15%	37	3,890	9	7,221	9	62%	23
Ohio	149,161	3	172,504	3	15%	38	9,268	3	13,816	3	40%	38
Indiana	80,362	9	99,120	9	21%	26	3,253	13	5,890	10	59%	25
Illinois	122,345	5	145,411	5	17%	35	5,276	7	8,811	7	51%	30
Michigan	139,645	4	150,416	4	7%	41	9,653	2	11,417	5	17%	44
Wisconsin	65,355	12	81,930	11	23%	23	2,630	15	5,879	11	80%	12
Minnesota	44,622	19	52,617	21	16%	36	2,623	16	2,935	23	11%	46
Iowa	32,948	25	43,579	24	28%	12	1,597	24	2,730	25	54%	28
Missouri	55,781	14	68,734	14	21%	28	3,908	8	4,257	17	9%	48
North Dakota	2,328	46	3,361	46	37%	7	147	44	323	44	79%	13
South Dakota	3,572	44	5,627	44	45%	2	132	45	146	47	10%	47
Nebraska	14,438	34	20,743	34	36%	8	456	38	1,390	34	112%	2
Kansas	28,329	26	33,712	26	17%	34	1,140	29	2,251	28	68%	18
Delaware	10,341	38	12,378	36	18%	31	347	41	853	38	90%	6
Maryland	25,856	27	28,407	29	9%	40	1,435	25	2,167	29	41%	37
Virginia	49,129	17	61,710	16	23%	22	2,471	17	4,647	16	63%	20
West Virginia	10,544	37	11,987	37	13%	39	763	32	800	40	5%	49
North Carolina	91,368	8	118,399	8	26%	16	3,490	11	8,316	8	87%	8
South Carolina	38,236	23	47,115	23	21%	27	1,923	22	4,086	18	75%	16
Georgia	71,444	11	85,159	10	18%	32	2,241	19	5,207	14	84%	10
Florida	50,601	16	54,356	19	7%	42	3,294	12	5,282	13	47%	32
Kentucky	39,307	21	53,117	20	30%	9	1,783	23	3,290	22	61%	24
Tennessee	53,988	15	71,006	13	27%	13	1,985	21	4,008	19	70%	17
Alabama	38,436	22	49,195	22	25%	18	1,175	28	2,840	24	88%	7
Mississippi	23,129	29	30,394	28	27%	14	1,014	30	1,822	32	59%	26
Arkansas	23,694	28	31,585	27	29%	11	678	35	1,894	31	103%	3
Louisiana	46,150	18	58,102	17	23%	21	2,270	18	3,485	21	43%	33
Oklahoma	22,477	30	28,070	31	22%	25	709	33	1,377	35	66%	19
Texas	149,716	2	192,358	2	25%	17	8,912	4	13,489	4	41%	36
Montana	2,775	45	3,394	45	20%	30	57	48	75	48	28%	41
Idaho	6,291	41	9,250	40	39%	6	409	40	1,627	33	138%	1
Wyoming	1,657	49	2,161	49	27%	15	10	49	13	49	25%	43
Colorado	21,336	32	26,955	32	23%	19	945	31	2,011	30	76%	15
New Mexico	3,579	43	8,264	42	84%	1	76	47	178	45	84%	9
Arizona	18,940	33	23,317	33	21%	29	1,263	26	2,357	27	62%	22
Utah	9,418	40	14,388	35	42%	4	288	43	735	41	94%	5
Nevada	2,098	48	2,646	48	23%	20	86	46	161	46	63%	21
Washington	42,091	20	65,131	15	44%	3	8,430	5	21,886	2	95%	4
Oregon	22,439	31	28,117	30	23%	24	1,226	27	2,665	26	78%	14
California	227,342	1	270,836	1	18%	33	14,111	1	23,822	1	52%	29
Alaska	2,250	47	3,339	47	40%	5	509	37	1,171	36	83%	11

Figure 2



Source: Economic Report of The President, 1996

Figure 3

Source: Economic Report of The President, 1996

Table 4 : Exports by Plant Type

Plant type	Exports - 1987		Exports - 1992		Change in Exports	
	($millions)	% of total	($millions)	% of total	($millions)	% of total
New	$0	0%	$23,392	11%	$23,392	29%
Failed	$13,241	11%	$0	0%	($13,241)	-16%
Continuing	$111,941	89%	$182,693	89%	$70,751	87%
Stoppers	$9,723	8%	$0	0%	($9,723)	-12%
Starters	$0	0%	$30,801	15%	$30,801	38%
Both	$102,218	82%	$151,891	74%	$49,673	61%
All	$125,183		$206,085		$80,901	

