GLOBALIZATION AND PRICE DISPERSION:

EVIDENCE FROM U.S. TRADE FLOWS

by

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Abstract

Historically, the integration of international markets has corresponded with decreasing prices for traded goods due to higher competition among suppliers, scale economies, and consumption demand. In recent years, product differentiation and multinational firm pricing behavior across markets and between suppliers make it difficult to assess the degree to which this still occurs. Using a confidential panel dataset comprising the universe of U.S. import trade transactions between 1992 and 2007, this paper explores the change in prices for imported commodities across American trade partners. Overall price dispersion appears to decline, albeit unevenly, over time; nevertheless, there is considerable heterogeneity within commodity groups, geographic regions, and income levels, which may owe to increased product and quality differentiation within commodity categories. Unusually, after controlling for gravity trade factors, trade openness and extensive measures of globalization are positively associated with price dispersion, which suggests a more disaggregated approach both at the commodity and firm level to account for these differences.

Keywords: price convergence, offshoring, product differentiation, multinational firm, law of one price

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I

Globalization may appear in many different guises, whether it is increased trade and capital flows, greater variety in traded goods and services, or fragmented production supply chains.[2] At its core, however, lies the principle of price arbitrage. Historically, this arbitrage has issued from market integration and manifested itself via price convergence. By extension, the dramatic increase in international trade over the past two decades, particularly with the entry of low cost producers like China and logistical improvements like containerization, would suggest that similar price convergence has been taking place.

Nevertheless, contemporary evidence corroborating this economic intuition has been mixed, with studies finding inconsistent price convergence over time and between countries.[3] Explanations for why prices converge range from production efficiencies and lower trade barriers to advances in transportation and communication technology. Reasons for non-convergence, however, are not well understood when occurring simultaneously with greater trade and capital movements. Moreover, this lack of consensus may be due in part to the commodities and countries selected for comparison.[4]

This paper seeks to identify factors influencing price dispersion over the past two decades and how price differences may relate to international market integration. The analysis uses highly detailed, confidential U.S. trade transaction data collected by the U.S. Census Bureau, while unlike other studies cover the entire range of merchandise imported from all trade partners of the U.S.[5] This coverage mitigates biases from commodity- or industry-specific samples while ensuring a consistent and balanced time series at the country-commodity level. Furthermore, by comparing import prices across all trade partners, this study more accurately represents price arbitrage opportunities faced by American firms and consumers instead of hypothetical comparisons of arbitrary commodity price pairs in foreign and domestic markets. These data also include variables such as the extensive number of commodities imported from each trade partner; the number of trade partners exporting a given commodity; whether trade in a commodity occurs within a multinational firm; method of transport (e.g., air versus water); and transportation costs and duties paid. Many of these factors, despite their likely influence on trade patterns, have either been wholly absent from existing studies or are proxied by less precise variables due to data availability.[6]

I find that between the years 1992 and 2007, overall price dispersion, measured as the average coefficient of variation of a commodity's import price for all trade partners in a given year,

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[2] This paper views globalization as primarily an economic phenomenon and does not extend to that of a political or cultural nature.
[3] Bergin and Glick (2007a, 2007b), Engel and Rogers (2004).
[4] One suggestion for non-convergence has been the effect of rising energy prices, which raise both the costs of production and transport; see Bergin and Glick (2007a). Another explanation may be quality differences within a commodity category, which is explored later in the paper.
[5] Data on exports will be included in later iterations of this paper.
[6] For example, transport costs are typically proxied by distances between major cities in trading countries.

decreased modestly by 2.1 percent annually. However, when disaggregated by region and commodity group, the dispersion trends exhibit considerably more heterogeneity, even divergence. Separating the trade between related parties and that of unrelated parties also shows trend differences. For example, price dispersion for transactions within multinational firms declines slowly until the mid 2000s while price dispersion for arms length trade declines rapidly in the late 1990s before rising steadily thereafter.

Estimates from regression analysis show that these trend disparities among regions, commodity groups, and multinational activity recur when price dispersion is clustered by trade partner and imported commodity. These specifications include gravity trade factors like GDP, bilateral distance, net terms of trade, and import tariffs to control for other determinants of trade flows. Unusually, the variables associated with trade openness (ie, trade partner's share of trade to GDP, the number of trade partners per commodity, the number of commodities exported per trade partner) all are positively and significantly associated with price dispersion. On the other hand, the net effect of related party trade and its interactions of commodity group, region, and income level with the share of related party trade tend to be negative, although smaller in magnitude to other variables. These findings obtain for the universe of import trade as well as in subsets of the data. These include the set of commodities that appear in all years of available data, which suggest the results are not due to panel heterogeneity; homogeneous commodities that are less likely to exhibit product and quality differentiation within commodity categories; as well as random samples taken from the population.

These results suggest that the relationship between prices and globalization varies much more than earlier studies would suggest, and depends not only on volume, but also on commodity type, the relationship between trading parties, and characteristics of one's trade partners. Specifically, price dispersion may owe to increased product differentiation and quality differences within a given commodity category, which may be only partly and inconsistently mitigated by multinational firm pricing behavior.[7]

II

Price variation for traded goods is typically attributed to transaction costs like transportation costs between trade partners, tariff and non-tariff barriers, exchange rate movements, and differences in production and input costs. As these factors are reduced, whether from technological advances, institutional change, or more efficient resource allocation, one expects a concomitant increase in trade volumes and convergence of prices. Historical studies of price convergence have indeed found a robust relationship between the two, with cheaper rail and ocean freight shipping costs laying the foundation for the first wave of globalization at the end of the

[7] See Bernard et al (2006) for a discussion of multinational firm pricing differences.

nineteenth century.[8] Contemporary research also underscores how anticipation of greater market integration can also lower price dispersion, aided by policy harmonization and income convergence; the increased use of containerization is credited with a similar effect.[9]

Nevertheless, earlier studies have tended to focus on a narrow set of countries and commodities, largely due to data and methodological limitations. Moreover, there is little research on price convergence that includes firm-level characteristics such as whether trade occurs between related parties or allows for differences in firm characteristics.[10] These omissions are likely to bias findings since there are persistent differences in productivity and the extensive margin of trade depending on the relation between trading parties, which in turn affect prices.[11]

The data used in this paper circumvent many of these problems due to their highly detailed nature as well as comprehensive coverage across countries and commodities. The U.S. Census Bureau maintains and updates a novel dataset of the universe of transaction-level foreign trade data known as the Foreign Merchandise Trade (FMT) database.[12] These data underlie the Census Bureau's published foreign trade statistics, which are the official source of data on U.S. international trade. Each transaction represents a shipment of one 10-digit Harmonized Schedule (HS) commodity from exporter to importer on a single carrier.[13] Import data come from the U.S. Customs' Automated Commercial System, which collects information on imports from import entry forms, warehouse withdrawal forms, and Foreign Trade Zone documents, and are then processed by the Census Bureau. Export data come from exporters' electronic filings on the Census Bureau's Automated Export System and also through a data-sharing arrangement with the Canadian government. Cumulatively, the FMT dataset include over 800 million transaction records between the years 1992 and 2007, spanning 234 trade partners and 21,233 distinct commodity codes.[14]

Transactions include the ten-digit commodity code, its value and quantity, the U.S. port of entry or exit, the country of origin or destination, date of transaction, mode of transportation and

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[8] See North (1958), Harley (1988), and O'Rourke et al (1996). Similarly, country-level studies in Asia and Europe on grain prices have also found a robust relationship between market integration and price convergence; see Keller and Shiue (2008) and Shiue (2002).
[9] See Rogers (2007), Crucini et al (2005), and Parsley and Wei (2002).
[10] An exception to this is a recent study on French commodity exports disaggregated at the firm level, which also distinguishes pricing strategies between firms; see Mejean and Schwellnus (2009).
[11] See Bernard et al (2007, 2009) and Bergin and Glick (2007b).
[12] Tang (2009) describes the FMT in detail and provides information on the construction of the dataset; see also US Census Bureau (2010).
[13] Exports and imports share the same first six digits in the Harmonized Schedule; additional digits sometimes overlap, but are country specific. Furthermore, some commodities may have multiple codes across years due to reassignment during revisions of the classification coding system; see Pierce and Schott (2009) for a more detailed discussion. As will be explained in the body text, this paper uses only import data.
[14] This number refers to the number of import commodity codes, which exceeds the number for exports, that are actually traded as opposed to those available in the coding system. Note that while the United Nations recognizes 193 countries, there are additional trading areas composed of colonial possessions, territories, and pseudo-states that the U.S. has designated with a unique trade identifier.

related-party status. Data are collected for every import transaction with a value greater than $2,000 and every export transaction with a value greater than $2,500. In addition, the Employer Identification Number (EIN) of the importer or exporter is collected, which can be used to link the records to other Census data products like the Business Register and economic surveys.[15] Furthermore, identification of trade partners allows the addition of time-varying country variables such as national income, population, terms of trade, and trade openness.[16]

A special feature of the FMT is that since it includes the universe of documented trade transactions between the U.S. and its trade partners, one can construct a panel dataset of commodities by country. For commodities whose codes are consistent over time, it is thus possible to have a perfectly balanced panel since an absence of recorded transactions for a country in a given year actually indicates a lack of trade instead of missing data.[17]

In preparation for analysis, I exclude some transactions due to possible biases or missing information. First, this paper uses only the import data as the focus is on price variation across countries that may vary in production and transaction costs.[18] That is, it seems reasonable to consider the import data as being more relevant to study the determinants of price convergence given the focus on price arbitrage across international producers, especially given the heterogeneity of U.S. trade partners and the size of the American market. Second, I omit transactions for which there is no identification of related party status since this variable is likely to contribute to price dispersion and heretofore have not been emphasized in previous analysis. Finally, transactions with American overseas territories like Puerto Rico are not included as they fall within the U.S. customs area and are not considered foreign per se.

III

Of the various methods used to assess price convergence or dispersion, which stem in part due to data limitations or commodity specificity, I use the coefficient of variation of each commodity's

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[15] The linked FMT-BR dataset, also known as the Longitudinal Firm Trade Transactions Database (LFTTD), underlies the analysis in Bernard et al (2007, 2009), for example.

[16] These variables are available from the World Bank Group's World Development Indicators online database; see World Bank (2009).

[17] Commodities may have code changes over time, leading to incomplete time series. Both the unbalanced and balanced panel data are analyzed in the following section.

[18] An interesting thought experiment would be to compare export price dispersion with that for imports and thus the behavior of American firms in the global marketplace. One complication is that the export data are missing establishment identifiers for approximately one-third of the transactions, namely those exported to Canada, due to a data sharing agreement. This inhibits linkage with other Census data products, which provide firm-level information on wages, capital investment, etc; however, matching algorithms, such as those used in Bernard et al (2007a, 2007b), can be used to identify Canadian export transactions for all years of data. See section VI for discussion of further work.

price across all trade partners within a calendar year.[19] That is, I divide the standard deviation of a commodity's unit price *p* for each country by its annual mean:

$$CV_{ist} = \frac{\sigma_{p_{ist}}}{\mu_{p_{ist}}}, \text{ or}$$

$$= \frac{\sqrt{\sum (p_{ist} - \overline{p}_{st})^2}}{\overline{p}_{st}}$$

where *i* indexes each 10-digit HS commodity, *s* indexes each trade partner, and *t* indexes each year.[20]

This method has a number of advantages compared to other metrics and is well suited to the detailed transaction data used in this paper. First, it is straightforward to calculate and intuitive to understand. Second, since the coefficient of variation is a ratio of moments, there are no units of measure in the resulting calculation; thus, it is both scale invariant and dimensionless. This allows comparison across commodities and avoids the need to convert nominal measurements. Third, because calculating a coefficient of variation does not require differencing across time periods to ensure stationarity, time-invariant information can be retained for additional explanatory power.[21]

To obtain unit prices for each commodity, I divide the summed value of all shipments of that commodity from a country by its corresponding summed quantity. Shipment value is given in current U.S. dollars and quantities are designated by various units of measure, which may differ across commodities, but not within them. Since tariffs and transportation charges are separately measured in the shipping record, the shipment value represents the price paid for the commodity.[22] Transactions where the designated unit of measure differs from that listed in the official HS codes are converted if possible; for the small number of transactions that are missing quantities, I substitute shipping weight where appropriate to calculate unit value by mass.[23]

There are potentially almost five million country-commodity observations for each of the

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[19] Other methods of calculating price dispersion include using price correlations for a given commodity across markets (Shiue 2002); comparing the speed of convergence between lagged and current prices (Mejean and Schwellnus 2009); relative changes in the ratios of prices or price indices (O'Rourke et al 1996); or the mean squared error (MSE) of relative prices (Engel and Rogers 2004; Bergin and Glick 2007a).

