Moving Up and Moving Out:
US Product-Level Exports and Competition from Low Wage Countries[1]

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Product cycle theory has developed countries inventing goods and developing countries copying them. Once copying takes place, developed countries abandon the market – either outright, or through vertical differentiation – because of developing country cost advantages. Matching US imports and exports at the product level, I find evidence of both reactions – moving up and moving out – during the 1990s. Three trends stand out. First, US intra-product trade is lower with respect to low-wage trading partners than it is with respect to high-wage trading partners. Second, US export unit values are significantly higher than low-wage country import unit values in products where the US and low-wage countries overlap. Finally, US exports in some industries decline over time as competition from low-wage countries rises. Consistent responses are also noted among US manufacturing industries: increased competition from low-wage countries is associated with declining output and skill and capital deepening.

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1 Issues

Product cycle theory has advanced countries abandoning product markets as developing countries enter them. In most versions of the theory, this competitive cycling is driven by a combination of advanced-country technical prowess and developing-country cost advantages. At the beginning of the product cycle, advanced countries invent, manufacture and export new goods to developing countries. Then, as developing countries figure out how to manufacture the goods, developed countries are driven from the market due to their higher costs.[1]

Empirically identifying the extent to which countries cycle through products is difficult using industry-level data because product differentiation can be fine relative to the coarseness of industries.[2] I tackle this problem by matching US imports and exports at the *product* level from 1989 to 1999. As a result, I can examine US trade in thousands of goods rather than a few hundred industries.

I use product-level import data to develop a measure of import competition that focuses on where imports originate rather than their magnitude. This index records the share of product value originating in countries with less than 5% of US per capita GDP (e.g. China, Egypt and Indonesia). It can be computed for 1972 to the present and aggregated up to any industry classification desired. These provide it with an important advantage over existing measures of import competition, such as import penetration and import price indexes.

I find US trade to be consistent with the key implications of product cycle theory. Most important, US intra-product trade with low-wage countries is about half the level it is with high-wage countries, suggesting that the US product mix is relatively more distinct from that of low wage countries. Over time, there is also some evidence that US exports decline as low-wage competition rises. In Textiles, for example, a 25 percentage point increase in low-wage competition (equivalent to a one standard deviation jump above zero) is associated with a 2.25% decline in real exports. This trend is suggestive of the US "moving out" of products that low-wage countries enter.

I also find evidence that the US "moves up" in response to competition. US export unit values are significantly higher than low-wage country import unit values when US and low-wage country product mix overlaps. In part this is because low-wage countries enter markets with vertically inferior products, but there is also some evidence that US unit values increase once competition commences. This evidence of vertical differentiation is present in a broad range of industries, but is strongest among Machinery products.

An important assumption justifying the use of trade data to uncover evidence of product cycle theory is that the goods that countries trade accurately reflect domestic

[1] Important early contributions to product cycle theory include Posner (1961) and Vernon (1966, 1979).

[2] Attempts to surmount the problems of industry coarseness do exist. See Balassa (1966), Finger (1975), Aquino (1978), Leamer (1984) and Schott (2001) for examples in various contexts.

production. This assumption is surely violated to some degree: tariffs and other trade barriers, for example, shield some US industries from international competitors, thereby allowing domestic production to continue long after export markets dry up. On the other hand, because the implications of model center on the cycling of *viable* goods, trade data may be a more appropriate target of inquiry in that they reflect a country's ability to compete successfully in external markets.

In any case, I supplement examination of trade data with a brief look at the relationship between low wage competition and US production. Merging the product-level competition index into a dataset on US manufacturing industry production for the years 1972 to 1996, I find that competition from low-wage countries is associated with declining output and increasing skill and capital deepening. These trends are consistent with a reallocation of US manufacturing toward a more sophisticated product mix.

This paper is most closely related to the literature testing product cycle theory, though it is the first to use product-level data. The most recent contribution to this field, by Feenstra and Rose (1999), demonstrates that the order in which countries begin exporting industries to the US is consistent with macroeconomic rankings typically associated with technological prowess. Earlier work by Gagnon and Rose (1995) takes an alternate approach by exploring disaggregate national trade balances for evidence of cycling. They find a high degree of temporal persistence in these balances, which they interpret as evidence against product cycles, which are assumed to move relatively quickly.[3]

Results in this paper are also relevant to recent research into firm turnover and growth. Surprisingly, the effect of competition from low-wage countries on firms and plants in rich countries is relatively unexplored.[4] Bernard and Jensen (2001) are an exception; they find that the least capital- and skill intensive plants within industries have a significantly higher probability of failure. To the extent that the output of those plants is most likely to overlap with output from low-wage countries, that evidence is consistent with product cycles and the results that I report.

This paper also contributes to the burgeoning literature on intra-industry trade. In particular, our use of unit values to discern within-product vertical specialization in US trade data follows Greenaway, Hine and Milner's (1995) use of industry, per-ton unit values to study Canadian trade. Like those authors, I find substantial variation in measures of intra-industry trade at successively fine levels of output aggregation, an indication that industries hide a substantial degree of underlying product heterogeneity. The more detailed US trade data, however, allows for much finer estimate of vertical differentiation.

The remainder of this paper proceeds as follows: section 2 contains a brief outline of product cycle theory and the hypotheses I test; section 3 describes the data I use; section 4 compares US intra-product with US intra-industry trade; section 5 introduces an index of low-wage country competition and estimates the extent to which the US moves

[3] Gagnon and Rose (1995) summarize early, less direct tests of product cycle theory by Wells (1969), Finger (1975), Hirsch (1975), Soete (1981), Audretsch (1987) and Cotsomitis *et al* (1991).

[4] See, for example, recent surveys by Sutton (1997), Caves (1998) and Tybout (2000, 2001).

up and out; section 6 contains an examination of US production data; and section 7 concludes with suggestions for future research.

2 Product Cycle Theory

In product cycle theory, Leader countries invent goods and export them to Follower countries until the latter figures out how to copy the good and enter the market (Posner 1961, Vernon 1966, 1979). Because of its lower production costs, Follower eventually then drives Leader out of the market as it becomes the sole supplier of the good.[5] During this cycle, illustrated in the left hand panel of Figure 1, Leader moves from being an exporter of the good to an importer. A "quality ladder" variant of this model has Leader and Follower trading dominance of a particular good over time, as Leaders re-enter the market for an existing good by innovating and offering a more advanced version (Grossman and Helpman 1991). In this paper we capture such differentiation empirically via unit value dispersion.

A similar sort of cycling is implied by the factor proportions framework. In the multiple cone equilibrium of the Heckscher-Ohlin model, for example, a country's product mix varies according to its relative factor endowments, as in the right hand panel of Figure 1. In the figure, countries enter successively more capital intensive product markets as their endowment of capital relative to labor increases.

The key difference between product cycle theory and the factor proportions framework is that new product introduction is an explicit component of the former but ignored in the latter. This distinction is most important for the most advanced countries because in both models, less advanced countries inherit existing goods. In any case, to the extent that countries' technological ability is correlated with endowments, and that both are correlated with time, it can be quite difficult to distinguish the specialization implied by product cycles from that implied by factor proportions.

The reallocation of manufacturing in both models provides the motivation for our empirical investigation. First, I examine the extent to which the product mix of the US and its lowest-wage trading partners overlaps. This overlap should be lower than that between the US and other rich countries, but it does not have to be zero: as detailed in Figure 1, Leader and Follower jointly produce a good while the market is in transition.

If there are several Follower cohorts (i.e. goods pass from the US and Germany to Korea and Taiwan and then from Korea and Taiwan to the Philippines and Indonesia), then overlap should be lower the further apart countries are in terms of technological prowess. Toward that end, I compare US product mix overlap with respect to low- and high-wage trading partners under the assumption that the lowest wage countries are the furthest behind the US in terms of their ability to copy goods.

The second examination focuses on US withdrawal from export markets. I consider two forms of exit. The first is a decline in the level of exports. The second is vertical product differentiation within a product category as measured by unit value

[5] In Vernon (1966), Leaders are leaders because their large, wealthy markets provide firms with a strong incentive to invent sophisticated products.

dispersion. Note that if product classification were ideal, within-product unit value dispersion would not exist. Thus, unit value dispersion is another form of exit.