Figure 4

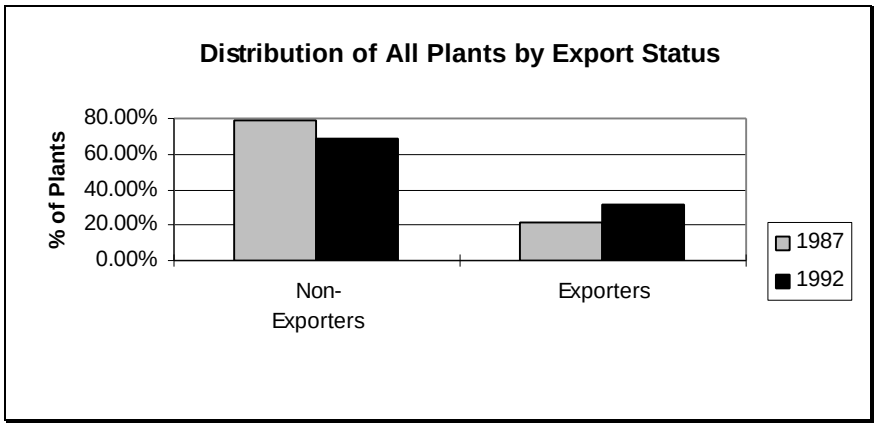

Distribution of All Plants by Export Status
% of Plants
80.00%
60.00%
40.00%
20.00%
0.00%
Non-
Exporters
Exporters
1987
1992

Figure 5

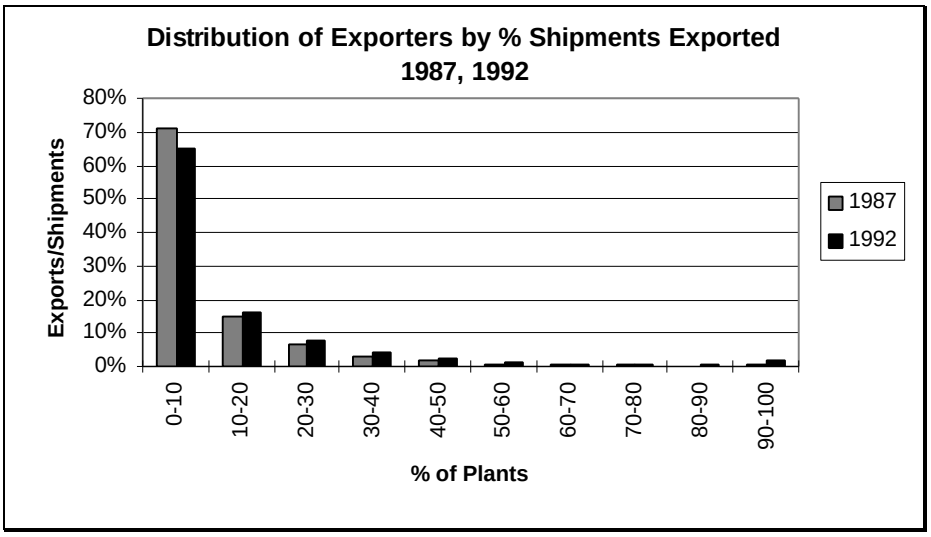
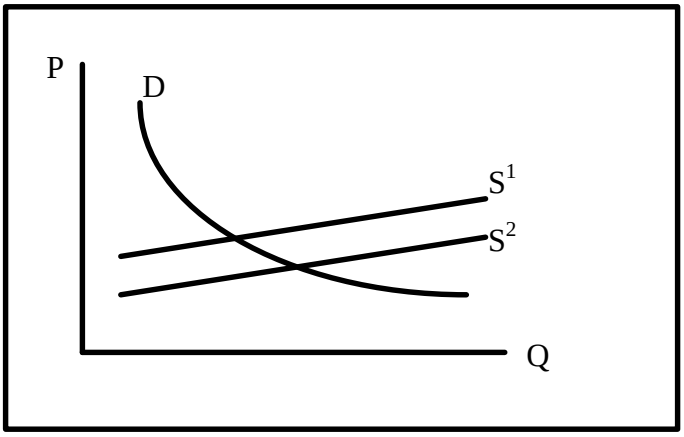