[20] As a separate robustness check, I also calculate the coefficient of variation for each commodity across all countries:

$$CV_{it} = \frac{\sigma_{p_{it}}}{\mu_{p_{it}}}.$$

[21] One disadvantage to using the coefficient of variation is that it may be subject to outlier bias. This can be remedied by weighting observations, and can be used as a robustness check against the unweighted results.

[22] Notice this differs from suggested retail prices, which are commonly used in these calculations.

[23] This is usually appropriate given that most commodities use kilograms as their quantity measurement.

sixteen years covered by the data.[24] However, since most countries do not produce anywhere near the entire range of commodities nor are all commodities traded each year, the actual number of combinations is just over 260,000 observations per year. The time series for the average coefficient of variation of the index of commodities across all trade partners is shown in Figure 1.

[Figure 1 here]

While the overall trend may appear to decline, it masks considerable heterogeneity on a number of levels. When the series is separated by whether the import transaction occurred between related parties or not, the two trends exhibit substantially different trends and diverge starting in the late 1990s. Breakdowns by geographic region and commodity group also show differences in levels and trends, as shown in Figures 2 and 3a-b.[25] At the regional level, price dispersion among Asian exporters increased over time, while that for Latin America sharply falls in the late 1990s. Europe, on the other hand, remains fairly stable for the period without either an upward or downward trend.

[Figure 2 here]

With regard to commodity groups, the differences in price dispersion trends are even more striking. Figures 3a and 3b present the average coefficient of variation series for eight major commodity groupings.[26] Commodities like chemicals and processed metal goods increased in dispersion over time while declining for machinery. The trends for minerals and textiles appear largely stationary; agricultural goods behave more erratically, but generally revert to a non-trending mean.

[Figures 3a and 3b here]

These trends by region and commodity exhibit considerably more heterogeneity when separated by trade partner relationship, shown in Figures 4a-f and 5a-h, respectively. Overall price dispersion for imports from Europe (Figure 4b) is higher in level than those for other regions, but generally stable and unchanging. In contrast, Asia (Figure 4c) exhibits rising price dispersion over time while Latin America (Figure 4d) exhibits decreasing dispersion. These differences are

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[24] That is, 4,968,522 country-commodity pairs = 234 trade partners * 21,233 commodities.
[25] The regions include North America, Latin America, Europe, Asia, Oceania (ie, Australia and neighboring islands), and Africa.
[26] For visual ease, the eight major commodity groups are separated into two panels. The major commodity groups are: agricultural products; mineral and ceramic goods; chemicals and plastics; paper and wood products; raw fiber and textiles; processed metals and metal ware; machinery and precision instruments; and miscellaneous manufactures. These can be further separated into 22 sections, which follow the US International Trade Commission's breakdown by Harmonized Tariff Schedule (HS) chapters; see Table 1 and USITC (2010).

magnified when separated by trade party relationship. In both Europe and Asia, the price dispersion trends for related and unrelated party trade are similar (albeit different in levels). On the other hand, price dispersion for unrelated trade transactions diverge from that for multinationals starting in the early 2000s among North and Latin American imports. One feature shared across these four regions is that arms length trade price dispersion exceeds that for related parties for the whole period.[27]

[Figures 4a through 4f here]

Trends by trade party relation also differ depending on the commodity, with dispersion in multinational transactions showing no consistent pattern across commodities or in relation to dispersion for unrelated party transactions. Unlike among regions, related party price dispersion often exceeds that for arms length trade, as shown in Figures 5a through 5d for agricultural goods, minerals, wood and paper products, and chemicals, although for most years in most commodity groups unrelated party trade price dispersion exceeds that for multinational firms.[28] Related and unrelated party trends in the latter two groups track each other fairly closely, unlike those for minerals or machine goods. From Figure 5f, one observes that arms length trade dispersion for processed metal goods is much more volatile than that for multinationals. Even among textiles (Figure 5e), which exhibit the least price dispersion among all major commodity groups, starting in the early 2000s unrelated party price dispersion diverges from that of multinational trade and remains noticeably higher for the rest of the period.

[Figures 5a through 5h here]

Table 1 presents commodity group level characteristics by the relationship between trading parties, including breakdowns of the number of transactions, overall value, and other descriptive statistics.[29] As shown in the second column, the average annual growth rate of all imports was 9 percent, with particular commodity groups increasing between 4.5 and 11.5 percent. More interesting is the third column, which shows the wide disparity in the share of related party trade by commodity group. Averaged across the period, nearly half of all import trade (47.3 percent) occurs within firms, but this obscures considerable variation. For example, clothing accessories are primarily traded at arms length, with 6.4 percent of its overage annual import value occurring between related parties. In contrast, over three-quarters of the value of transport equipment (76.7 percent) is within multinational firms. Moreover, related party trade has generally increased over

[27] This relationship does not hold for some years in both Oceania (eg, Australia and surrounding islands) and Africa. See Tables 4a through 4f.
[28] Whether this level difference in dispersion corresponds with the higher observed arms length prices themselves is an interesting area for further work; see Bernard et al (2006).
[29] For greater detail at the commodity level, see the Appendix.

time, at 0.4 percent per annum, although the value share has decreased in some commodities like stone and ceramic goods and general machinery.

Commodities with the lowest amount of price variation by trade partner (column 6) include precious materials (2.5), wood products (1.9), and textiles (2.7). This seems reasonable given the fairly homogeneous quality within each product category (eg, gold). Those showing the largest price dispersion are chemicals (92.9), livestock (48.3), and transport equipment (31.4), which often have 10-digit commodity categories that cover a broad range of differentiated products. What is more, the price dispersion trends vary by category. While the raw import data indicate that price dispersion has been decreasing about 2.1 percent per year, driven primarily by lower variation in unit prices among machinery goods, for chemicals the variation in unit prices has been increasing dramatically.

Finally, the last two columns show the average number of 10-digit commodities and the number of countries exporting to the US within each product grouping, respectively. Both textiles and machinery contain the largest number of 10-digit codes, while the fewest belong to primary or resource-intensive products. Most countries are also well-represented across product groupings.[30]

IV

To better account for factors that may influence traded price dispersion, I use multivariate OLS regression analysis on the country-commodity dataset. I model the coefficient of variation as a function of a few different types of variables. First, to account for standard determinants of trade patterns, I include **gravity trade factors** like trade partner gross income, bilateral distance (kilometers) to the US, the effective dutiable rate, and total transportation costs for each commodity paid annually; **country- and year-varying variables** like trade partner's income per capita, external debt, foreign direct investment, and net terms of trade; and **dummy variables** for year, region, income group, and commodity groups.[31] All prices and monetary values are in current dollars.

I also include **trade openness variables** such as the percentage of trade relative to the economy (a measure of foreign dependency), the number of US trade partners exporting the same ten-digit commodity (a measure of international competition), and the number of ten-digit commodities exported to the US for each trade partner (a measure of economic sophistication). In addition, I account for **multinational trade activity** in the percentage of related party trade value relative to total trade for each commodity exported by each trade partner. To capture the curvature in the price dispersion series as suggested by the earlier figures, I include both a linear and non-linear **time trend** for the entire period. Finally, there are also **interaction terms** for both multinational trade and time trend by region, income group, and major commodity groups.

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[30] The appendix contains annual breakdowns of the 22 commodity groups, including the numbers used to calculate the averages in Table 1.

[31] Commodity group is at the two-digit HS level, while the unit of analysis in the regressions is at the 10-digit HS level (per trade partner).

The results are presented in Table 2, where columns A through D contain the estimates for the model when the data are pooled together and columns E through G use the country-commodity panel format. To mitigate the effect of unit price outliers in the pooled data, those specifications are weighted by the annual import value of each 10-digit commodity per trade partner.

[Table 2 here]

The first specification (column A) includes the time trend and its interactions variables, the share of trade to GDP, gravity trade factors, and fixed effects for year and commodity group. In the remaining specifications, I also include the share of related party trade and its interactions with commodity group, region, and income level. Furthermore, to check for the robustness of the results from the overall data sample, I run the same regressions on two different subsamples: column C is limited to commodities whose classification codes did not change over the period to ensure time consistency, and column D includes only homogeneous commodities that are less likely to exhibit quality and product differentiation.[32] Columns E through G replicate the specifications in columns B through D, but with country-commodity panel data.[33]

Looking at the pooled specifications in columns A through C, basic gravity factors like trade partner gross income and its distance to the US have the expected signs and are highly significant. That is, larger economies are likely to produce (and export) more varied goods with quality (and price) differences in each category. Also, countries further away presumably export a narrower range of goods (and associated prices), particularly those in which they have comparative advantages, to offset greater transportation and transaction costs. This latter aspect is further corroborated by the negative coefficient for transportation costs in columns B and C. Curiously, the higher the external debt of a country, the lower the price dispersion, which may owe to fewer exports in total value and/or a higher degree of specialization in products that are globally competitive; that said, neither of these explanations is tested in this paper. Most of these gravity variables are not significant in the specification containing only homogeneous commodities (column D) either.

With regard to the trade openness variables, all coefficients are positive and generally significant, which is somewhat surprising given conventional wisdom about the relationship between trade and prices. That is, it appears that increased market integration and extensive trade margins correspond to greater price differences for a given commodity.[34] As mentioned earlier, these

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[32] These homogeneous commodities, drawn from the list compiled by Foster et al (2008) include food products like coffee beans; milled wood; paper boxes; ink; concrete; ice and water; gasoline; and baked confectionaries.

[33] A third robustness check uses the same pooled and panel specifications in ten 10 percent random samples of the overall dataset; results, which are not reported, are qualitatively similar.

[34] An alternative measure of globalization (not reported) is the KOF index, produced by the Swiss Federal Institute of Technology. It comprises 24 variables for 181 countries and measures

anomalous relationships may owe to greater product and quality differentiation within a commodity code. This appears to be corroborated among the homogeneous commodities in column D, where the net effect of time is negative for a larger proportion of represented commodity groups (three of the seven) with statistically significant coefficients than in either the unbalanced or balanced data samples.

More generally, among the 22 commodity groups price dispersion is highly variable over time. In column A, eight commodity groups have significant coefficients in their interaction with the linear time trend variable, and all of which are negative.[35] However, their interactions with the quadratic time trend variable are all significant and positive. Similarly, in columns B and C, all commodity groups that have significant coefficients in the linear time trend interaction show an oppositely signed coefficient in the quadratic interaction.[36] Depending on the relative magnitudes of the coefficients on the two time trend interaction terms, commodity price dispersion either increases or decreased over time. Commodities also differ in how the share of related party trade affects price dispersion. In column B, nearly all interactions between commodity group and related party share are negative and significant; in column C, however, most are positive signed. This latter result suggests increasing price dispersion for the same set of commodities over time, while the appearance of new commodities within a broader commodity category mitigates this effect.

For the panel data specifications in columns E through G, the most notable difference from earlier specifications is the significance of related party share on its own and when interacted with another variable. In both column E (unbalanced panel) and F (balanced panel), the net cumulative effect of related party share and its interactions is negative across commodities (except general machinery), regions, and income groups. In other words, a higher share of related party trade is associated with lower price dispersion. In contrast, the coefficients for the interactions between the linear time trend and group variables are consistently positive, which suggests increasing within-commodity price dispersion over time, while all quadratic time trend terms are dropped for collinearity. One interpretation of these two divergent trends is that as the share of related party trade increases, ceteris paribus, the dispersion of overall prices should decrease.

Finally, although results from pooled data specifications generally show little difference between regions, the panel specification in column E shows a negative coefficient for the interaction

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globalization across three dimensions: economic (e.g., trade share, foreign direct investment, portfolio investment), social (e.g., information technology usage, tourism), and political (e.g., diplomatic representation, international treaty participation); see Dreher (2007) and Dreher et al (2008). The results using this index are qualitatively similar to those shown in Table 2.

[35] These include: fats and oils; chemicals; plastic and rubber; leather et al; pulp and paper; textiles; processed metal goods; and precision instruments. Only selected commodity group interactions are reported in Table 2; the remaining commodity estimates are available by request.

[36] In column B, these include: fats and oils; chemicals; pulp and paper; processed metal goods; general machinery; and art and antiques. In column C, these include: fats and oils; chemicals; plastic and rubber; pulp and paper; processed metal goods; art and antiques; and special classification items.

between the South America dummy variable and the linear time trend while that for Asia is positive. Estimates from interactions with income group are largely insignificant and similar in trend.

V

Whether price convergence issues in general from the recent increase in global trade and the integration of markets remains an open question. Preliminary analysis of detailed U.S. trade transaction data over the past two decades indicates that price dispersion has been highly uneven across time, commodities, region, and trading firm relationship. In particular, it appears that for most commodity groups price dispersion has been increasing and that it is negatively associated with the share of related party trade. Surprisingly, an economy's trade openness is positively associated with price dispersion, which belies conventional wisdom on the correspondence between market integration via trade and price convergence.