As noted above, it is possible that the US ceases exporting a good before it ceases production for the domestic consumption. To investigate this hypothesis, in a final section I check the robustness of the trade results by examining the link between low-wage competition and US industrial production.

3 Data Description

Data available from the US Census Bureau and Feenstra (1996) track the customs value of all US imports and exports by source and destination country for the years 1972 through 1999.[6] Trade flows are classified according to seven digit Tariff Schedule of the United States (TS7) codes from 1972 to 1988 and according to ten digit Harmonized System (HS10) codes from 1989 to 1999.

I match US imports at the HS10 level for 1989 to 1999 (see Appendix for details). For the remainder of the paper I refer to HS10 imports or exports as "goods" or "products". Higher levels of aggregation, such as the one digit Standard International Trade Classification (SITC1), the 1987 revision of four digit Standard Industrial Classification (SIC4r87) or the six digit HS, are referred to as "industries" or "sectors".

Table 1 provides examples of the type of products contained in SITC1 industries. In the empirical work to follow, I focus on manufacturing goods and omit products belonging to the ninth SITC1 industry due to their idiosyncratic nature (e.g. State Department Recordings, Antiques More than 100 Years Old).

The US Census trade data also include quantity and unit information for a large portion of products, rendering possible the calculation of import and export unit values.[7] Availability of unit values ranges from 77% of country-good observations in 1972 to 85% in 1999, with unit values for natural resources generally being more available than for manufactures. Machinery, arguably the most heterogeneous industry, has the lowest coverage, growing from 56% of country-good pairs in 1972 to roughly 75% in 1999. This growth is largely attributable to an increase in electronics trade, for which quantity categories are more prevalent.

Examples of the units employed in the data include dozens of shirts in apparel, square meters of carpet in textiles and pounds of folic acid in chemicals. Import and export unit values for each product are computed as value-weighted averages: imports are averaged across source countries while exports are averaged across destinations.

I also rely upon per capita GDP (PCGDP) estimates from the 2000 World Bank CD-ROM to group countries by per capita income relative to the US. I define low-wage

[6] Customs value is the value upon which duties are assessed. It does not include shipping charges and is intended to serve as an arm's-length transaction value for the commodity.

[7] Unit values are not without error. In a 1995 study, the General Accounting Office identified underlying product variation (studied more broadly here) and classification error as the two major sources of unit value dispersion in an in-depth analysis of eight products. Classification error included inaccurate recording of units and misclassification of goods. Value-weighted unit values are used in cases where multiple product-country observations exist in a single year.

countries as countries whose per capita GDP is less than 5% of the US level. The identity of low wage trading partners, by year, is reported in Table 2. Examples of countries included in the list are China, Egypt and the Philippines.

I use national income rather than wages or endowments to gauge relative labor costs because the former data are available for a much larger sample of countries over a longer time period.[8] Sample size is an important consideration for our analysis because product mix overlap should be less pronounced the more dissimilar the countries. Because GDP is not a reliable proxy for natural resource endowments, the empirical examination is confined to manufacturing.

4 Intra-Product versus Intra-Industry Trade

Figure 2 illustrates the overlap of US import and export products by SITC1 manufacturing industry. The figure contains two bars for each industry. The thin gray bar depicts the number of goods exported (above zero) or imported (below zero) by the US in 1999. The wider black bar, on the other hand, notes the number of overlap goods, i.e. the number of goods that are both imported *and* exported in 1999. Thus, the black bars are symmetric around zero.

In 1999, the US exported and imported 1154 and 2037 Chemical products, respectively. 835 of the products – 76% – overlapped in the send that they were both imported and exported. Across manufacturing, overlap is highest in Machinery and lowest in Miscellaneous Manufacturing and Manufactured Materials, which are dominated by Textiles and Apparel, respectively. The general impression left by Figure 2 is that the overlap of imports and exports in the US is lowest among goods generally thought to be labor intensive.

Product overlap can be measured via the Grubel-Lloyd (1975) index of intra-industry trade,

$$GL_{pt} = 100 - 100 * \frac{\left| X_{pt} - M_{pt} \right|}{X_{pt} + M_{pt}}, \qquad (1)$$

where X_{pt} and M_{pt} represent the dollar value of exports and imports of product *p* in year *t*, respectively.

An import problem with the GL index is its susceptibility to aggregation bias, which hampers its ability to distinguish vertical from horizontal trade (Gray 1979; Greenaway and Milner 1983). If, for example, the US exchanges capital intensive electronics for labor intensive electronics with a developing country, intra-industry trade in the electronics industry can be high even though the underlying (vertical) intra-product trade is zero.

[8] Sachs and Shatz (1994) use manufacturing wages to identify "developing" countries in their analysis of the employment effects of developing country import penetration across three digit SIC manufacturing industries from 1978 to 1990.

Greenaway and Milner (1983) illustrate the relevance of this concern by reporting substantial decay in measurements of 1977 UK intra-industry trade across successively fine levels of industry aggregation (SITC1 to SITC4). In Table 3 I go a step further, comparing 1999 US GL indexes down the to the product level. The first column of the table reports intra-industry trade across SITC1 industries. Subsequent columns report the average GL index across the sub-industries noted in each column, down to the product level in the final column. As indicated, average GL indexes fall off substantially with disaggregation: whereas intra-industry trade in Machinery is 87 at the SITC1 level, its average across all 3,663 Machinery products is 31. Across the four manufacturing industries, intra-product trade is higher for Machinery and Chemical products and lower for Manufactured Materials and Miscellaneous Manufacturing products.[9]

A key implication of product cycle theory is that US product mix be less similar to low wage countries than high wage countries. Evidence supporting this implication across SITC1 industries is presented in Table 4, which reveals that US intra-product trade with low-wage countries is roughly half the level it is with high-wage countries. The evidence for SITC2 industries, in Table 5, is similar. In both tables, high-wage trading consist of all non-low-wage countries. Very similar results, however, are obtained a smaller set of high wage countries, such as the OECD.[10]

Table 4 and Table 5 also report a quantity version of the GL index as a check on whether the value trends are driven by the lower prices of low wage country imports. In the quantity version, the value of exports and imports in equation (1) (i.e. X_{pt} and M_{pt}) are replaced by import and export quantities. Very similar results are obtained. Finally, results over time (not shown), indicate that GL indexes, both in aggregate and with respect to rich and poor countries, are relatively stable.

5 US Trade Response to Low Wage Competition

I measure the severity of low wage competition at the product level via the share of US import value (V) or quantity (Q) originating in low wage countries,

$$V_{pt}^{N} = \frac{\sum_{c \in L} M_{pct}^{V}}{\sum_{c \in C} M_{pct}^{V}}, \qquad \text{(2a)}$$

[9] Results do not control for the potential endogeneity of product classification. One explanation for the relatively low *intra-product* trade in Manufactured Material and Miscellaneous Manufactures products (i.e. the final column of Table 3) is that Textile and Apparel goods are categorized more finely (in terms of the number of product codes) than Chemical or Machinery goods. On the other hand, the relative ranking of *intra-industry* trade for SITC1 industries is the same as the average across products at lower levels of aggregation, indicating that some factor other than the way in which products are classified plays a role.

[10] Results are also similar when GL indexes are measured at the HS8 and HS6 levels of aggregation.

$$Q_{pt}^{N} = \frac{\sum_{c \in L} M_{pct}^{Q}}{\sum_{c \in C} M_{pct}^{Q}}, \qquad (2b)$$

where M_{pct}^{V} and M_{pct}^{Q} represent the value and quantity of US imports of product *p* from country *c* in year *t*, respectively, L is the set of countries in year *t* whose per capita GDP is less than *N*% of US per capita GDP and *C* is the set of all countries. Though I use 5% as a cutoff for low wage countries for the remainder of the paper, results are similar for higher and lower cutoffs.

As measures of import competition, V_{pt}^{N} and Q_{pt}^{N} have several advantages over import penetration and import price indexes. Import price indexes, for example, are available only at very high levels of aggregation and for a relatively recent history, limiting their empirical usefulness. Import penetration, on the other hand, focuses on the magnitude rather than the origin of imports. In addition, it incorporates information about domestic production that is unavailable at the product level.

