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Understanding the U.S. Trade Deficit
A Disaggregated Perspective

Catherine L. Mann and Katharina Plück

7.1 Introduction

By late 2005, U.S. net trade had been in deficit for more than twenty-five years and was on a trajectory for more than $700 billion for the year. In dollar terms, this was the largest deficit of any country ever; as a share of gross domestic product (GDP), it was much larger than ever experienced by a large industrial country. Pundits, policymakers, financiers, and researchers wanted to know how the trade deficit got so large. They were even more interested in its future path.

Empirical modeling of the determinants of trade flows using the elasticities approach has a very long history in international economics and is used both to explain the past and to project the future. Key ingredients of this model are the elasticity of demand for exports and imports with respect to economic activity, the elasticity of exports and imports with respect to relative prices, and the influence of other factors, for example, global supply and increased product variety.

Given that so much work has already been done, has U.S. trade changed so as to warrant more analysis in this vein? An examination of U.S. trade patterns over the last twenty-five years finds that the commodity and country composition of trade have changed, particularly for imports. A changing country and commodity composition of trade may be particularly important to understand both the widening of the trade deficit and its future trajectory. Country composition may affect comparative advantage as new global supply comes on line and new trading partners appear and because

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differences in exchange rate regimes across countries may affect movements of relative prices. Commodity composition may matter because of different products may have differences in relative price elasticities. In addition, for both country and commodity composition, differences in growth rates of different categories of expenditure (particularly as reflected in persistent and systematic deviation between production and absorption) in the United States compared with that of U.S. trading partners could be particularly important in explaining the dynamics of U.S. trade and the deficit.

This paper considers whether measures of economic activity other than GDP better model observed trade flows. It investigates whether income and relative price elasticities of U.S. trade differ by trading partner or commodity category. It asks whether new estimates of key parameters improve the forecast performance of the trade equations. Our strategy creates a database of bilateral trade data for thirty-one countries, aggregates these detailed flows into four categories of goods based on the Bureau of Economic Analysis's (BEA) end-use classification system—autos; industrial supplies and materials, excluding energy (ISM-ex); consumer goods; and capital goods. We employ trade prices and measures of expenditure that match these four commodity categories and include a country-by-commodity proxy for global supply-cum-variety.

We find that using expenditure matched by commodity category is a superior measure of economic activity compared with using GDP and yields far more plausible values for the demand elasticities. We find that the demand and relative price elasticities differ between industrial and developing countries and across the four commodity categories. Because the commodity composition of trade and of trading partners has changed, particularly for imports, we find that the demand elasticity for imports is not constant. We find that industrial and developing countries have different demand and relative price elasticities for these four commodity categories. We find that variety is an important variable for the behavior of capital goods trade.

Comparing the in-sample performance of our specification—which disaggregates by product group, uses matched expenditure and trade prices, adds a variable for variety, and differentiates by trading partners' level of income into industrial and developing country groups—with that of the standard formulation of the model—which uses aggregated trade data and GDP as the expenditure variable—our disaggregated model predicts exports better in-sample but does not predict imports as well as the standard formulation. Auto trade and consumer goods imports are least well explained in-sample by the disaggregated model; in-sample predictions of exports in each commodity category (consumer goods, autos, ISM-ex, capital goods) are superior than the predictions from the standard model.

The new elasticities yield insights into the sources of the widening of the

U.S. trade deficit and have implications going forward for policymakers' approach to demand management and exchange rate regimes to rectify global trade imbalances. With respect to demand management, these newly estimated demand elasticities across commodity categories and trading partners imply that if U.S. consumers *saved more,* this would be a more important factor to change the trajectory of the trade deficit than if our trading partners *grew more.* With respect to exchange rate regimes, the estimated relative price elasticities for industrial countries imply that the dollar depreciation since 2002 should affect trade with those countries, but that significantly greater exchange rate variation on the part of developing countries as well is needed to appreciably narrow the U.S. trade deficit.

Section 7.2 of the paper briefly reviews the vast literature on modeling U.S. international trade, focusing on the workhorse model of income and relative prices, including its more recent variations that include proxies for global supply and variety. Section 7.3 presents and discusses data on the U.S. trade deficit that show changes in country and commodity composition of trade, which initiated this investigation. Section 7.4 discusses our newly constructed data. Section 7.5 presents the econometric approach. Section 7.6 discusses results and summarizes findings. Section 7.7 presents some implications and notes areas for further work.

7.2 Literature Review

The classic workhorse model for estimating trade elasticities has been used since at least the 1940s (Adler 1945, 1946; Chang 1945–1946). It relates the volume of exports or imports to real foreign and domestic income and relative prices (in log form):

$$\ln \text{trade} = \alpha + \beta_1 \ln \text{income} + \beta_2 \ln \text{rel.price}.$$

The model assumes that domestic and foreign tradable goods are imperfect substitutes, that price homogeneity holds (e.g., that an estimated coefficient on the trade price and domestic price are equal, thus allowing for a single relative price term), and that the elasticities with respect to economic activity (e.g., income) and relative prices are constant over time (see Hooper, Johnson, and Marquez [2000] for a concise summary of the model).