These results cast doubt on some explanations for increasing price dispersion despite increasing trade as well as highlight the possibly validity of others. Given the similarity in estimates for the entire sample and the subset of commodities with time-consistent codes or are homogeneous, it is unlikely that commodity heterogeneity at the extensive margin is driving price dispersion. Also, since the share of related party trade appears to mitigate price dispersion in most commodities, its increase over time (0.4 percent on average annually) suggests a product-specific effect and not a generalizable relationship with price trends. This leaves increasing product and quality differentiation within commodity categories as the likely reason for increasing price dispersion in most cases.

To identify whether product differentiation is indeed responsible for price dispersion trends, it may be fruitful to further exploit the additional information available in the trade transaction records, in particular the establishment identifier that can be used to link trade transactions with other Census data products. Given the persistent difference in price level and dispersion depending on trade party relationship, these linked datasets, which would include detailed firm and establishment level information like size, revenues, wages, capital investment, and research and development expenditure, may clarify the degree to which higher quality inputs in capital and labor correspond to higher per unit prices within a commodity category. Separately, the existence of new data that indicate whether firms engage in offshoring may elucidate how changes in foreign procurement or supplier volatility affect the pricing of intermediate goods.[37] Thus, while this paper suggests that there may not be a simple relationship between trade and price convergence, it nevertheless may be possible to disentangle the myriad facets of globalization that contribute to recent price dispersion.

[37] See Jarmin et al (2009).

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Figure 1: Coefficient of Variation, Import Prices

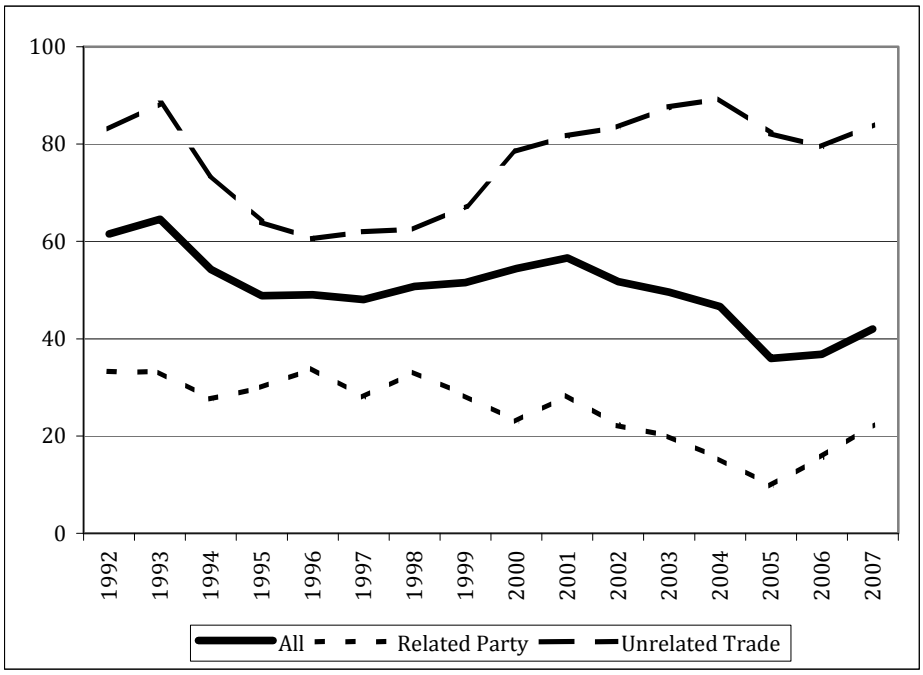
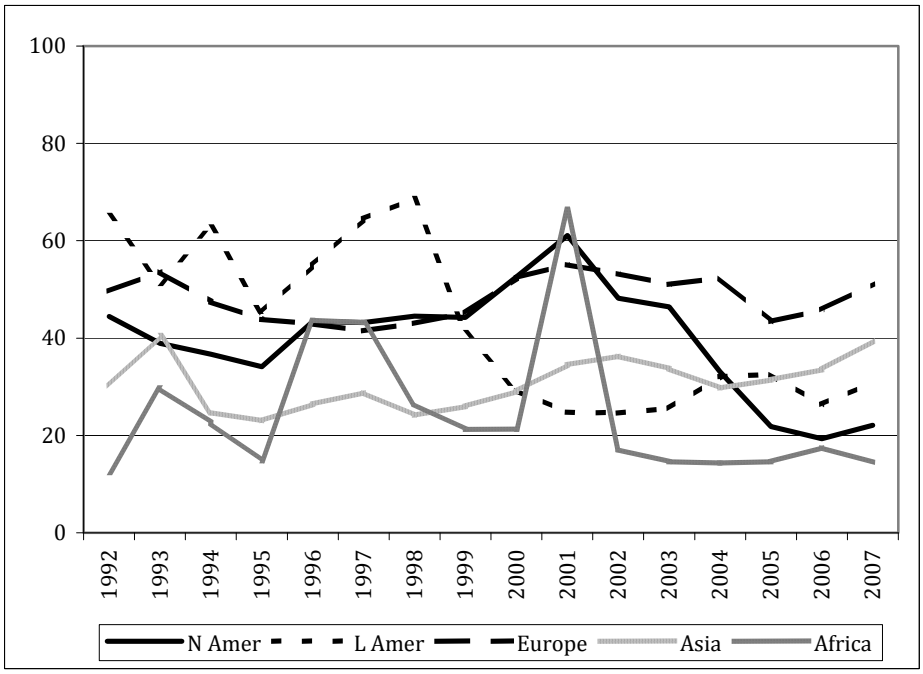
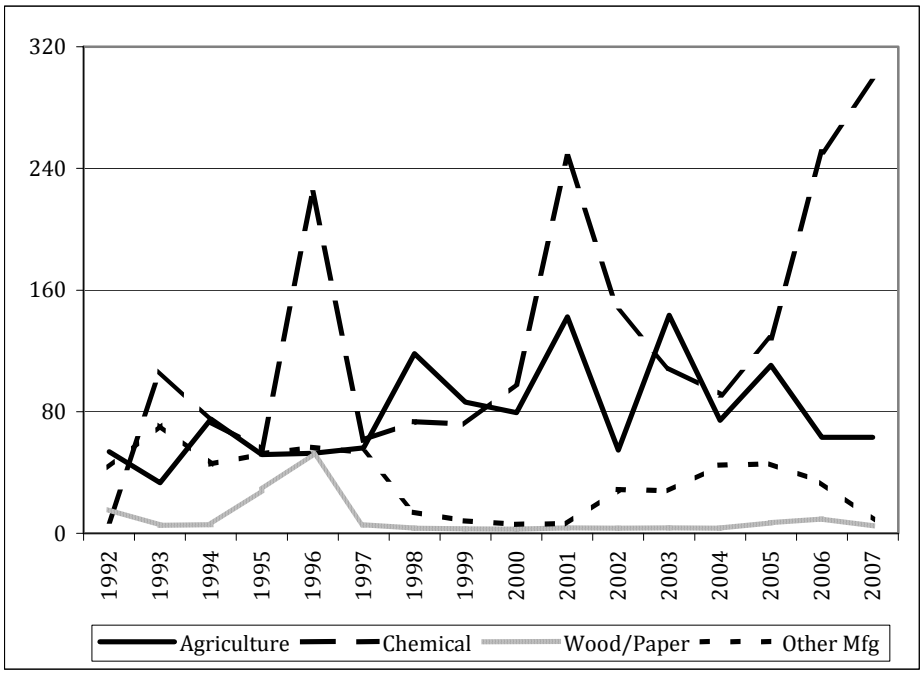