The correlation of V_{pt}^{5} and Q_{pt}^{5} varies by industry but is in general quite high. In 1999, the correlation across products in Chemicals, Manufactured Materials, Machinery and Miscellaneous Manufacturing products is 0.90, 0.95, 0.85, and 0.94, respectively. That machinery should have the lowest correlation is not surprising given that this industry shows the greatest unit value dispersion across products (see section 5.2).

Figure 3 summarizes the 1999 distribution of V_{pt}^{5} via a box and whisker plot. Each industry's box spans the measures' interquartile range, while the line in the middle of the box identifies the median value. Whiskers extend above and below the 25th and 75th percentile for a distance of 1.5 times interquartile range. Extreme observations beyond these lines are omitted from the figure to promote readability. Each industry, however, contains at least one good that is imported exclusively from low wage countries (i.e. where $V_{pt}^{5} = 1$).

V_{pt}^{5} is skewed toward zero for most industries, and is generally higher in the four manufacturing SITC1 industries (i.e. 5, 6, 7 and 8) than in non-manufacturing industries.[11] Within manufacturing, Manufactured Materials and Miscellaneous Manufactures face the highest level of low-wage country competition. This outcome is not too surprising given that these industries are dominated by Textiles and Apparel, industries often thought of as being the most labor intense. On the other hand, the US Apparel and Textiles industries have been protected by quotas negotiated under the Multifiber Arrangement and its predecessors since the early 1970s. Apparel and Textiles (along with Footwear) also exhibit the highest tariffs among SITC2 industries. In the

[11] The relatively high competition for Fuel in the figure is due to the imperfect ability of per captia GDP to proxy for resource endowments. Competition in Fuel is driven by oil-rich Nigeria, which has less than 5% of US per capita GDP for the entire 1989 to 1999 sample period. For this reason, I focus on manufacturing industries for the remainder of the paper.

absence of such protection (the Multifiber Arrangement is due to expire in 2004), measured competition would likely be higher.

Figure 4 plots the evolution of low-wage country competition across SITC1 manufacturing industries from 1989 to 1999. Each panel contains two time series: the dashed line corresponds to weighting competition by export value while the solid line reflects weighting by import value. In addition to being higher, competition increases more quickly in Miscellaneous Manufacturing and Manufactured Materials than in Chemicals and Machinery. The relative ordering of the series is also sensible; it indicates that US exports are higher in product markets less inhabited by low-wage countries.

An examination of competition across SITC2 industries uncovers the same sort of industry heterogeneity apparent in the GL indexes above. Table 6, for example, sorts SITC2 industries by import-weighted competition. Six out of the eight Miscellaneous Manufacturing industries – Footwear (85), Travel Goods (83), Plumbing/Heating (81), Apparel (84), Miscellaneous Manufacturing (89) and Furniture (82) – top the list as being subject to the most intense competition from low-wage countries. The remaining two Miscellaneous Manufacturing industries, which exhibit far lower competition from low-wage countries, are, perhaps unsurprisingly, Photographic Apparatus (88) and Professional Equipment (87). The latter includes products like microscopes and surgical instruments, which are easy to think of as being relatively more sophisticated than Footwear and Apparel.

5.1 Export Market Exit In the Face of Low Wage Import Competition

To gauge the extent to which the US moves out of product markets, I estimate via OLS whether the annual change in real (i.e. quantity) exports varies with quantity competition,

$$\ln\left(\frac{X^Q_{pt+1} - X^Q_{pt}}{\left(X^Q_{pt+1} + X^Q_{pt}\right)/2}\right) = \alpha_0 + \sum_y \alpha_{1y} d_y + \sum_p \alpha_{2p} d_p + \alpha_3 \ln(X^Q_{pt}) + \alpha_4 Q^5_{pt} + \alpha_5 \left(Q^5_{pt}\right)^2 + \varepsilon_{pt} \quad , \quad (4)$$

where the dependent variable is a normalized growth rate equaling –2 and 2 for withdrawal and entry, respectively. Included in the regression are product and year fixed effects, so that coefficients pick up the variation within industries over time. Regression errors are clustered by product.

Results pooling goods across all manufacturing products as well as by SITC1 industry are reported in Table 7. As indicated in the table, the association between competition from low-wage countries and export varies across sectors. In Manufactured Materials, coefficient estimates imply that moving from the 25th to the 75th competition percentile (i.e. Q^5_{pt} increasing from zero to 0.23, which is also a one standard deviation increase in1999) reduces exports by about 2.25%.

One explanation for the weak relationship between competition and export growth in Manufactured Materials and Miscellaneous Manufactures is that US exports of products, as indicated by the Grubel-Lloyd indexes above, is already quite low by 1989. Another explanation is that the existing product overlap is vertical: though the US both imports and exports goods in common with low wage countries, the US goods are vertically superior. Evidence on unit value dispersion in the next section is consistent with this explanation.

5.2 Export Market Upgrading in the Face of Low Wage Import Competition

Firms may decide to upgrade rather than exit in response to competition. One way in which upgrading may be revealed is via an increase in the relative value of a US export due to improvements in quality or the addition of new features.[12]

Table 8 compares US export unit values (EUV_{pt}) to low-wage country import unit values (IUV_{pt}^5) across SITC2 manufacturing industries and time. For each product, EUV_{pt} is the average US export unit value of product *p* in year *t* across destination countries, weighted by the value of exports to each market. IUV_{pt}^5, on the other hand, is the average import unit value of product *p* in year *t* across all low-wage source countries, weighted by import value.

For each industry and year, the table reports the p-value associated with the null hypothesis that export and import unit values are equal (i.e. $EUV_{pt} = IUV_{pt}^5$). The final column of the table reports p-values when observations are pooled across years.

Results vary by industry. Pooled results indicate that export unit values are significantly greater than low-wage country import unit values in all but two SITC2 Machinery industries. The exceptions are General Industrial Machinery and Miscellaneous Transport Equipment. While the latter exhibits weak evidence against equality in several years, evidence against inequality in General Industrial Machinery ends abruptly in 1995. This break in significance may be related to a change in the underlying product classification system and is worthy of further inquiry.

Pooled export and import unit value equality is also rejected in rejected in several Miscellaneous Manufacturing industries, including Furniture, Footwear and Professional Equipment. That Footwear should exhibit evidence of vertical differentiation while Apparel and Textiles do not is quite interesting given that all three are relatively labor intensive and exhibit low levels of intra-product trade. Here, too, the difference may be due to the Multifiber quotas protecting Apparel and Textiles but not Footwear.

There is very little evidence of vertical differentiation across Chemical and Manufactured Material industries.

Results thus far are based upon products at different stages of competition. A cleaner, alternate approach is to seek evidence of vertical differentiation in the year competition commences. Toward that end, Table 9 records median unit value ratios

[12] Vertical differentiation in response to competition may also manifest as a *horizontal* shift across related products. Results (not reported), however, indicate that US exports do not shift across HS10 product codes within HS8 (or HS6) industries in response to relative competition across goods.

(EUV_{pt} / IUV_{pt}^{5}) and p-values for unit value equality ($EUV_{pt} = IUV_{pt}^{5}$) across SITC2 industries for the subset of goods where low-wage country entry (after 1989) can be observed. All goods summarized in the table where exported by the US but not imported from low-wage countries prior to the entry date. The second column of the table reports the number of products where entry is observed. Entry is observed for relatively few goods, a fact that should be kept in mind while reviewing the table's results.

The third and fourth columns of the table indicate that low-wage country imports in five out of nine Machinery industries, and two out of five Miscellaneous Manufacturing industries (Professional Equipment and Photographic Apparatus), enter their markets at prices significantly lower than the US export price. Thus, low-wage countries appear to enter these markets with products that are vertically inferior to the US product.

Results do not indicate any significant difference in import and export unit values in any Chemical or Manufactured Material industries. To the extent that equal unit values indicate a lack of vertical differentiation, product cycle theory implies that the US will either move up or move out of these products. To evaluate this implication, I report p-values for real export growth and real unit value growth in the fifth and sixth columns of Table 9.[13]

Results provide some support for the dynamic implications of product cycle theory. Several of the industries where the US lacks of vertical differentiation when low-wage countries enter, including Medicines (54), Plastics (58) and Iron and Steel (67), experience a significant decline in real export growth with the onset of competition. Several others experience an increase in unit value. One industry – Metal Manufacturing (69) – experiences both effects. The travails of US Iron and Steel firms are well known, as are the numerous anti-dumping claims filed on their behalf (see, for example, Prusa 1996 and Blonigen and Prusa 2001). An interesting question is whether the ability to restrict imports via anti-dumping duties has kept the industry from upgrading its products, exiting the market, or both.