Distribution of Exporters by % Shipments Exported
1987, 1992
Exports/Shipments
80%
70%
60%
50%
40%
30%
20%
10%
0%
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100
% of Plants
1987
1992

Table 5 : Decomposition of Export Growth (1987-1992)

Exporter Type	Growth Effect: Change in Shipments * Average Export Intensity ($millions)		Intensity Effect: Change in Export Intensity * Average Shipments ($millions)		Total ($millions)	
Stoppers	139	0%	-9,861	-14%	-9,722	-14%
Starters	4,149	6%	26,652	38%	30,801	44%
Both	21,547	30%	28,125	40%	49,673	70%
All Continuing	25,836	37%	44,916	63%	70,752	100%

Figure 6

Supply Shift
(Productivity Increase)



Demand Shift
(Exchange Rate, Foreign Income)

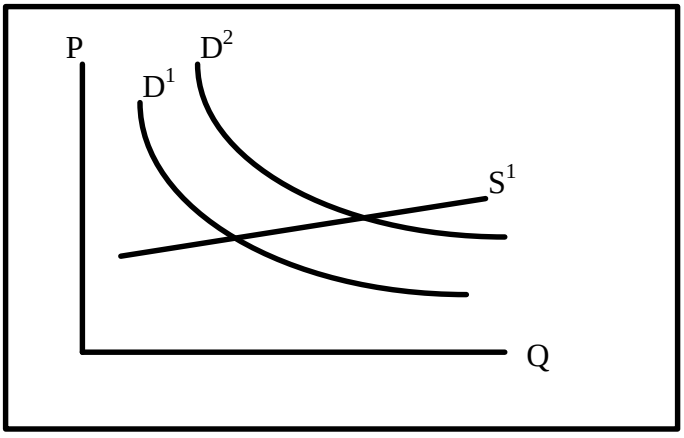


Table 6 : Changes in Exports, Exports/Shipments 1987-1992

(All Plants)

	Dependent Variable			
	Change in Exports (DHS measure)		**Change in Export Intensity** (Exports/Shipments)	
	Estimate	t-statistic	Estimate	t-statistic
Exchange Rate	-0.924	31.52	-0.924	31.52
Foreign Income	0.752	15.38	0.752	15.38
Labor productivity	0.033	8.52	0.033	8.52
N	106510		106510	
R^2	0.044		0.045	

Table 7 : Changes in Exports, Exports/Shipments 1992-1987

Continuing Exporters

	Dependent Variable					
	Change in Exports (ΔlnExports)		**Change in Exports** (DHS measure)		**Change in Export Intensity** (Exports/Shipments)	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Exchange Rate	-2.558	16.56	-1.809	18.61	-0.152	11.51
Foreign Income	1.321	5.39	0.981	6.36	0.135	6.43
Labor productivity	0.186	9.40	0.135	10.81	-0.009	5.42
N	14434		14434		14434	
R^2	0.100		0.125		0.062	

Table 8 : Changes in Exports - Decomposition

All Plants, 1992-1987

	Dependent Variable			
	Growth Effect		**Intensity Effect**	
	Estimate	t-statistic	Estimate	t-statistic
Exchange Rate	286.2	0.49	-1109.5	3.38
Foreign Income	3414.8	3.48	2773.4	5.07
Labor productivity	676.5	8.62	130.7	2.99
N	106497		106497	
R^2	0.001		0.002	

Table 9 : Contributions of Foreign Income, Exchange Rates and Productivity to Export Growth

	Size Groups							
Actual	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	ΣQuintiles	Δ in Total Exports	
Growth Effect	0.7%	1.2%	2.9%	10.1%	85.1%	25,836	70,752	36.5%
Intensity Effect	0.6%	1.2%	3.5%	10.8%	83.9%	44,916		63.5%
Estimated								
Growth Effect								
Exchange Rate	-0.9%	-1.4%	-2.0%	-0.6%	104.8%	(8,492)	60,818	-14.0%
Foreign Income	0.3%	0.5%	1.4%	6.4%	91.4%	27,265		44.8%
Productivity	-0.2%	0.1%	1.1%	9.1%	89.8%	5,317		8.7%
Intensity Effect								
Exchange Rate	0.0%	1.7%	4.3%	12.8%	81.2%	11,196		18.4%
Foreign Income	1.1%	1.2%	3.0%	9.1%	85.6%	24,746		40.7%
Productivity	0.3%	0.3%	2.5%	28.2%	68.7%	783		1.3%