Figure 2: Coefficient of Variation, by Region



Figures 3a-b: Coefficient of Variation, by Major Commodity Group



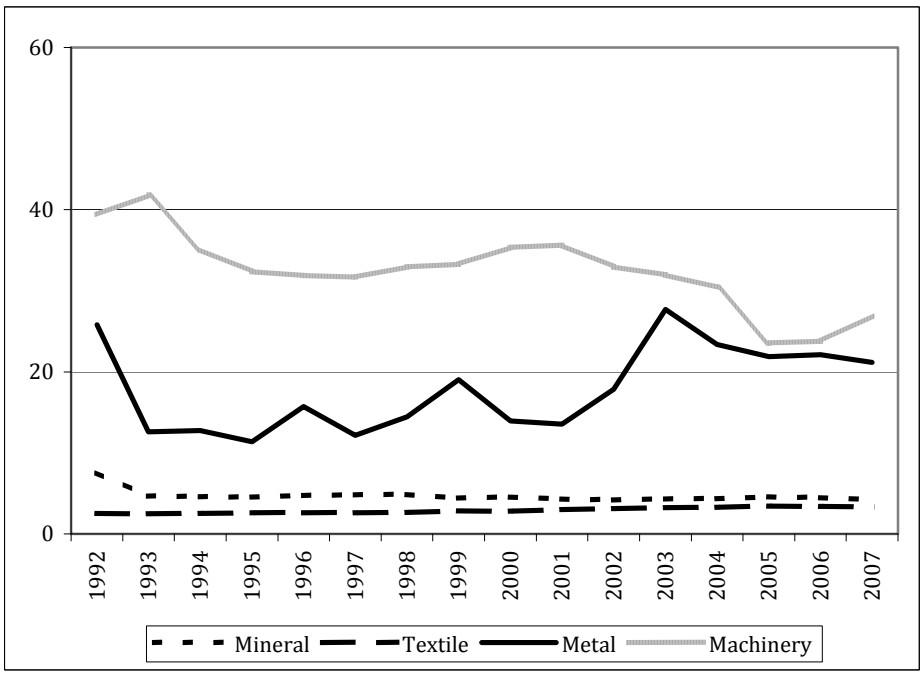


Figure 4a: Coefficient of Variation, North America

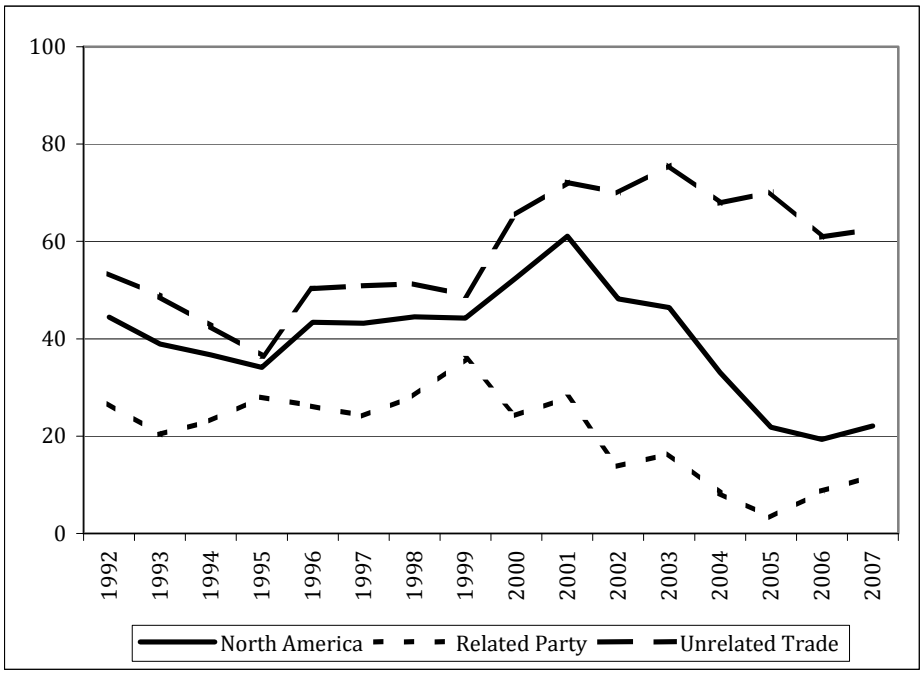


Figure 4b: Coefficient of Variation, Europe

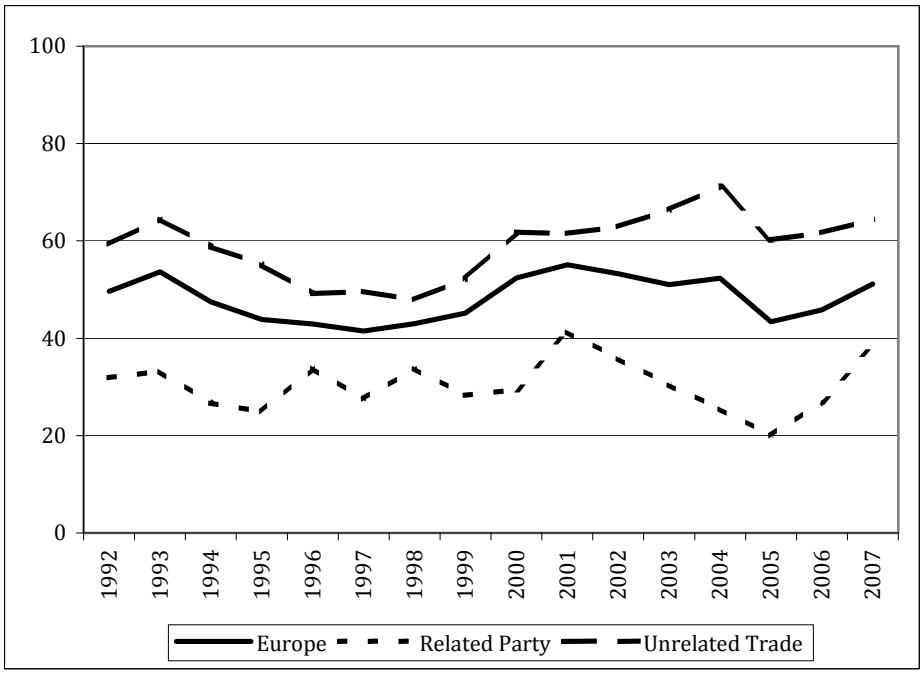


Figure 4c: Coefficient of Variation, Asia

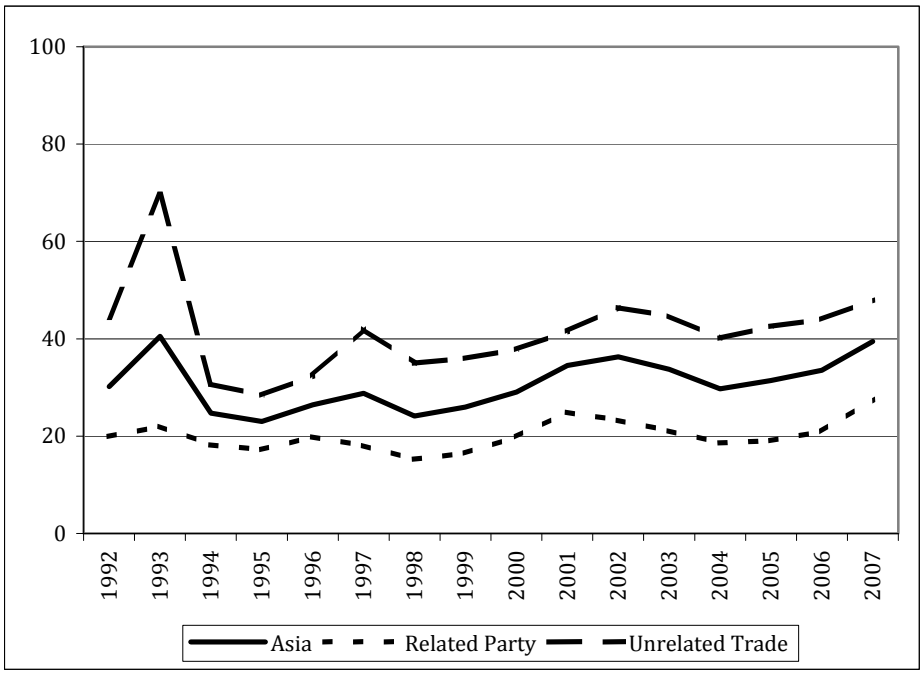


Figure 4d: Coefficient of Variation, Latin America

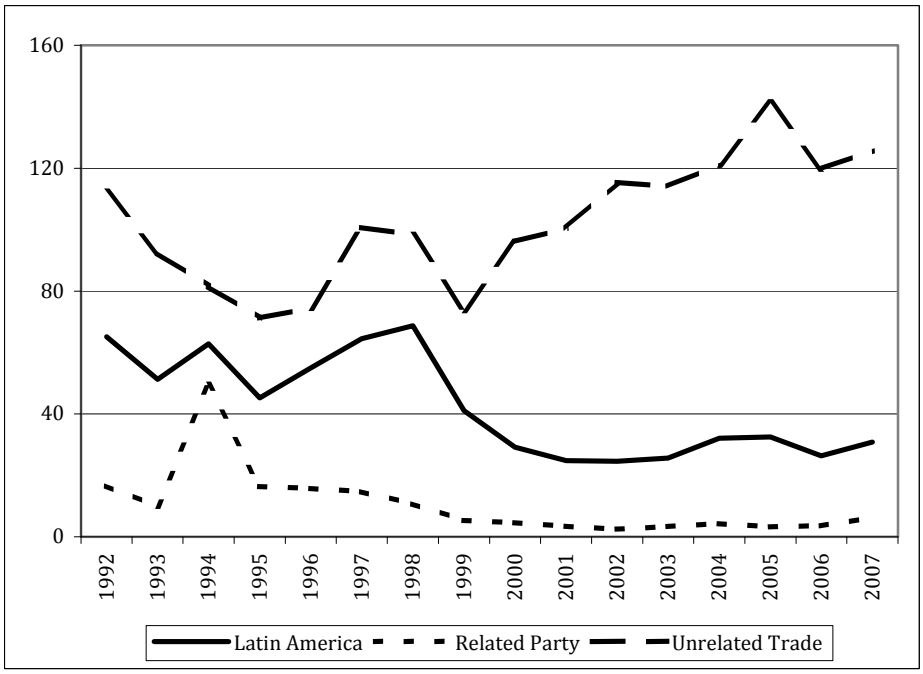


Figure 4e: Coefficient of Variation, Africa

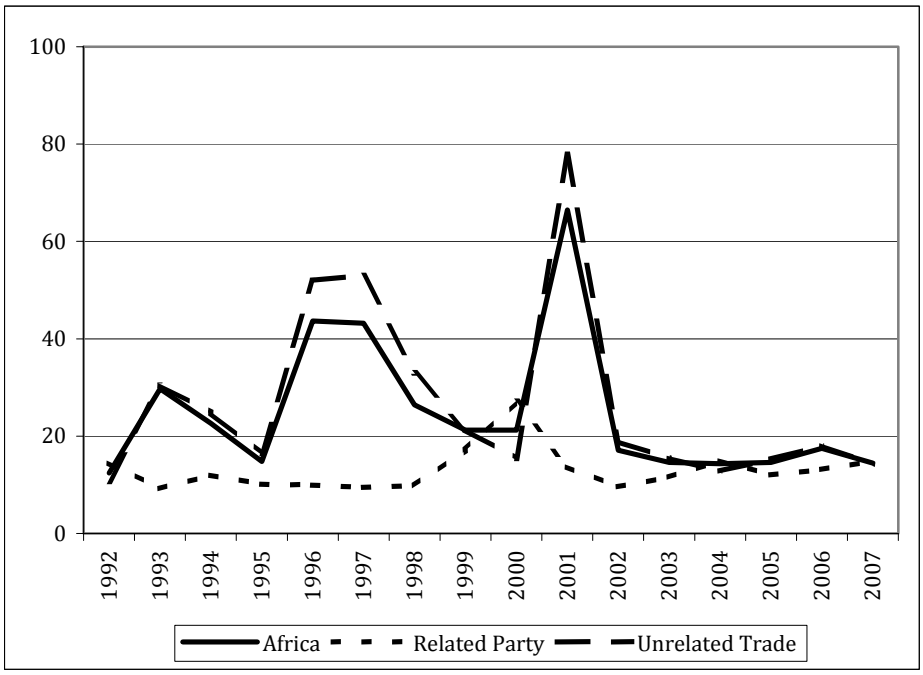


Figure 4f: Coefficient of Variation, Oceania

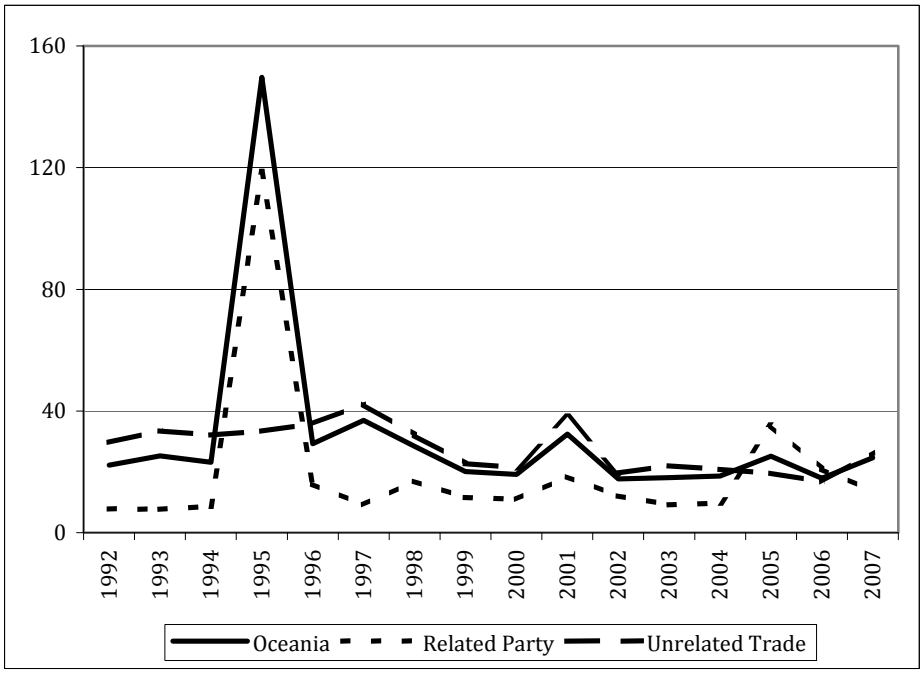


Figure 5a: Coefficient of Variation, Agricultural Goods

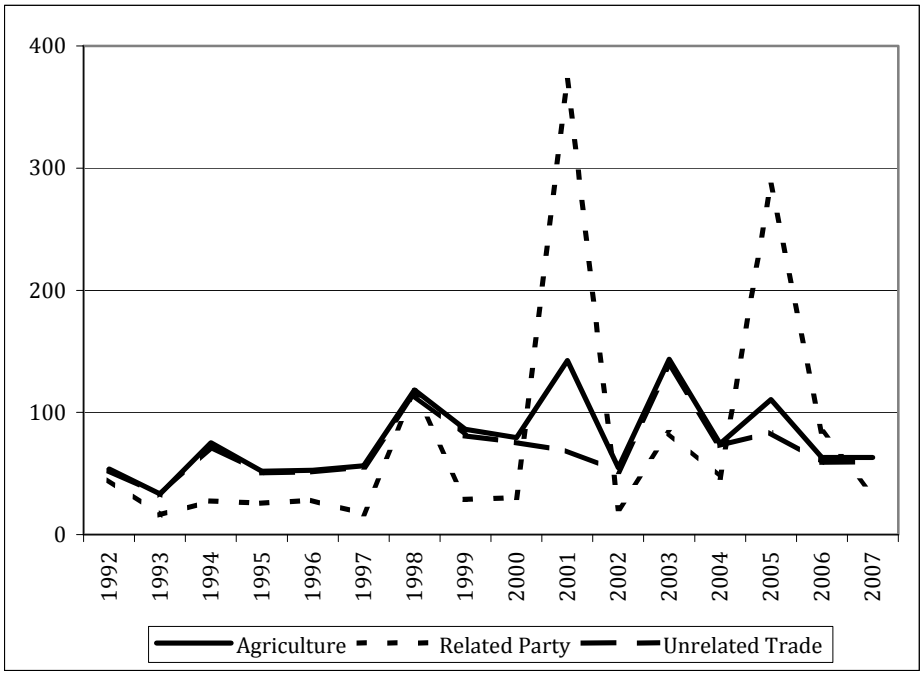


Figure 5b: Coefficient of Variation, Mineral and Allied Goods

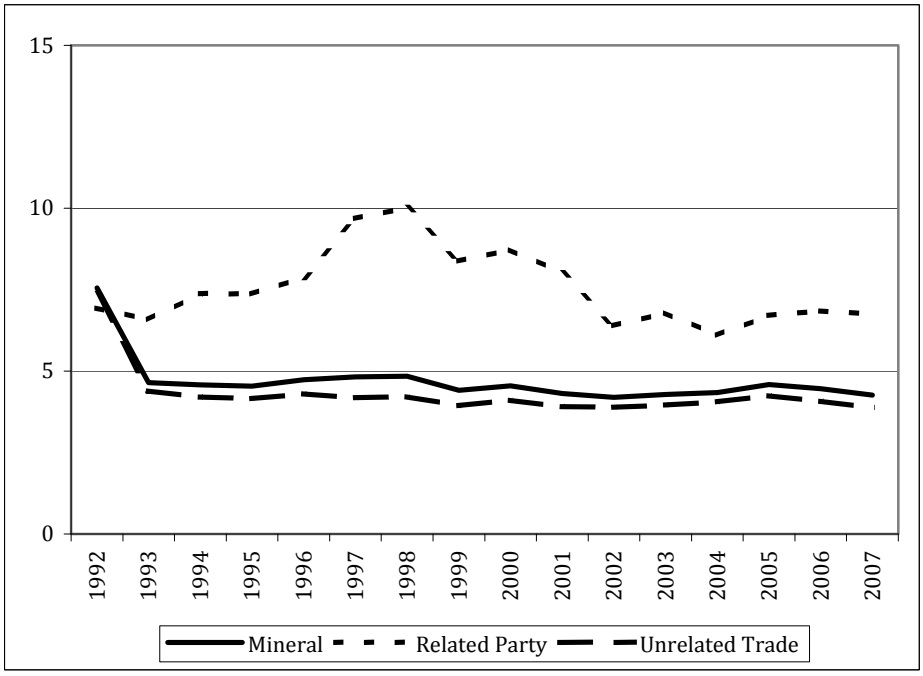


Figure 5c: Coefficient of Variation, Wood and Paper Goods

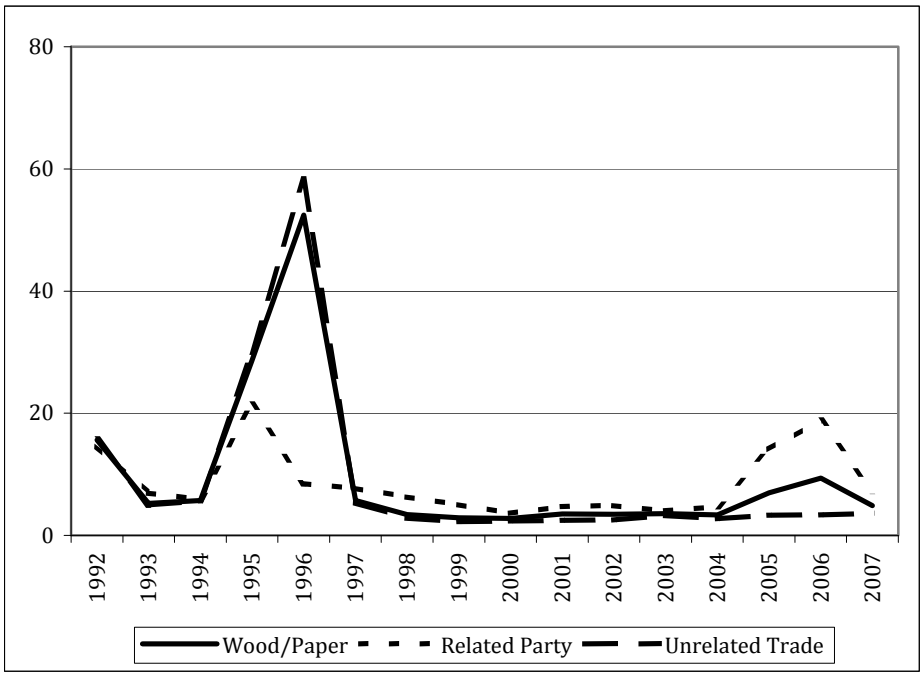


Figure 5d: Coefficient of Variation, Chemical and Allied Goods

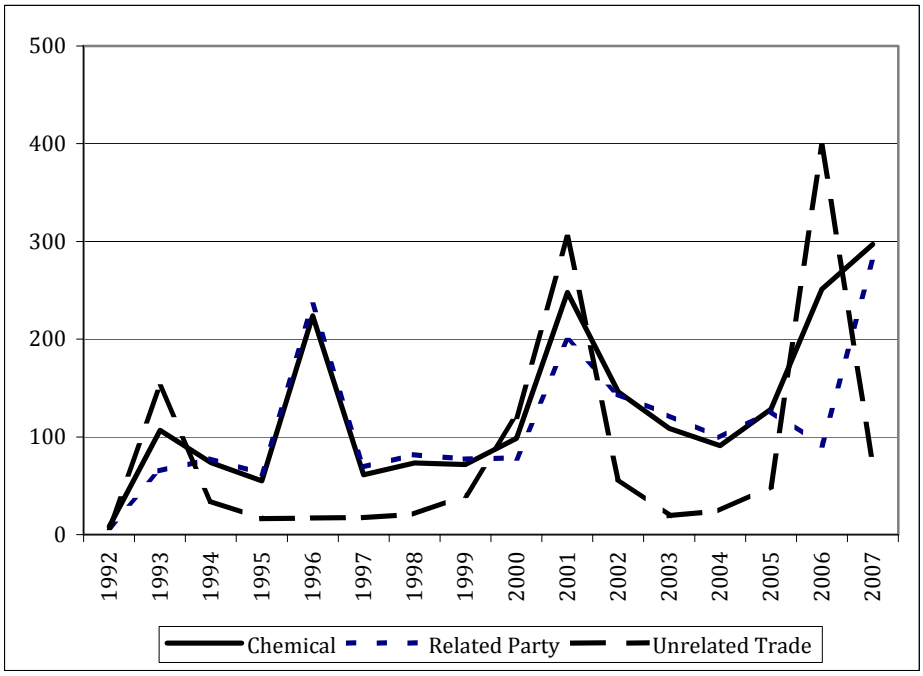


Figure 5e: Coefficient of Variation, Textile Goods

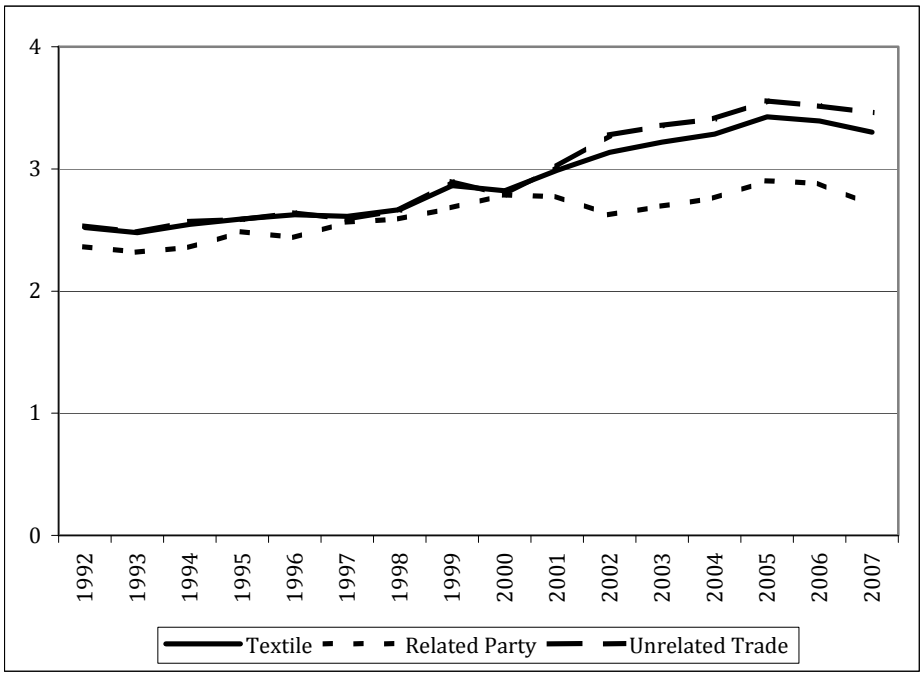


Figure 5f: Coefficient of Variation, Processed Metal Goods

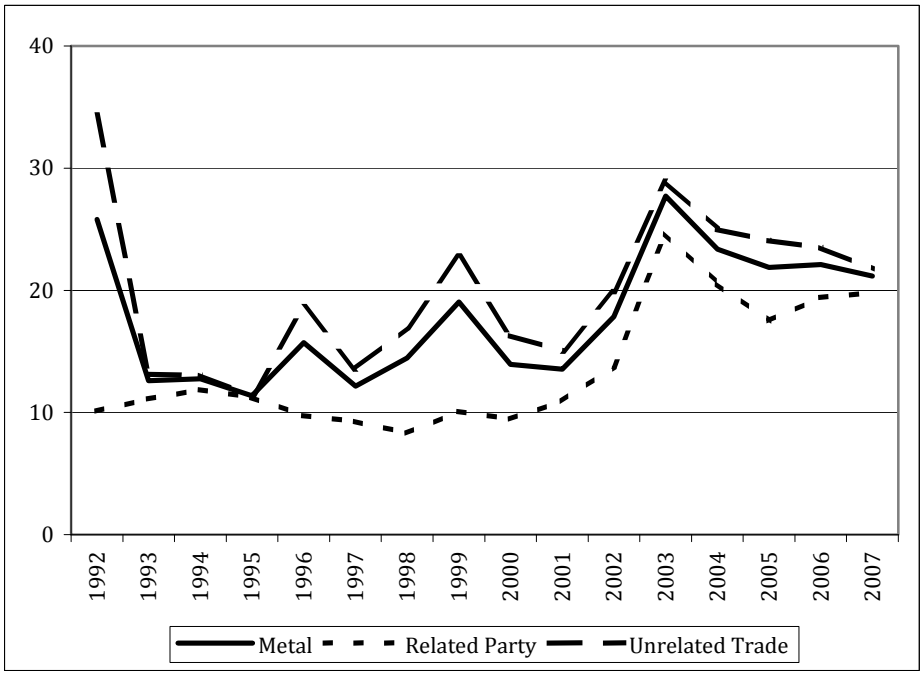


Figure 5g: Coefficient of Variation, Machinery Goods

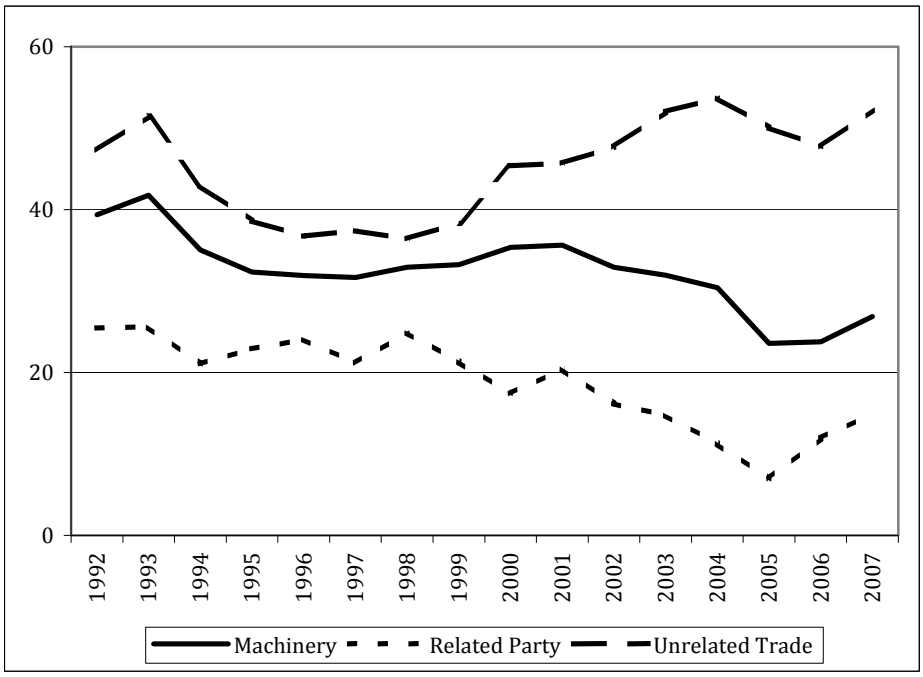


Figure 5h: Coefficient of Variation, Other Manufactures

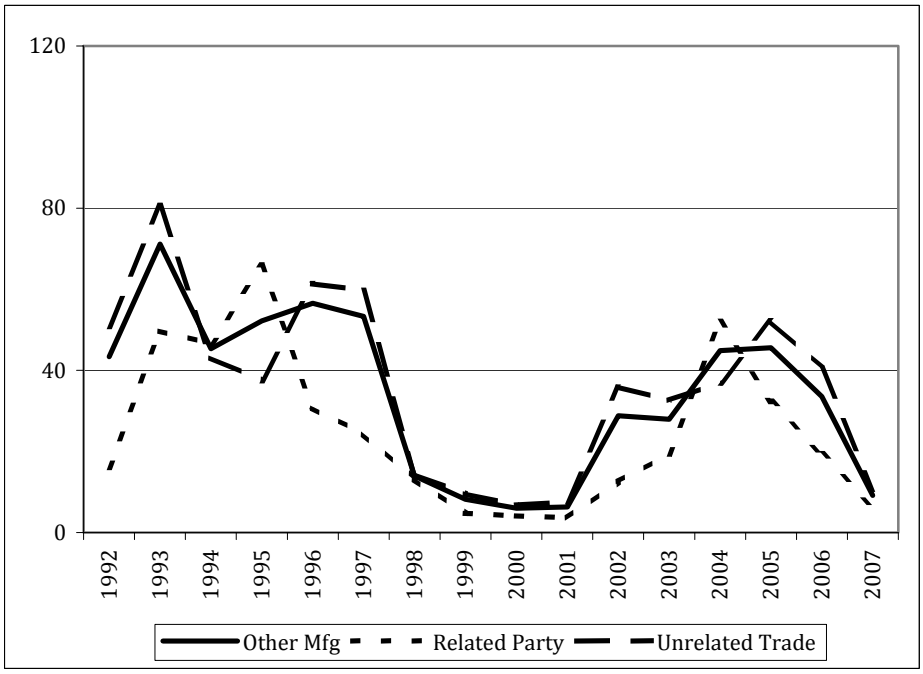


Table 1: Commodity Group Summary Statistics

	Value		Related Party		Coefficient of Variation		HS10	Country
	2007 ($bil)	*Avg Year Δ (%)*	*Avg Trade Share (%)*	*Avg Year Δ (%)*	*1992-2007 Average*	*Avg Year Δ (%)*	*1992-2007 Average*	*1992-2007 Average*
Overall	**1,698.7**	**9.0**	**47.3**	**0.4**	**50.1**	**-2.1**	**16,222**	**224**
I. Agricultural Goods	**86.8**	**7.7**	**20.7**	**3.0**	**78.7**	**18.5**	**2,315**	**202**
a. Livestock, Animal Products	20.8	5.9	11.6	4.0	48.3	15.5	655	165
b. Vegetable Products	23.0	8.3	20.7	0.9	13.9	1.4	709	164
c. Fats and Oils	3.4	9.8	19.8	3.2	15.6	0.4	88	89
d. Prepared Food and Beverage	39.6	8.5	26.6	3.6	18.9	16.1	862	161
II. Minerals, Allied Goods	**246.3**	**10.2**	**21.3**	**4.3**	**4.7**	**-3.1**	**760**	**184**
a. Minerals	181.5	11.5	22.9	5.3	4.2	-2.1	269	131
b. Stone and Ceramic Goods	17.3	8.8	29.3	-0.4	8.6	3.4	365	138
c. Precious Materials	47.5	9.9	11.4	4.3	2.5	-3.7	127	158
III. Chemicals, Allied Goods	**199.0**	**10.9**	**51.5**	**1.5**	**127.7**	**112.3**	**2,637**	**192**
a. Chemicals	136.3	12.1	59.8	1.3	92.9	101.3	1,917	159
b. Plastics and Rubber	52.2	10.1	45.5	-0.2	6.7	6.1	451	160
c. Leather	10.6	5.1	10.1	2.5	3.8	-0.9	270	149
IV. Wood and Paper Goods	**46.5**	**6.9**	**24.0**	**3.1**	**9.8**	**26.4**	**714**	**174**
a. Wood	19.3	8.4	13.7	5.7	1.9	1.6	393	149
b. Paper and Pulp	27.1	6.4	31.9	2.8	11.9	28.0	321	146
V. Textiles and Accessories	**120.7**	**6.7**	**14.0**	**0.6**	**2.9**	**1.9**	**3,817**	**195**
a. Textiles	99.1	7.3	15.9	0.6	2.7	2.0	3,420	193
b. Accessories	21.6	4.5	6.4	-1.3	3.7	0.0	397	140
VI. Processed Metal Goods	**115.1**	**11.9**	**37.4**	**-0.5**	**17.8**	**2.5**	**1,617**	**163**
VII. Machinery	**762.1**	**8.8**	**66.0**	**-0.4**	**32.4**	**-2.1**	**3,879**	**206**
a. General Machinery	479.5	9.4	61.3	-0.6	19.2	-0.6	2,563	200
b. Transport Equipment	222.7	7.8	76.7	-0.1	31.4	-0.1	416	132