There is also evidence that the forces described by product cycle theory operate in industries where the US already enjoys vertical superiority. Telecommunications Machinery (76), which exhibits an export unit value premium of roughly 3.5 when competition begins, experiences a reduction in real exports and in increase in export unit values after low-wage country entry. One explanation for why both reactions occur may be heterogeneity among products within the industry. Unfortunately, there are too few products where entry is observed to investigate the effects of competition formally at lower levels of aggregation.

Results also suggest more complicated forces may be at work. In two of the industries where vertical differentiation is manifest – General Industrial Machinery (74) and Office Machines (75) – for example, US export unit values decline after low-wage countries enter the market. To the extent that consumers substitute lower quality low-

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[13] Results for real export growth are taken from a regression of post-entry real exports on pre-entry real exports and the pre-entry US dollar trade-weighted exchange rate. Results for export unit value growth deflate unit values by the US GDP deflator and also control for exchange rates.

wage country goods for higher quality US goods, this outcome may be driven by a reduction of US profit margins. Certainly market structure is an important determinant of both the level and price of US exports and imports.[14] Unfortunately, it is quite difficult to control for such structure and provide a rigorous test of the theories based upon it with the data at hand.

6 US Production and Low-Wage Country Competition

Using trade data to estimate product cycle theory assumes that the goods countries trade accurately reflect the goods they produce at home. To check whether evidence for the model generated thus far can also be found US production patterns, I merge the low-wage country competition index introduced in the previous section into the NBER-CES Manufacturing Industry Database (NBERMID) compiled by Bartelsman, Becker and Gray (2000). The NBERMID tracks US manufacturing annually at the four digit 1987 SIC industry level (SIC4r87) from 1958 to 1996. The database includes measures of industry shipments, skill intensity (non-production workers per production worker, or *NP/P*) and capital intensity (capital per labor or *K/(NP+P)*). The merged dataset is available for the years 1972 through 1996.

Low-wage country competition at the product level can be aggregated to SIC4r87 industries via,

$$V_{it}^{5} = \frac{\sum_{c \in L} M_{pict}}{\sum_{c \in C} M_{pict}}, \qquad (2)$$

where $p \in i$ are the goods that make up industry *i* and the other variables are defined as above. As noted in the Appendix, mapping products to SIC4r87 industries is a complicated process involving several imperfect concordances. I am able to compute a competition index for 385 of 459 industries.

Table 10 reports OLS results of regressing log changes in real shipments, capital intensity and skill intensity on low-wage country competition (V_{it}^{5}) and the lagged logs of other production controls. Included in the regression are industry and year fixed effects, so that coefficients pick up the variation within industries over time. In addition, regression errors are clustered by industry.

As noted in the table, competition is negatively correlated with shipment growth and positively correlated with capital and skill deepening. Coefficient estimates imply that a one standard deviation jump in competition (approximately 0.16 in 1996) is associated with a 0.7 percentage point decline in real shipments and 0.8 and 1.0 percentage point increases in skill and capital intensity, respectively.

All three effects are consistent with the view that competition from poor countries forces US firms to drop relatively unsophisticated goods in favor of a more skill and capital intensive product mix. Unfortunately, these data cannot shed light on the extent to

[14] See, for example, Sutton (1991).

which existing firms update plants to produce this new mix of goods rather than construct new ones. It also cannot address the factors which permit some firms to upgrade rather than exit. These results are consistent with recent research into US manufacturing plant turnover by Bernard and Jensen (2001), who find that US manufacturing plant failure is inversely correlated with skill and capital intensity.

7 Conclusion and Future Research

Understanding how competition from low wage countries influences the US product mix is an integral part of determining how the gains and losses from trade are distributed across the US economy. From 1972 to 1999, the portion of US manufacturing value imported from the poorer half of the world's countries increased by a factor of 4, from 5% to 20%. But the share of trade "touched" by poor countries is much larger: by 1999, products originating in at least one of the poorest half of countries represented 90% of the total value of manufacturing imports. Thus, the influence of low-wage countries can extend far beyond the level implied by the magnitude of their trade.

The evidence reported in this paper suggests that the US responds to competition from its lowest-wage trading partners – as measured by the share of imports originating in countries with less than 5% of US per capita GDP – by exiting export markets, vertically differentiating their goods, curtailing domestic production and increasing the capital and skill intensity of its production techniques.

More research is required to determine the extent of manufacturing reallocation in the US. In particular, we need a better sense of the role that firms play in determining the aggregate US response. Does market withdrawal and product upgrading occur within firms over time or is it a result of creative destruction? What attributes of firms contribute to their ability to survive competition? To what extent does skill and capital deepening reflect an effort to increase the efficiency with which existing goods can be produced rather than attempts to produce newly invented goods? I hope to address these questions in the near future by adding the data used in this paper to firm-level manufacturing data maintained by the US Census.

Appendix

A1 Matching US Imports and Exports at the Product Level

Under the Harmonized System (HS), six digit HS industries are defined by international agreement. Countries participating in the system are then free to define sub-industries and products at a higher level of detail via HS7 to HS10 codes.

In the US, import and export classification are under the jurisdiction of two separate agencies. Import codes are maintained by the International Trade Commission (ITC) while export codes are administered by the Foreign Trade Division (FTD) of the US Census Bureau. Though US imports and exports can be matched exactly at the HS6 level, the split jurisdiction of HS7 to HS10 codes interferes with a direct matching of US trade at the product level.

This interference is important because it can lead exports to be recorded at a coarser level of aggregation than imports. The most prevalent such mismatch occurs when exports are recorded at the HS6 level while imports are recorded using HS7 to HS10 aggregates within the export's HS6 code. Across the sample, this mismatch involves roughly 23% of imports and 15% of exports and is more frequent in Manufactured Materials and Miscellaneous Manufactures. Mismatches where exports are recorded at the HS7 or HS8 level while the corresponding imports are recorded at a lower level represent an additional 3% of export value and 3% of import value, respectively. HS6 industries where this mismatch occurs are excluded from the product-level empirical results in the text.

A2 Concording HS10 Products to SIC4 Industries

TS7 and HS10 product-level data are aggregated to SIC4 industries via the algorithms.

1 *TS7 to SIC4r87* (1972 through 1988): Aggregating TS products to revision 1987 SIC4 industries (SIC4r87) requires mapping TS7 to revision 1972 import SIC4 industries (MSIC4r72), MSIC4r72 to SIC4r72 and SIC4r72 to SIC4r87:

a) A matching of TS7 products to MSIC4r72 codes is provided with the NBERTD. This mapping is imperfect in the sense that some products span more than a single industry. Census places each set of such products into just one of the possible industries (none on the remaining industries to which they it is related). I perform an analogous aggregation with the production data when merging the competition indexes with the NBER-CIS Manufacturing Industry Database.

b) The NBERTD includes a file (MSIC_SIC.ASC) indicating which SIC4r72 belong to each MSIC4r72. In many cases, more than SIC4r72 is assigned to a single MSIC4r72, but weights are not provided. We compute weights using NBERTD imports data reported at the SIC4r72 industry level. That is, for each SIC4r72 assigned to a MSIC4r72 in each year, we compute the relative import share. Thus, if a matching between a MSIC4r72 and a SIC4r72 is one to one, the weight is unity.

c) Mapping SIC4r72 to SIC4r87 is done via the concordance provided by Bertelsman, Becker and Grey in the NBER Productivity Database. Because of the idiosyncrasies of the various classification systems, it is not possible to compute low-wage competition for 15 of the SIC4r87 industries for 1972 to 1988.

2 *HS10 to SIC4r87*: To match HS10 products to SIC4r87 industries, we rely upon the concordance published by Census and available at their website (www.census.gov). Here, as well, a perfect match between products and industries does not exist. As a result, it is not possible to compute competition for 70 of the SIC4r87 industries from 1989 to 1999. As with TS7 products, some HS10 products span more than a single industry. For such products, Census places each set of such products into just one of the possible industries (none on the remaining industries to which they it is related). I perform an analogous aggregation with the production data when merging the competition indexes with the NBER-CIS Manufacturing Industry Database.

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Figure 1: Technology- vs Endowment-Driven Development Paths

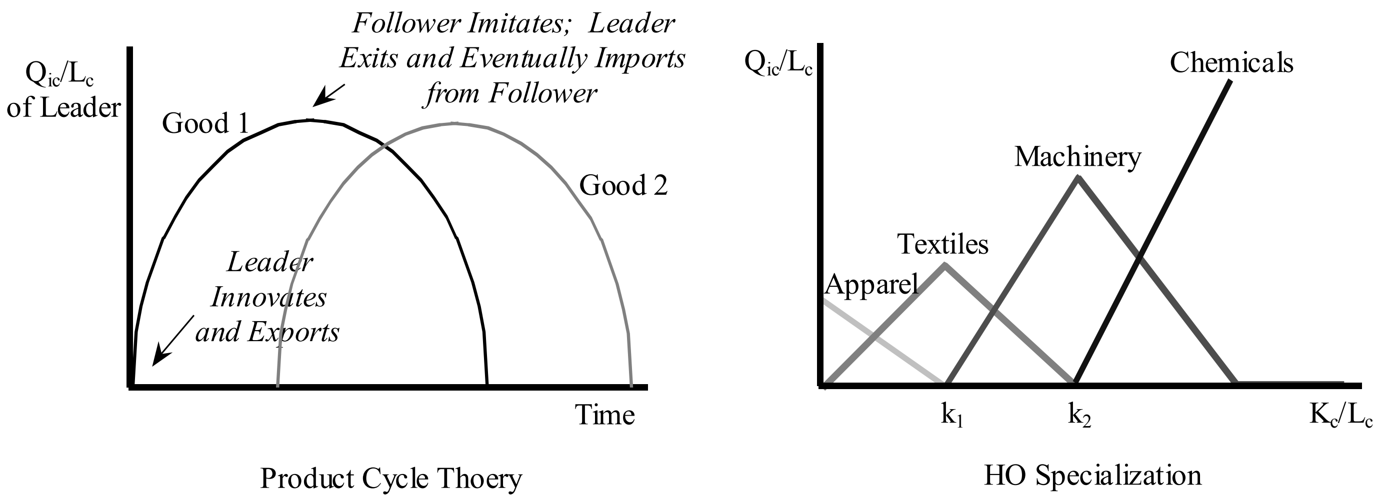
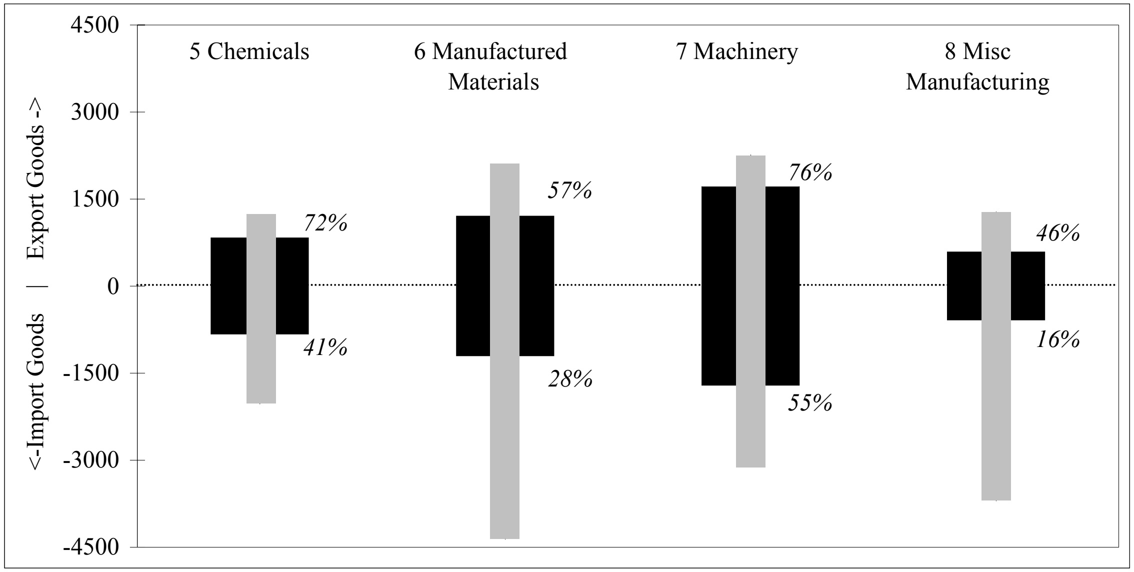


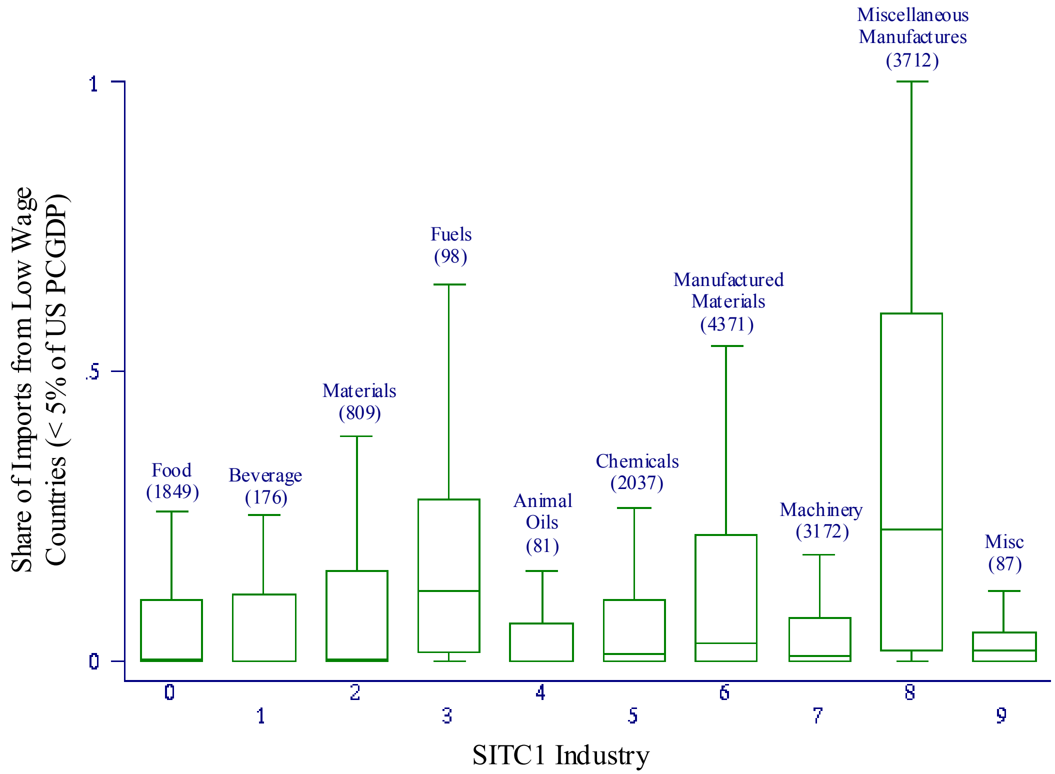
Figure 2: US Import and Export Product Overlap by SITC1 Manufacturing Industry, 1999



[1] This figure illustrates the overlap of US export and import products in 1999. Thin gray bars represent the number of export (above zero) or import (below zero) goods. Wide black bars represent the number of goods both imported and exported. Black bars are symmetric around zero.

[2] Percentages report the share of exports and imports also imported and exported, respectively.