c. Precision Instruments	57.7	8.4	60.6	0.6	28.3	0.6	841	161
d. Ordnance	2.2	10.6	38.5	-1.4	13.5	-1.4	59	61
VIII. Other Manufactures	**122.3**	**9.1**	**30.9**	**0.2**	**34.1**	**15.1**	**482**	**211**
a. Miscellaneous Manufactures	75.3	10.0	27.7	-0.4	17.3	-0.4	405	165
b. Art and Antiques	8.7	10.8	12.0	-2.4	10.2	-2.4	11	170
c. Special Classification Items	38.3	7.7	39.1	2.1	26.0	2.1	66	201

Note: See Appendix for annual breakdowns.

Table 2: Regression Results

DV: Coefficient of variation	[A]	[B]	[C]	[D]	[E]	[F]	[G]
Dataset format	pooled	pooled	pooled, balanced HS	pooled, homo. goods	panel, unbalanced	panel, balanced HS	panel, homo. goods
Time trend 1992-2007	dropped	dropped	dropped	dropped	dropped	dropped	dropped
Time trend^2 (10^{-4})	dropped	dropped	-0.401	-4.564***	dropped	dropped	dropped
			(0.338)	(1.255)			
Related party trade share		1.207	-0.712	1.294	-0.469***	-0.778***	-0.435
		(1.078)	(1.154)	(5.559)	(0.055)	(0.127)	(0.478)
Gravity trade variables							
GDP ($ tril)	1.040***	0.656***	0.668**	0.370	0.088***	-0.001	-0.248
	(0.248)	(0.240)	(0.276)	(1.090)	(0.017)	(0.025)	(0.321)
Distance (10^{-4})	-1.206***	-0.426**	-0.745***	1.207	-0.143***	-0.230***	-0.371
	(0.156)	(0.184)	(0.195)	(1.35)	(0.012)	(0.019)	(0.323)
GDP per capita (10^{-4})	0.386	0.371	0.060	-0.465	-0.010	-0.010	0.101
	(0.347)	(0.344)	(0.465)	(1.758)	(0.021)	(0.029)	(0.398)
External debt ($ tril)	-1.860**	-4.790***	-3.130***	-5.920	-0.185***	-0.235**	1.220
	(0.803)	(1.020)	(0.997)	(5.600)	(0.072)	(0.108)	(1.330)
Foreign direct investment ($ tril)	-14.300**	-8.250	-11.400*	7.970	-0.582*	1.650***	-9.340*
	(5.66)	(5.430)	(6.040)	(25.600)	(0.305)	(0.467)	(5.270)
Terms of trade (not %)	0.416***	-0.224	0.351*	-0.489	-0.026***	0.061***	-0.098
	(0.160)	(0.159)	(0.180)	(0.766)	(0.009)	(0.015)	(0.134)
Transport charges ($ bil)	0.572	-3.500***	-3.290**	0.189e^3**	0.028e^3***	0.038e^3***	0.680e^3***
	(1.390)	(1.080)	(1.480)	(0.742e^3)	(0.006e^3)	(0.011e^3)	(0.184e^3)
Import tariffs paid ($ bil)	-0.004	-3.060	1.420	0.956e^3***	0.799	4.590	0.017e^6***
	(2.810)	(2.450)	(3.210)	(0.340e^3)	(2.570)	(3.840)	(0.002e^6)
Trade openness variables							
Share of trade to GDP (not %)	0.459***	0.188	0.337***	0.308	0.107***	0.039***	0.365***
	(0.125)	(0.129)	(0.126)	(0.644)	(0.010)	(0.015)	(0.118)
Trade partners per commodity (10)		0.280***	0.173***	0.720***	0.137***	0.129***	0.242***
		(0.016)	(0.026)	(0.130)	(0.002)	(0.003)	(0.040)
Commodities per trade partner (1000)		0.169***	0.174***	0.345***	0.105***	0.110***	0.184***
		(0.021)	(0.024)	(0.124)	(0.002)	(0.003)	(0.062)

Table 2: Regression Results (cont.)

DV: Coefficient of variation	[A]	[B]	[C]	[D]	[E]	[F]	[G]
Dataset format	pooled	pooled	pooled, balanced HS	pooled, homo. goods	panel, unbalanced	panel, balanced HS	panel, homo. goods
Selected interaction terms							
Chemicals · Time trend (10^{-1})	-1.033***	-0.863***	-0.880***	1.196	0.310***	0.197***	0.297*
	(0.254)	(0.251)	(0.247)	(0.760)	(0.024)	(0.029)	(0.158)
Chemicals · Time trend^2 (10^{-4})	0.519***	0.435***	0.443***	4.597***	dropped	dropped	dropped
	(0.127)	(0.125)	(0.124)	(1.15)			
Chemicals · Related share		-2.472**	0.146	0.157	0.140**	0.345***	0.245
		(1.037)	(0.286)	(2.105)	(0.055)	(0.124)	(0.253)
Asia · Time trend (10^{-1})	0.391	0.518*	-1.438	2.288	0.024**	0.059***	0.199
	(0.269)	(0.268)	(1.334)	(1.930)	(0.010)	(0.013)	(0.200)