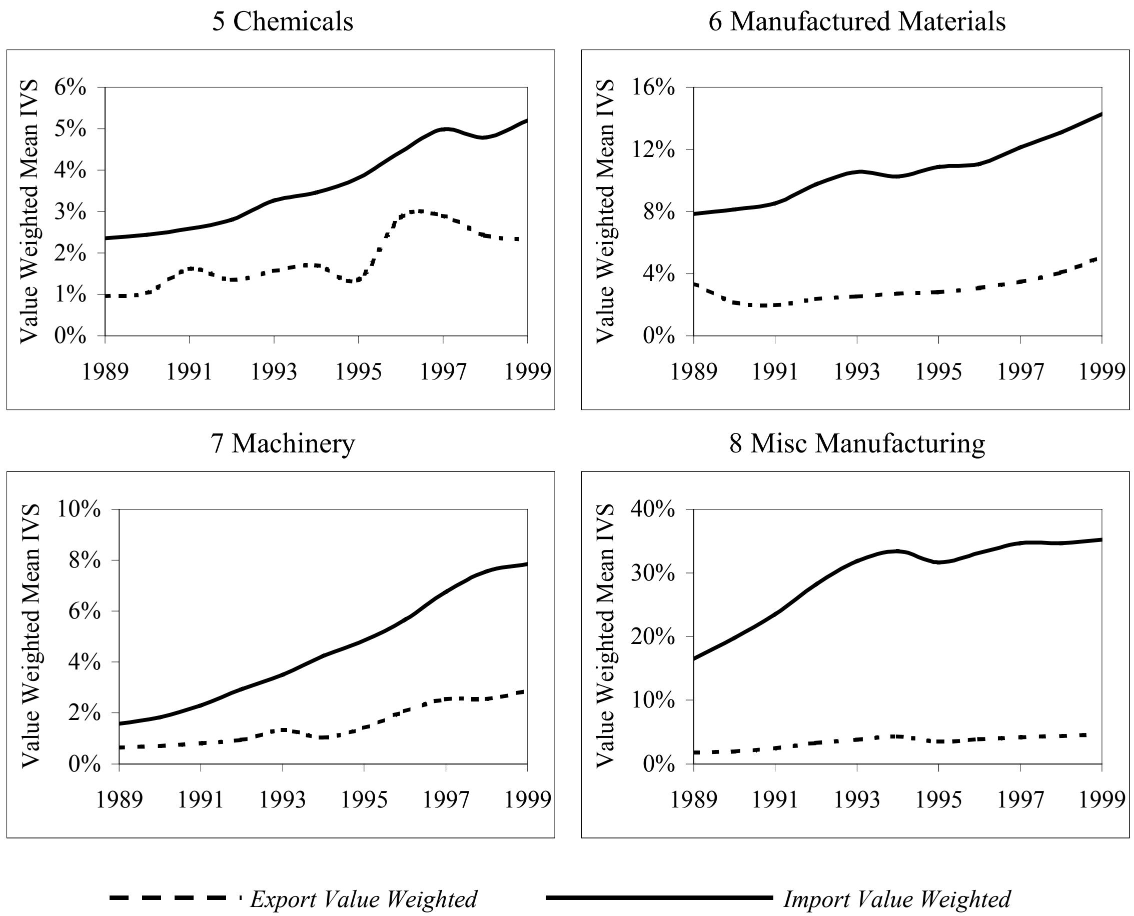
Figure 3: Distribution of Low-Wage Country Import Value Shares (V^5_{pt}) by SITC1 Industry in 1999



[1] Box and whiskers note the distribution of product level competition indexes (IVS) by SITC1 industry in 1999. Boxes surround the interquartile range. The horizontal line within each box marks the median observation. Whiskers extend up and down to "adjacent values", defined as 1.5 times the length of the interquartile range from the 75^{th} and 25^{th} percentile, respectively. Observations beyond the adjacent values are excluded from the plot. Each industry has several observations near or at unity.

[2] Number in parentheses below each industry label indicates the number of import products in that industry in 1999.

Figure 4: Import- and Export-Value-Weighted Average Low Wage Country Competition (V^5_{pt}) by Manufacturing SITC1 Industry



[1] The two lines for each industry represent a weighted average of the product level, low wage country import value shares (IVS^5) for each year. Weights are export and import value, as noted.

Table 1: Mapping SITC1 Industries to HS10 Products

SITC1 Industry	Example of SITC2 Industries	Example of HS Product	HS10 Products (1999)
0 Food	Meat, Dairy Products, Fruit	Sheep, live	2236
1 Beverages and Tobacco	Wine, Cigarettes	Carbonated soft drinks	235
2 Crude Materials	Rubber, Cork, Wood, Textile Fibers	Silkworm cocoons suitable for reeling	953
3 Mineral Fuels	Coal, Coke, Petroleum, Natural Gas, Electric Current	Unleaded gasoline	119
4 Animal and Vegetable Oils	Lard, Soybean Oil, Linseed Oil	Tallow, edible	94
5 Chemicals	Organic Chemicals, Dyes, Medicines, Fertilizers, Plastics	Chloroform	2356
6 Manufactured Materials	**Textiles**, Leather, Paper, Steel, Cork Products	Diaries and address books, of paper or paperboard	5277
7 Machinery	Power Generating Machinery, Computers, Autos	Ultrasonic scanning apparatus	3663
8 Miscellaneous Manunfactures	**Apparel**, Footwear, Plumbing, Scientific Equipment, Cameras	Boys' shorts cotton playsuit parts, not knit	4405
9 Not Elsewhere Classified	Special Transactions, Coins, Gold	Sound recordings for State Dept use	106

[1] Final column reports the number of products either exported out of or imported into the US in 1999.

Table 2: US "Low-Wage" Trading Partners, 1989-1999

Afghanistan	China	India	Pakistan
Albania	Comoros	Kenya	Rwanda
Angola	Congo	Lao PDR	Samoa
Armenia	Equatorial Guinea	Lesotho	Sao Tome
Azerbaijan	Eritrea	Madagascar	Sierra Leone
Bangladesh	Ethiopia	Malawi	Somalia
Benin	Gambia	Maldives	Sri Lanka
Bhutan	Georgia	Mali	St. Vincent
Burkina Faso	Ghana	Mauritania	Sudan
Burundi	Guinea	Moldova	Togo
Cambodia	Guinea-Bissau	Mozambique	Uganda
Central African Rep	Guyana	Nepal	Vietnam
Chad	Haiti	Niger	Yemen

Table 3: Mean US Intra-Industry Trade By Level of Industry Aggregation, 1999

SITC1	SITC1	SITC2	SITC3	SITC4	SITC5	HS6	HS8	HS10	*Products (1999)*
5 Chemicals	94	80	79	69	61	57	36	32	*2,356*
6 Manufactured Materials	70	72	72	63	57	53	36	25	*5,277*
7 Machinery	87	87	78	72	65	64	44	31	*3,663*
8 Misc Manufacturing	63	46	41	40	37	37	23	17	*4,405*
Number of Industries (1999)	*4*	*69*	*264*	*1,038*	*3,126*	*4,089*	*9,257*	*15,701*	

[1] First column reports the Grubel-Lloyd index (100-100|x-m|/(x+m)) at the SITC1 industry level; subsequent columns report the average index across sub-industries or products (for HS10). The higher the GL index, the higher the intra-industry or intra-product trade.*

[2] Final row reports the number of sub- industries or products (for HS10) either imported or exported by the US at each level of aggregation. Final column adds to last cell in final row.

Table 4: Mean Intra-Product Trade in Quantity and Value Terms by SITC1 Industry and Country Type, 1999

	Value			Quantity[2]		
SITC1 Industry	All Countries	Countries with <5% US PCGDP	Countries with >5% US PCGDP	All Countries	Countries with <5% US PCGDP	Countries with >5% US PCGDP
5 Chemicals	32	15	32	29	12	30
6 Manufactured Materials	25	13	26	21	10	22
7 Machinery	31	15	31	25	12	26
8 Misc Manufacturing	17	8	18	11	5	12

[1] Columns report average value and quantity Grubel-Lloyd indexes, overall and by type of trading partner, for products in noted SITC1 industry. Grubel-Lloyd index is (100-100|X-M|/(X+M)), where X and M are the quantity or value of exports and imports, respectively. A higher index implies higher intra-product trade.*

[2] The availability of quantity information, used to compute indexes in the first three columns, varies by industry. The share of products with quantity information from 1989 to 1999 averaged 0.94, 0.92, 0.85 and 0.64 for Chemicals, Manufactured Materials, Machinery and Miscellaneous Manufacturing, respectively.