Asia · Time trend^2 (10^{-4})	-0.214**	-0.225**	0.72	-1.143	dropped	dropped	dropped
	(0.093)	(0.094)	(0.667)	(0.966)			
Asia · Related share		1.414***	-0.117	-5.451	0.342***	0.350***	0.401
		(0.266)	(1.094)	(5.512)	(0.023)	(0.058)	(0.453)
Middle-High Y · Time trend (10^{-1})	0.175	0.374	0.212	-0.674	-0.027**	0.007	-0.134
	(0.251)	(0.269)	(0.218)	(0.984)	(0.013)	(0.017)	(0.262)
Middle-High Y · Time trend^2 (10^{-4})	-0.087	-0.187	-0.106	0.337	dropped	dropped	dropped
	(0.126)	(0.135)	(0.109)	(0.492)			
Middle-High Y · Related share		0.313	1.127***	1.491	0.322***	0.570***	0.778
		(0.339)	(0.320)	(1.952)	(0.027)	(0.067)	(0.478)
N	948,445	948,445	569,574	2,359	948,445	569,574	2,359
R^2	0.139	0.170	0.175	0.798	0.136	0.145	0.474

Robust standard errors in parentheses. Significance level: ***1% **5% *10%

Note: Pooled data specifications are weighted by annual transaction value by commodity per import partner. All specifications include year, major commodity group, region, and income group fixed effects. See text for complete list of included variables.

Appendix: Commodity Group Annual Summary Statistics

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
I. Agricultural Products								
a. Livestock and Animal Products (HS 01 through 05)								
1992	4,100	34.63	28.56	34.72	9.189	7.7	559	154
1993	4,039	21.39	11.48	21.25	7.966	7.8	555	158
1994	4,411	47.07	17.12	46.59	10.029	7.5	554	163
1995	4,568	33.98	31.30	33.38	10.336	8.3	628	161
1996	4,561	34.91	35.18	34.19	10.270	10.0	639	163
1997	4,776	38.72	24.20	37.77	11.597	12.2	646	161
1998	4,768	74.61	90.68	73.02	12.237	14.1	673	170
1999	4,717	53.42	57.01	50.91	13.237	13.7	663	155
2000	4,925	48.15	52.41	46.24	15.059	12.7	687	167
2001	4,913	84.23	169.80	42.32	15.533	13.3	686	161
2002	5,139	34.08	32.35	32.70	15.616	12.5	697	176
2003	4,977	85.76	101.75	83.17	15.530	11.9	696	169
2004	5,014	46.68	61.29	45.13	17.380	12.9	692	167
2005	4,967	64.75	212.06	49.20	18.727	14.0	693	173
2006	4,955	35.64	104.51	33.51	19.593	13.8	703	166
2007	5,048	34.15	23.92	32.55	20.844	13.0	712	171
b. Vegetable Products (HS 06 through 14)								
1992	5,269	11.87	10.52	12.31	7.616	20.5	626	161
1993	5,169	14.25	10.59	15.25	6.826	23.1	635	157
1994	5,716	15.51	10.31	16.84	9.702	21.3	659	158
1995	5,803	15.01	11.77	16.14	11.010	20.9	680	162
1996	6,067	22.09	10.89	25.01	11.570	23.4	683	157
1997	6,305	13.70	10.97	14.34	13.326	22.0	694	164
1998	6,279	12.94	14.77	12.63	13.654	20.2	700	167
1999	6,224	13.45	13.26	13.37	13.554	20.2	727	167
2000	6,482	15.37	14.34	15.47	13.440	19.4	716	169
2001	6,628	12.66	13.79	12.47	12.662	19.8	731	163
2002	7,027	12.98	14.23	12.79	13.130	20.9	752	163
2003	7,176	13.31	17.68	11.28	13.926	19.6	751	171
2004	7,255	13.30	16.22	11.59	16.274	18.6	738	164
2005	7,332	11.88	18.07	10.43	17.948	19.0	748	167
2006	7,415	12.47	16.06	11.81	20.051	19.8	758	168
2007	7,550	11.41	16.22	10.72	22.981	22.6	746	172
c. Fats and Oils (HS 15)								
1992	561	16.94	9.38	18.84	1.053	15.8	95	72
1993	529	17.81	3.57	19.48	0.811	17.4	94	71
1994	580	21.35	7.91	23.14	1.200	17.8	89	81
1995	642	14.92	11.74	15.77	1.506	22.2	91	79
1996	573	15.73	5.17	17.70	1.573	18.6	86	89
1997	613	11.13	6.65	12.16	1.566	15.9	84	92
1998	582	17.77	20.21	15.35	1.508	12.5	86	84
1999	642	16.35	17.81	15.14	1.388	19.3	90	89
2000	674	15.98	11.51	16.92	1.387	23.2	90	79
2001	651	20.63	9.16	21.70	1.178	23.2	85	89
2002	723	12.93	13.72	12.64	1.323	25.1	86	91