Table 5: Mean Intra-Product Trade in Quantity and Value Terms by SITC2 Industry and Country Type, 1999

SITC2 Industry	Value				Quantity[2]			
	All Countries	Countries with <5% US PCGDP	Countries with >5% US PCGDP	Ratio	All Countries	Countries with <5% US PCGDP	Countries with >5% US PCGDP	Ratio
51 Organic Chemicals	24	12	24	0.48	10	4	11	0.38
52 Inorganic Chemicals	39	19	39	0.49	23	11	23	0.47
53 Dyeing Materials	36	14	36	0.40	13	6	13	0.46
54 Medicines	36	13	37	0.36	23	9	23	0.41
55 Oils, Resinoids And Perfumes	45	26	45	0.57	15	9	14	0.66
57 Plastics In Primary Forms	43	12	44	0.28	38	9	38	0.22
58 Plastics In Nonprimary Forms	56	39	55	0.71	22	13	22	0.58
59 Misc Chemical Materials	28	10	29	0.35	12	4	12	0.36
61 Leather	37	27	38	0.71	15	14	15	0.97
62 Rubber Manuf	39	26	40	0.66	16	8	17	0.48
63 Cork And Wood Manuf	15	8	15	0.54	8	4	8	0.46
64 Paper	34	14	33	0.41	25	9	25	0.37
65 Textile Yarn	19	8	20	0.41	5	2	6	0.44
66 Mineral Manuf	38	20	40	0.50	12	7	12	0.55
67 Iron And Steel	20	10	20	0.47	7	4	8	0.54
68 Nonferrous Metals	32	15	32	0.46	15	9	15	0.59
69 Metal Manuf	26	13	27	0.49	11	5	12	0.38
71 Power Generating Mach	23	12	24	0.49	17	9	18	0.49
72 Specialized Mach	37	12	37	0.31	28	9	28	0.32
73 Metalworking Machinery	24	9	24	0.37	20	9	21	0.43
74 General Industrial Machinery	40	19	41	0.47	26	13	28	0.48
75 Office Machines	39	20	39	0.51	35	14	37	0.38
76 Telecom Machines	9	6	9	0.65	5	3	5	0.56
77 Electrical Machines	37	22	37	0.59	23	15	25	0.60
78 Road Vehicles	17	5	17	0.28	11	3	11	0.30
79 Misc Transport Equip	33	15	34	0.45	26	8	26	0.32
81 Plumbing/Heating	21	12	22	0.53	9	4	10	0.45
82 Furniture	12	8	13	0.61	3	1	3	0.44
83 Travel Goods	4	1	5	0.29	1	1	1	0.93
84 Apparel	4	2	5	0.42	2	1	2	0.41
85 Footwear	4	2	4	0.50	2	1	2	0.32
87 Professional Equip	26	12	26	0.47	12	7	15	0.51
88 Photographic Apparatus	42	18	42	0.43	6	2	6	0.28
89 Misc Manuf	31	15	35	0.44	13	5	14	0.39

[1] Columns report average value and quantity Grubel-Lloyd indexes, overall and by type of trading partner, for products in noted SITC1 industry. Grubel-Lloyd index is (100-100|X-M|/(X+M)), where X and M are the quantity or value of exports and imports, respectively. A higher index implies higher intra-product trade.*

[2] The availability of quantity information, used to compute indexes in the first three columns, varies by industry. The share of products with quantity information from 1989 to 1999 averaged 0.94, 0.92, 0.85 and 0.64 for Chemicals, Manufactured Materials, Machinery and Miscellaneous Manufacturing, respectively.

Table 6: 1999 Import- and Export-Weighted Low Wage Country Competition (V_{pt}^5) by SITC2 Manufacturing Industry

(Industries sorted by import-weighted V_{pt}^5)

SITC2 Industry	Import Weighted *IVS*	Export Weighted *IVS*	SITC2 Industry	Import Weighted *IVS*	Export Weighted *IVS*
85 Footwear	**0.68**	**0.05**	53 Dyeing Materials	0.07	0.01
83 Travel Goods	**0.64**	**0.17**	74 General Industrial Machinery	0.07	0.03
81 Plumbing/Heating	**0.52**	**0.02**	55 Oils, Resinoids And Perfumes	0.06	0.04
84 Apparel	**0.38**	**0.05**	51 Organic Chemicals	0.06	0.03
89 Misc Manuf	**0.37**	**0.07**	59 Misc Chemical Materials	0.06	0.01
65 Textile Yarn	0.29	0.04	**87 Professional Equip**	**0.06**	**0.02**
82 Furniture	**0.26**	**0.03**	64 Paper	0.05	0.04
66 Mineral Manuf	0.21	0.12	58 Plastics In Nonprimary Forms	0.04	0.04
69 Metal Manuf	0.18	0.04	68 Nonferrous Metals	0.04	0.02
76 Telecom Machines	0.18	0.04	54 Medicines	0.03	0.02
88 Photographic Apparatus	**0.16**	**0.06**	56 Fertilizers	0.03	0.00
63 Cork And Wood Manuf	0.16	0.05	57 Plastics In Primary Forms	0.03	0.01
77 Electrical Machines	0.15	0.07	73 Metalworking Machinery	0.02	0.01
75 Office Machines	0.14	0.04	71 Power Generating Mach	0.02	0.01
52 Inorganic Chemicals	0.09	0.05	72 Specialized Mach	0.01	0.01
67 Iron And Steel	0.08	0.03	78 Road Vehicles	0.01	0.00
61 Leather	0.08	0.05	79 Misc Transport Equip	0.01	0.00
62 Rubber Manuf	0.08	0.05			

[1] Industries sorted by import-weighted average competition.

[2] Industries in Miscellaneous Manufacturing (SICT1=8) are shaded to highlight intra-industry heterogeneity.

Table 7: Real Export Growth in Response to Low-Wage Country Competition (V^5_{pt}), 1989-1999

Dependent Variable: Log Normalized Real Export Growth Between t and t+1

	All Manufacturing	(5) Chemcials	(6) Manuf Materials	(7) Machinery	(8) Misc Manufactures
Lag Exports	-0.06	-0.06	-0.03	-0.11	-0.05
	0.00	0.00	0.00	0.00	0.00
Lag Competition	-0.05	0.01	-0.13	0.00	0.02
	0.07	0.91	0.02	0.90	0.51
Lag Competition^2	0.07	0.01	0.14	0.04	-0.01
	0.04	0.85	0.03	0.32	0.78
Observations	53,588	10,052	18,164	16,430	8,942
Adjusted R^2	0.26	0.36	0.28	0.22	0.43
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Product Fixed Effects	Yes	Yes	Yes	Yes	Yes

[1] Table reports OLS coefficients and p-values for each independent variable. Dependent variable is normalized so that exit and entry equal 2 and –2, respectively (see text). Competition is the share of US industry imports originating in countries with less than 5% of US per capita GDP in year t (V^5_{pt}). Errors are clustered by product code. Shaded cells indicate p-values less than 10%.

[2] Each regression (column) includes a different set of manufacturing products. Availability of real exports (i.e. quantity) varies by industry: from 1989 to 1999, the share of products with quantity information averaged 0.94, 0.92, 0.85 and 0.64 for Chemicals, Manufactured Materials, Machinery and Miscellaneous Manufacturing, respectively.

Table 8: T-Tests of Product-Level US Export vs Low-Wage Country Import Unit Values, by SITC2 Manufacturing Industry and Year