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
2003	792	16.73	13.15	17.42	1.483	21.2	88	99
2004	779	17.17	8.94	18.14	2.234	22.0	88	102
2005	837	11.00	9.18	11.49	2.343	22.2	86	104
2006	869	12.91	16.41	11.35	2.797	21.0	89	102
2007	879	10.44	13.21	9.41	3.376	20.0	87	106
d. Prepared Food and Beverage (HS 16 through 24)								
1992	7,356	7.03	7.96	6.71	12.308	19.2	715	158
1993	7,228	9.73	19.88	8.00	10.071	20.1	728	152
1994	7,938	17.12	45.75	10.79	12.523	22.3	790	150
1995	8,358	11.50	18.19	8.65	13.354	22.8	880	156
1996	8,447	9.07	15.49	6.69	16.215	23.5	841	155
1997	8,712	8.20	11.19	6.80	17.663	24.7	884	159
1998	8,801	10.20	14.52	8.33	18.209	25.9	878	157
1999	8,712	24.99	16.80	25.82	19.738	26.1	868	164
2000	9,209	21.18	17.14	22.57	20.479	27.7	870	161
2001	9,564	28.83	21.40	30.11	21.687	28.1	873	160
2002	10,227	21.59	17.90	21.74	24.025	29.6	910	172
2003	10,530	31.43	31.50	30.83	26.482	29.7	920	161
2004	10,715	31.06	37.57	27.70	29.656	30.4	904	171
2005	10,806	22.47	32.43	11.44	32.574	30.6	911	170
2006	10,911	23.68	34.38	10.18	37.666	31.9	903	160
2007	11,102	24.34	38.31	10.18	39.575	32.8	919	168
II. Mineral and Allied Products								
a. Minerals (HS 25 through 27)								
1992	1,928	4.58	4.69	4.47	49.543	22.3	271	127
1993	1,875	4.49	4.41	4.49	40.735	21.4	273	130
1994	2,013	4.11	4.66	3.84	50.326	22.3	268	126
1995	2,099	4.48	4.13	4.60	52.634	23.1	276	129
1996	2,166	4.42	4.21	4.40	52.050	16.8	278	128
1997	2,195	3.90	4.20	3.67	44.436	16.8	267	129
1998	2,221	4.61	5.22	4.20	32.318	15.0	267	126
1999	2,248	4.07	4.08	4.02	36.329	14.3	261	133
2000	2,371	4.04	3.67	4.21	60.844	15.0	259	133
2001	2,408	5.30	7.37	4.21	58.453	14.6	259	129
2002	2,404	4.14	4.62	3.90	60.535	16.9	270	127
2003	2,356	3.88	4.06	3.79	78.494	21.5	272	128
2004	2,473	3.90	3.80	3.93	106.064	28.2	271	137
2005	2,541	4.07	4.62	3.78	145.036	36.0	274	137
2006	2,532	3.77	2.99	3.91	168.129	40.6	272	139
2007	2,515	2.91	2.94	2.85	181.490	41.1	270	132
b. Stone and Ceramic Goods (HS 68 through 70)								
1992	5,366	5.65	7.35	4.89	5.279	30.0	307	120
1993	5,316	5.50	6.69	4.97	4.701	29.6	316	124
1994	5,868	6.40	8.18	5.69	6.612	31.3	319	136
1995	6,283	7.73	11.79	5.16	7.348	30.1	341	132
1996	6,651	12.30	14.37	11.06	7.892	32.5	365	133
1997	6,936	12.72	17.51	10.50	8.750	31.7	372	142
1998	6,959	13.79	22.61	5.71	9.402	31.1	369	139
1999	7,032	11.36	15.66	8.69	10.675	31.8	368	139

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
2000	7,421	10.09	17.87	6.55	11.854	29.6	382	135
2001	7,398	8.46	16.50	4.99	11.372	28.8	379	136
2002	7,607	6.20	9.06	5.04	11.912	27.4	376	138
2003	7,786	6.65	9.64	5.59	12.439	27.3	381	140
2004	7,934	7.25	8.72	6.88	14.573	27.2	390	146
2005	7,959	7.11	12.09	6.17	15.905	26.1	381	145
2006	8,005	9.91	8.41	9.72	17.461	26.8	383	156
2007	8,415	6.36	9.09	5.85	17.305	27.7	403	154
c. Precious Materials (HS 71)								
1992	2,387	4.45	2.88	4.56	12.454	11.7	115	153
1993	2,436	2.64	2.58	2.64	11.466	7.5	115	157
1994	2,631	2.53	2.67	2.48	15.004	8.6	115	150
1995	2,853	2.44	2.61	2.41	15.724	10.0	123	156
1996	3,006	2.40	2.47	2.38	17.199	9.1	133	158
1997	3,083	2.44	3.22	2.34	19.110	10.6	129	161
1998	3,137	2.47	2.21	2.49	22.531	10.7	129	158
1999	3,085	2.30	2.60	2.27	24.473	12.3	129	157
2000	3,202	2.43	2.60	2.41	29.788	11.4	129	160
2001	3,060	2.28	2.37	2.27	26.009	10.9	129	149
2002	3,079	2.28	2.43	2.26	26.492	11.1	130	166
2003	3,027	2.29	2.48	2.27	27.126	10.0	130	159
2004	3,042	2.27	2.24	2.27	33.347	11.0	130	162
2005	3,081	2.44	2.45	2.44	37.171	12.9	130	159
2006	3,186	2.27	2.62	2.24	43.970	17.1	130	164
2007	3,246	2.26	2.52	2.23	47.518	18.2	130	162
III. Chemicals, Plastics, and Allied Products								
a. Chemicals (HS 28 through 38)								
1992	15,116	7.19	7.73	6.13	26.039	54.9	1,817	150
1993	14,561	88.97	56.88	126.71	21.927	55.7	1,749	154
1994	15,878	63.28	65.95	32.20	29.518	54.6	1,771	157
1995	16,722	47.08	54.02	13.33	35.668	53.7	1,901	154
1996	17,071	178.76	187.66	14.48	40.070	54.0	1,910	155
1997	18,067	51.28	57.87	14.78	44.781	54.2	1,925	157
1998	17,967	58.95	66.65	17.24	48.657	56.1	1,927	154
1999	17,920	54.69	59.73	32.28	55.700	57.8	1,923	152
2000	18,431	72.88	60.14	89.62	65.877	59.4	1,930	160
2001	18,559	162.43	139.62	196.80	70.927	61.9	1,919	158
2002	19,195	98.35	99.24	41.79	76.493	66.1	1,950	163
2003	19,436	82.04	95.85	14.54	84.590	65.2	1,971	161
2004	20,414	69.49	78.07	19.35	97.619	66.0	2,004	169
2005	20,289	86.50	87.46	36.09	109.954	64.3	1,988	166
2006	20,480	169.24	63.04	274.18	122.227	66.8	1,983	174
2007	20,424	194.48	184.69	57.54	136.287	66.3	1,996	167
b. Plastics and Rubber (HS 39 and 40)								
1992	6,757	5.93	5.25	6.19	13.261	45.6	404	123
1993	7,129	5.48	4.97	5.51	12.227	45.9	403	134
1994	8,350	5.33	4.90	5.38	17.260	45.6	418	150
1995	8,697	5.42	5.14	5.26	20.339	45.4	444	148
1996	8,687	5.34	4.87	5.48	20.874	45.8	441	147

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
1997	9,260	10.19	4.94	14.73	22.422	45.5	444	159
1998	9,606	9.82	5.21	14.48	24.013	47.9	445	156
1999	9,975	6.09	6.06	5.63	25.974	48.0	447	160
2000	10,235	6.07	5.73	6.16	29.030	47.5	444	165
2001	10,650	6.12	5.86	6.01	28.218	45.0	452	173
2002	11,094	5.55	4.71	6.35	30.319	44.8	472	169
2003	11,217	5.49	4.98	5.86	33.019	45.3	473	167
2004	11,745	5.38	4.86	5.80	39.662	44.5	482	172
2005	12,192	7.04	6.56	7.37	46.985	43.1	478	183
2006	12,279	8.34	4.67	10.13	50.991	43.9	479	176
2007	12,497	9.54	4.99	12.15	52.164	44.3	485	185
c. Leather (HS 41 through 43)								
1992	3,862	4.07	2.84	4.30	5.482	8.0	215	137
1993	4,142	4.15	2.35	4.47	4.652	8.2	228	137
1994	4,730	4.33	2.76	4.60	6.468	8.3	230	147
1995	4,729	3.91	2.10	4.32	6.644	10.3	235	138
1996	4,717	3.70	2.37	4.07	6.769	10.8	233	147
1997	4,896	3.99	2.29	4.40	7.170	10.0	233	139
1998	5,017	4.06	2.42	4.42	7.129	10.0	240	133
1999	4,990	3.89	2.50	4.22	7.169	10.4	234	139
2000	5,354	3.68	2.73	3.94	8.533	10.2	232	153
2001	5,326	3.57	2.59	3.90	8.418	10.3	234	155
2002	6,289	3.57	2.68	3.90	8.131	10.9	344	154
2003	6,198	3.40	2.33	3.89	8.125	10.9	334	153
2004	6,263	3.39	2.13	4.09	9.245	10.9	330	159
2005	6,358	3.36	1.99	4.17	9.605	10.7	331	154
2006	6,390	3.55	2.06	4.49	10.131	10.6	330	169
2007	6,378	3.51	2.27	4.46	10.565	11.2	331	165
IV. Wood and Paper Goods								
a. Wood Products (HS 44 through 46)								
1992	3,065	2.03	1.83	2.04	6.668	10.1	358	140
1993	3,081	1.68	1.86	1.66	7.434	10.5	366	127
1994	3,419	1.64	1.61	1.64	10.371	11.1	365	138
1995	3,623	1.94	1.80	1.95	10.193	11.3	370	139
1996	3,835	1.83	1.95	1.82	11.930	8.7	393	145
1997	4,089	1.69	2.07	1.65	13.232	8.3	387	148
1998	4,026	1.78	2.08	1.74	13.681	8.7	388	149
1999	4,251	1.68	1.97	1.64	16.440	9.0	392	150
2000	4,478	1.88	1.92	1.87	15.907	11.2	392	148
2001	4,531	2.06	1.98	2.06	15.457	13.5	393	155
2002	4,801	2.09	2.01	2.10	16.252	15.8	405	151
2003	4,846	2.16	2.01	2.19	16.735	18.0	402	158
2004	4,966	1.96	1.84	1.99	23.534	20.7	402	154
2005	5,070	2.06	1.91	2.09	24.429	20.5	401	158
2006	5,391	2.16	2.11	2.17	23.577	20.4	448	162
2007	5,390	2.40	2.39	2.41	19.324	21.3	433	158
b. Paper and Pulp (HS 47 through 49)								
1992	3,065	2.03	1.83	2.04	6.668	10.1	358	140
1993	3,081	1.68	1.86	1.66	7.434	10.5	366	127

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
1994	3,419	1.64	1.61	1.64	10.371	11.1	365	138
1995	3,623	1.94	1.80	1.95	10.193	11.3	370	139
1996	3,835	1.83	1.95	1.82	11.930	8.7	393	145
1997	4,089	1.69	2.07	1.65	13.232	8.3	387	148
1998	4,026	1.78	2.08	1.74	13.681	8.7	388	149
1999	4,251	1.68	1.97	1.64	16.440	9.0	392	150
2000	4,478	1.88	1.92	1.87	15.907	11.2	392	148
2001	4,531	2.06	1.98	2.06	15.457	13.5	393	155
2002	4,801	2.09	2.01	2.10	16.252	15.8	405	151
2003	4,846	2.16	2.01	2.19	16.735	18.0	402	158
2004	4,966	1.96	1.84	1.99	23.534	20.7	402	154
2005	5,070	2.06	1.91	2.09	24.429	20.5	401	158
2006	5,391	2.16	2.11	2.17	23.577	20.4	448	162
2007	5,390	2.40	2.39	2.41	19.324	21.3	433	158
V. Textiles and Clothing Accessories								
a. Textiles (HS 50 through 63)								
1992	42,336	2.33	2.28	2.32	36.492	13.6	3,211	182
1993	42,028	2.27	2.20	2.26	31.711	14.1	3,217	186
1994	46,894	2.34	2.24	2.35	42.976	14.7	3,278	191
1995	48,195	2.39	2.37	2.37	46.663	15.2	3,298	185
1996	49,875	2.44	2.34	2.44	48.894	15.7	3,377	190
1997	52,259	2.43	2.46	2.39	57.035	15.5	3,438	185
1998	54,493	2.49	2.49	2.47	63.144	16.0	3,421	194
1999	57,150	2.68	2.59	2.69	66.430	16.5	3,417	187
2000	60,999	2.62	2.69	2.57	74.681	16.7	3,458	195
2001	61,031	2.76	2.68	2.76	73.434	17.0	3,435	197
2002	64,448	2.89	2.54	2.99	75.084	17.6	3,503	197
2003	64,843	2.99	2.63	3.08	77.398	17.4	3,497	198
2004	65,373	3.08	2.69	3.17	86.692	17.5	3,506	201
2005	67,459	3.23	2.85	3.32	92.580	16.1	3,531	202
2006	69,257	3.19	2.82	3.27	96.173	15.3	3,590	202
2007	67,200	3.10	2.65	3.22	99.104	14.7	3,541	199
b. Clothing Accessories (HS 64 through 67)								
1992	4,852	4.05	3.51	4.01	11.625	6.6	373	125
1993	5,469	3.69	3.11	3.76	10.235	7.4	377	127
1994	6,241	3.75	2.69	3.96	13.380	7.8	398	125
1995	6,357	3.26	2.50	3.40	13.899	8.0	408	131
1996	6,395	3.31	2.55	3.44	14.485	6.6	405	131
1997	6,462	3.42	2.78	3.51	15.764	7.3	408	142
1998	6,615	3.42	2.64	3.58	15.824	7.5	411	140
1999	6,643	3.93	2.80	4.15	16.219	6.3	413	133
2000	6,902	3.82	2.75	4.02	17.274	6.2	415	146
2001	6,680	3.68	2.40	3.94	17.787	6.5	390	136
2002	6,907	5.18	2.18	5.94	17.972	6.2	391	143
2003	7,033	3.73	2.19	4.14	17.455	5.9	391	150
2004	7,176	3.57	2.05	4.05	19.243	6.3	389	151
2005	7,254	3.66	2.06	4.10	20.467	4.7	387	157
2006	7,416	3.85	2.06	4.34	21.374	4.8	391	153
2007	7,597	3.48	1.93	3.88	21.564	5.0	411	152

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
VI. Processed Metal Goods (HS 72 through 83)								
1992	18,151	25.81	10.10	34.37	26.025	40.5	1,495	156
1993	18,275	12.61	11.11	13.13	23.681	37.6	1,511	150
1994	20,783	12.74	11.88	13.03	36.940	38.2	1,559	157
1995	20,919	11.38	11.24	11.33	41.364	38.4	1,557	157
1996	22,032	15.72	9.75	18.65	42.299	38.7	1,583	156
1997	23,320	12.16	9.27	13.57	46.506	38.0	1,619	164
1998	23,461	14.47	8.30	16.97	50.460	38.4	1,607	160
1999	23,273	19.04	10.10	22.78	48.566	35.6	1,611	159
2000	24,484	13.94	9.46	16.31	56.252	36.3	1,645	167
2001	23,835	13.55	10.91	15.02	49.348	37.9	1,630	169
2002	23,739	17.85	13.77	19.89	51.126	36.8	1,639	163
2003	24,128	27.71	24.65	28.96	50.431	37.4	1,712	171
2004	25,340	23.37	20.54	25.00	77.276	36.6	1,663	172
2005	25,575	21.88	17.50	24.07	88.721	36.3	1,671	164
2006	26,327	22.10	19.42	23.50	113.434	34.1	1,667	176
2007	25,906	21.17	19.81	21.75	115.080	36.8	1,700	166
VII. Machinery Goods								
a. General Machinery (HS 84 and 85)								
1992	35,954	20.26	19.99	20.32	138.464	63.0	2,185	178
1993	35,764	18.02	19.26	16.68	130.007	63.1	2,208	168
1994	42,207	17.08	18.44	15.74	191.258	62.4	2,451	182
1995	44,052	14.97	14.39	15.04	228.569	62.3	2,467	190
1996	46,895	17.00	14.20	17.75	236.491	62.4	2,579	197
1997	53,304	19.05	14.43	20.44	258.370	61.5	2,842	199
1998	50,397	19.63	14.12	21.21	272.263	61.9	2,661	202
1999	50,459	20.67	14.81	21.79	302.900	61.2	2,682	201
2000	52,750	18.36	16.48	18.99	358.608	61.2	2,643	202
2001	52,726	21.43	19.33	21.45	308.190	60.4	2,649	207
2002	52,922	22.48	20.14	22.52	306.335	61.0	2,653	205
2003	53,847	19.87	16.80	21.46	309.824	61.9	2,641	212
2004	55,961	17.36	13.93	19.69	374.520	62.1	2,636	213
2005	57,323	17.19	12.82	19.95	418.878	60.0	2,640	213
2006	58,924	19.49	16.70	21.08	456.450	59.3	2,651	215
2007	56,372	24.25	25.77	22.70	479.459	57.7	2,426	209
b. Transport Equipment (HS 86 through 89)								
1992	3,679	40.38	23.11	49.00	76.865	77.4	370	110
1993	3,711	47.55	24.77	59.46	71.375	76.4	369	118
1994	4,642	42.50	18.15	56.68	97.968	76.0	412	128
1995	4,834	42.11	22.92	58.51	102.404	79.4	419	125
1996	4,873	39.85	22.88	55.01	107.366	75.2	415	134
1997	5,120	37.84	19.36	51.95	119.261	73.5	415	128
1998	5,418	34.73	24.22	41.15	132.358	75.1	423	126
1999	5,494	30.02	17.03	38.13	158.608	74.7	424	133
2000	5,745	29.83	11.94	41.76	176.620	78.0	421	138
2001	5,841	29.03	14.09	42.37	174.613	77.6	422	143
2002	6,018	25.60	9.88	44.85	180.264	78.1	427	131
2003	5,914	24.06	8.85	47.85	177.824	78.1	420	135
2004	6,156	23.39	6.73	51.33	196.790	78.5	425	132

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
2005	6,306	17.89	3.14	51.28	205.805	76.4	421	135
2006	6,392	17.91	7.57	56.69	220.562	76.5	423	138
2007	7,032	20.17	9.59	61.47	222.735	75.5	445	154
c. Precision Instruments (HS 90 through 92)								
1992	10,630	18.54	15.61	21.44	18.239	57.3	800	132
1993	10,618	18.85	19.97	10.60	16.518	60.1	797	140
1994	11,884	24.04	21.27	21.97	22.422	61.1	812	152
1995	12,274	23.25	22.13	13.89	25.304	61.7	823	145
1996	12,741	24.07	22.34	17.57	26.394	60.1	826	154
1997	14,205	25.61	23.91	19.08	29.113	60.5	890	161
1998	13,922	22.82	22.69	18.24	31.461	60.0	855	157
1999	13,892	25.89	25.43	19.23	33.876	58.9	848	156
2000	14,717	28.03	28.03	22.29	40.245	57.7	848	167
2001	14,925	29.58	28.67	23.59	38.528	58.6	864	161
2002	15,028	34.83	33.50	22.89	38.515	61.8	857	159
2003	14,862	39.15	38.15	30.92	41.196	62.3	855	167
2004	15,485	37.37	35.16	39.89	48.574	62.8	856	182
2005	15,712	41.42	38.65	44.40	51.083	61.7	850	178
2006	16,095	45.08	41.33	49.99	54.696	62.1	846	182
2007	16,046	14.86	12.75	18.02	57.726	62.8	833	187
d. Ordnance (HS 93)								
1992	575	9.01	2.65	8.82	0.541	45.7	58	49
1993	570	9.90	3.40	9.60	0.517	36.4	59	58
1994	658	9.74	7.25	9.25	0.741	35.6	60	59
1995	617	12.26	17.71	9.59	0.654	45.0	60	55
1996	654	7.00	3.74	7.19	0.615	42.9	58	63
1997	678	13.53	4.34	13.54	0.588	37.4	59	59
1998	689	6.85	4.84	6.81	0.620	43.7	56	60
1999	735	7.91	7.27	7.62	0.686	45.8	59	63
2000	754	5.34	5.87	5.09	0.779	42.6	60	62
2001	737	5.82	6.15	5.66	0.832	38.1	59	59
2002	754	33.63	4.23	33.54	0.969	35.3	57	62
2003	774	6.45	3.21	7.14	1.061	33.5	56	62
2004	761	9.90	12.73	7.03	1.338	33.8	57	66
2005	849	7.83	2.17	9.01	1.446	35.1	62	64
2006	830	33.30	35.28	31.34	1.823	31.4	61	60
2007	880	37.27	40.02	12.96	2.188	33.7	61	68
VIII. Other Manufactures								
a. Miscellaneous Manufactures (HS 94 through 96)								
1992	8,305	14.83	12.87	15.44	18.730	31.3	408	141
1993	8,429	13.34	12.73	13.27	17.328	31.8	415	145
1994	9,512	13.08	11.81	13.40	22.465	28.7	419	159
1995	9,799	16.92	21.96	14.68	24.918	27.9	419	157
1996	9,887	17.52	14.31	18.24	27.951	29.4	421	169
1997	10,306	21.79	37.39	16.38	32.843	30.4	431	162
1998	9,649	12.53	15.00	11.96	36.916	29.3	397	159
1999	9,736	12.14	10.06	12.27	41.273	27.3	397	162
2000	10,262	12.86	11.95	12.88	45.882	26.0	403	169
2001	10,189	14.07	11.58	14.10	46.199	28.1	391	172

Year	Shipment	Coefficient of Variation			Value		HS10	Country
		Overall Avg	*Related*	*Unrelated*	*Total ($ bil)*	*Rel. %*	*Total*	*Total*
2002	10,712	13.85	13.76	13.76	50.928	27.1	399	164
2003	10,752	14.55	12.42	14.69	51.955	25.6	400	175
2004	11,020	16.97	10.97	17.21	58.857	23.7	400	181
2005	10,949	44.98	16.16	46.64	64.838	24.3	399	170
2006	11,083	18.69	22.31	17.86	68.818	24.4	399	177
2007	10,329	19.39	23.43	18.05	75.301	28.4	384	183
b. Art and Antiques (HS 97)								
1992	8,305	14.83	12.87	15.44	18.730	31.3	408	141
1993	8,429	13.34	12.73	13.27	17.328	31.8	415	145
1994	9,512	13.08	11.81	13.40	22.465	28.7	419	159
1995	9,799	16.92	21.96	14.68	24.918	27.9	419	157
1996	9,887	17.52	14.31	18.24	27.951	29.4	421	169
1997	10,306	21.79	37.39	16.38	32.843	30.4	431	162
1998	9,649	12.53	15.00	11.96	36.916	29.3	397	159
1999	9,736	12.14	10.06	12.27	41.273	27.3	397	162
2000	10,262	12.86	11.95	12.88	45.882	26.0	403	169
2001	10,189	14.07	11.58	14.10	46.199	28.1	391	172
2002	10,712	13.85	13.76	13.76	50.928	27.1	399	164
2003	10,752	14.55	12.42	14.69	51.955	25.6	400	175
2004	11,020	16.97	10.97	17.21	58.857	23.7	400	181
2005	10,949	44.98	16.16	46.64	64.838	24.3	399	170
2006	11,083	18.69	22.31	17.86	68.818	24.4	399	177
2007	10,329	19.39	23.43	18.05	75.301	28.4	384	183
c. Special Classification Items (HS 98)								
1992	1,530	30.89	13.30	35.04	13.875	33.9	54	187
1993	1,550	51.37	41.00	55.61	11.555	37.0	48	184
1994	1,519	33.92	37.85	31.43	16.186	38.1	51	193
1995	1,590	40.59	55.37	28.05	17.743	37.2	54	201
1996	1,610	44.98	26.68	45.41	20.303	36.8	50	202
1997	2,787	43.92	19.77	46.48	22.850	35.0	73	198
1998	2,777	11.78	10.94	12.22	26.185	35.8	73	201
1999	2,892	5.81	3.45	7.00	31.574	36.2	77	204
2000	2,874	2.65	2.47	2.77	34.447	37.4	71	202
2001	2,857	2.39	2.30	2.46	35.208	38.7	76	200
2002	2,995	24.62	10.14	32.66	35.778	36.7	74	204
2003	2,984	23.67	15.80	29.54	32.223	42.1	71	202
2004	3,048	37.09	41.86	31.80	33.665	45.3	72	204
2005	3,138	33.96	25.66	38.72	36.384	45.7	71	209
2006	3,184	25.43	15.12	30.20	37.976	44.7	72	208
2007	3,215	2.57	2.26	2.78	38.284	45.2	72	210

Source: US Census Bureau (2010).

Note: Commodity groups follow the U.S. International Trade Commission's chapter organization (ie, two-digit Harmonized Schedule classification coding); see USITC (2010).