SITC2 Industry	Average Number of Products	1989 P-Value EUV>IUV^5	1990 P-Value EUV>IUV^5	1991 P-Value EUV>IUV^5	1992 P-Value EUV>IUV^5	1993 P-Value EUV>IUV^5	1994 P-Value EUV>IUV^5	1995 P-Value EUV>IUV^5	1996 P-Value EUV>IUV^5	1997 P-Value EUV>IUV^5	1998 P-Value EUV>IUV^5	1999 P-Value EUV>IUV^5	Pooled P-Value EUV>IUV^5
51 Organic Chemicals	104	0.69	0.22	0.72	0.75	0.92	0.83	0.36	0.87	0.86	0.50	0.94	0.99
52 Inorganic Chemicals	92	0.86	0.85	0.88	0.94	0.69	0.81	0.94	0.92	0.94	0.83	0.96	1.00
53 Dyeing Materials	19	0.87	0.44	0.86	0.73	0.86	0.85	0.91	0.89	0.90	0.95	0.88	0.97
54 Medicines	39	0.96	0.90	0.92	0.96	0.90	0.99	1.00	0.86	0.99	0.99	0.99	0.95
55 Oils, Resinoids And Perfumes	24	0.84	0.85	0.86	0.85	0.84	0.85	0.86	0.87	0.86	0.85	0.87	1.00
57 Plastics In Primary Forms	33	0.83	0.92	0.83	0.68	0.38	0.93	0.78	0.86	0.90	0.93	0.96	0.97
58 Plastics In Nonprimary Forms	28	0.68	0.60	0.85	0.01	0.40	0.90	0.87	0.85	0.02	0.86	0.71	0.98
59 Misc Chemical Materials	28	0.82	0.93	0.84	0.93	0.91	0.93	0.92	0.70	0.82	0.59	0.86	1.00
61 Leather	30	1.00	1.00	1.00	1.00	1.00	0.87	0.94	0.91	0.93	0.96	0.90	1.00
62 Rubber Manuf	33	0.03	0.31	0.77	0.55	0.01	0.02	0.10	0.03	0.00	0.00	0.01	0.00
63 Cork And Wood Manuf	21	0.91	0.95	0.90	1.00	0.99	0.99	0.99	0.99	0.99	0.98	0.88	1.00
64 Paper	73	0.99	1.00	0.95	0.87	1.00	0.93	1.00	0.98	1.00	1.00	0.99	1.00
65 Textile Yarn	256	0.95	0.60	0.84	0.80	0.78	0.93	0.90	0.84	0.51	0.04	0.13	0.86
66 Mineral Manuf	59	0.77	0.85	0.65	0.84	0.73	0.66	0.76	0.82	0.39	0.29	0.50	0.95
67 Iron And Steel	62	0.79	0.80	0.97	0.62	0.58	0.18	0.10	0.87	0.67	0.46	0.35	0.92
68 Nonferrous Metals	60	0.08	0.20	0.46	0.83	0.24	0.87	0.86	0.84	0.38	0.87	0.85	0.99
69 Metal Manuf	104	0.08	0.14	0.72	0.45	0.00	0.09	0.83	0.01	0.76	0.01	0.91	0.89
71 Power Generating Mach	53	0.05	0.22	0.38	0.19	0.15	0.14	0.16	0.08	0.04	0.15	0.22	0.00
72 Specialized Mach	105	0.69	0.01	0.00	0.00	0.26	0.04	0.00	0.00	0.10	0.01	0.18	0.00
73 Metalworking Machinery	77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00
74 General Industrial Machinery	202	0.80	0.38	0.07	0.01	0.01	0.04	0.90	0.76	0.82	0.64	0.74	0.92
75 Office Machines	50	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76 Telecom Machines	29	0.01	0.55	0.01	0.01	0.00	0.05	0.13	0.58	0.71	0.03	0.01	0.08
77 Electrical Machines	248	0.08	0.03	0.08	0.12	0.02	0.16	0.10	0.09	0.14	0.09	0.11	0.00
78 Road Vehicles	20	0.04	0.16	0.04	0.06	0.06	0.16	0.02	0.02	0.01	0.03	0.03	0.00
79 Misc Transport Equip	14	0.86	0.14	0.69	0.13	0.16	0.64	0.07	0.17	0.83	0.04	0.52	0.21
81 Plumbing/Heating	6	0.51	0.86	0.79	0.69	0.82	0.76	0.33	0.22	0.16	0.70	0.24	0.80
82 Furniture	5	0.01	0.02	0.01	0.01	0.02	0.00	0.01	0.07	0.15	0.03	0.07	0.00
83 Travel Goods	4	0.42	0.15	0.77	0.55	0.13	0.69	0.58	0.17	0.58	0.15	0.62	0.75
84 Apparel	69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
85 Footwear	13	0.00	0.00	0.00	0.01	0.03	0.06	0.24	0.11	0.79	0.22	0.34	0.01
87 Professional Equip	39	0.55	0.03	0.11	0.54	0.06	0.14	0.24	0.19	0.21	0.03	0.29	0.01
88 Photographic Apparatus	38	0.11	0.77	0.77	0.41	0.89	0.92	0.18	0.80	0.07	0.84	0.26	0.95
89 Misc Manuf	122	0.13	0.31	0.82	0.31	0.31	0.49	0.04	0.32	0.79	0.34	0.10	0.62

[1] EUV is the value-weighted average US export unit value across export destinations. IUV^5 is the value-weighted average import unit value from countries with less than 5% of US per Capita GDP.

[2] The final column reports a t-test for products pooled across 1989 to 1999. Shading indicates significance at the 10% level.

Table 9: Vertical Differentiation When Poor Countries First Enter A Product Market Also Produced by the US

SITC2 Industry	Number of Products	Median EUV/IUV^5 at Entry	P-Value EUV>IUV^5 at Entry	Significant Export Change After Entry	Significant EUV Change After Entry
51 Organic Chemicals	121	0.81	0.94		
52 Inorganic Chemicals	39	1.27	0.97		-
53 Dyeing Materials	10	1.59	0.96		-
54 Medicines	26	0.54	0.99	-	
55 Oils, Resinoids And Perfumes	3	0.34	0.30	na	na
57 Plastics In Primary Forms	29	1.09	0.95	+	
58 Plastics In Nonprimary Forms	9	1.19	0.61	-	
59 Misc Chemical Materials	13	0.69	0.72	-	
61 Leather	3	1.47	0.48	na	na
62 Rubber Manuf	6	1.01	0.92		+
63 Cork And Wood Manuf	12	0.67	0.90	+	
64 Paper	40	0.47	0.88	+	-
65 Textile Yarn	67	1.67	0.78		-
66 Mineral Manuf	18	0.77	0.88	+	-
67 Iron And Steel	67	1.44	0.88	-	-
68 Nonferrous Metals	25	1.11	0.91	+	+
69 Metal Manuf	15	1.64	0.21	-	+
71 Power Generating Mach	31	7.64	0.11	+	
72 Specialized Mach	107	3.34	0.09	+	+
73 Metalworking Machinery	47	2.16	0.00	+	-
74 General Industrial Machinery	91	4.23	0.05	-	-
75 Office Machines	20	3.49	0.15	+	-
76 Telecom Machines	6	3.57	0.09	-	+
77 Electrical Machines	48	2.89	0.15		
78 Road Vehicles	24	2.17	0.02		
79 Misc Transport Equip	15	3.44	0.29	-	
81 Plumbing/Heating	3	1.35	0.26	na	na
84 Apparel	2	1.37	0.72	na	na
87 Professional Equip	7	12.07	0.09		
88 Photographic Apparatus	18	2.69	0.04	-	
89 Misc Manuf	9	2.32	0.79	+	

[1] EUV is the value-weighted average US export unit value across export destinations. IUV^5 is the value-weighted average import unit value from countries with less than 5% of US per Capita GDP. The second column of the table reports the number of products, by SITC2 industry, where low-wage country entry is observed between 1990 and 1998. Year of entry varies by product.

[2] The third column reports a p-value for a $EUV_{pt} = IUV^5_{pt}$ across the products in the noted SITC2 industry. Shading indicates significance at the 10% level.

[3] Results for real export growth are taken from a regression of post-entry real exports on pre-entry real exports, controlling for the pre-entry US dollar trade-weighted exchange rate. Results for export unit value growth deflate unit values by the US GDP deflator and also control for exchange rates.

Table 10: Year Upon Year Changes in US Production versus Low-Wage Competition (V_{pt}^{5}), 1972-1996

	Change in Shipments	Change in Skill Intensity	Change in Capital Intensity
Lag Employment	-0.08	0.02	0.10
	0.00	0.08	0.00
Lag Capital Intensity	0.00	0.01	-0.06
	0.91	0.45	0.00
Lag Skill Intensity	-0.03	-0.29	0.04
	0.00	0.00	0.00
Lag Low-Wage Competition	-0.04	0.05	0.06
	0.04	0.06	0.00
Observations	9211	9211	9211
Industries	385	385	385
R-squared	0.24	0.21	0.22
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes

[1] Table reports OLS coefficients and p-values for each independent variable given the dependent variable noted at the top of each column. Dependent variables are log differences between years t and t-1. Employment, Capital Intensity and Skill Intensity are logged. Low-wage competition is the share of industry imports originating in countries with less than 5% of US per capita GDP in year t (V_{it}^{5}). Errors are clustered by industry

[2] US production data is from the Bartelsman, Becker, Gray (2000) NBER-CES Manufacturing Industry Database(NBERMID) available at www.nber.org. . Shipments are in constant 1987 dollars. Skill intensity is non-production workers per production worker. Capital per labor is in thousands of constant 1987 dollars.