All studies find—as expected—that an increase in domestic economic activity (income) will raise the domestic demand for imports and that an increase in foreign economic activity (income) will raise the foreign demand for domestic exports. A rise in the relative price of imports to the domestic substitute will reduce demand for imports, and a rise in the relative price of a country's export good to the foreign competing good will dampen the demand for exports.

The sizes of the coefficients on income and relative price vary greatly by study, time period, countries analyzed, coverage of commodity groups, and as to whether different or additional explanatory variables are in the model. Most studies estimate that the income elasticity for U.S. exports is smaller than the income elasticity for U.S. imports and in this regard replicate the earliest and most well-known finding by H. S. Houthakker and Stephen Magee (1969). Subsequent studies often estimate higher export and import elasticities than the original findings but surprisingly find that the *ratio* of the import to export elasticity varies relatively little from the 1.7 found by Houthakker and Magee.[1]

Despite the empirical persistence of this asymmetry and its concomitant value for intermediate-term projections of U.S. trade flows, it is not consistent with global long-run equilibrium. The estimates imply that if the United States and the rest of the world grow at the same pace (long-run convergence), the U.S. trade deficit would worsen, absent a trend change in relative price[2]—which is also inconsistent with long-run equilibrium. Researchers continue to investigate U.S. trade flows and the Houthakker-Magee asymmetry by examining different data samples, considering more precise measures for certain variables, employing different estimation techniques, and adding new independent variables to the basic Houthakker and Magee specification.

One approach to the Houthakker-Magee asymmetry is to evaluate whether changes in the commodity composition of U.S. trade over the past twenty-five years changes the elasticities. For example, researchers have found different income and price elasticities for different product categories (see Stone [1979] and Marquez [2002] for different goods categories; see Sawyer and Sprinkle [1996] for a survey; see Deardorff, Humans, Stern, and Xiang [2001] and Mann [2004] for services). Hooper, Johnson, and Marquez (2000) cannot reject the hypothesis that the U.S. trade elasticities are constant over time, but they hold the country composition of trade fixed at the 1995 shares and, because of data availability and the objective of the study, focus on industrial-country trade. On the other hand, using a

1. Houthakker and Magee (1969) estimated the U.S. income elasticity for total imports of 1.7 (autocorrelation corrected estimate in the appendix) and the foreign income elasticity for U.S. exports at around 1. In their survey of import and export demand elasticities for the United States, Sawyer and Sprinkle (1996) find income elasticities for total merchandise imports ranging from 0.1322 (Welsch 1987) to 4.028 (Wilson and Takacs 1979). Estimates for foreign income elasticities for U.S. exports do not vary quite as much; still they range from 0.374 (Stern, Baum, and Greene 1979) to 2.151 (Wilson and Takacs 1979). The median (mean) estimate of the twenty-four studies on total U.S. imports referenced in Sawyer and Sprinkle is 2.02 (2.14). The median (mean) estimate of the seventeen studies on total U.S. merchandise exports referenced in Sawyer and Sprinkle is 1.12 (1.02). In one of the more recent studies, Hooper, Johnson, and Marquez (2000) find that the long-run income elasticities for U.S. exports and imports are 0.8 and 1.8, respectively, and are stable over time. See also discussion in Mann (1999, 123–26).

2. Krugman and Baldwin (1987), among others, make this observation and discuss implications.

century of data, Marquez (1999) finds that the elasticity with respect to income for U.S. imports varies over time as trade openness affects the share of imports in expenditure.

Researchers have also focused on "the notorious inadequacies of import and export price indexes" (Houthakker and Magee 1969, 112). Relative price measures used most often to proxy for domestic substitutes for the traded product—the GDP deflator and the wholesale price index—introduce bias because both include a considerable share of nontraded goods (Goldstein and Khan 1985). Moreover, conventional price indexes for traded goods are too aggregated to reflect new product introductions and may not take account of the effect of changes in global supply on prices and therefore on demand, which apparently have been important features of current data.[3] Incorporating different price indexes changes the estimated income elasticities in the workhorse model. In a narrow investigation, Feenstra's (1994) detailed work on prices of six narrowly defined manufacturing goods substantially reduced the estimated income elasticity of U.S. import demand for these six products.[4] Marquez (2002) constructs a relative price variable using Feenstra's price-index methodology and also includes a type of relative capital stock term originally used in Helkie and Hooper (1988); his estimation reduced income elasticities for U.S. imports of producer goods, but not of services or consumer goods.

Constructing new price indexes is outside the scope of most empirical work, so researchers have focused on putting auxiliary variables in the standard regression to account for changes to supply and demand that may not be incorporated into price indexes. The sign and size of any such supply-cum-variety variables is not clear. If new trading countries simply increase global supply, global prices would tend to fall and thus increase demand for their exports. But according to Paul Krugman's (1989) "45-degree rule,"[5] such fast-growing countries produce more varieties with in-

3. Broda and Weinstein (2004) show that between 1972 and 2002 the number of varieties imported by the United States increased by 252 percent (15), with an important source of the new varieties being the entry into global trade of dynamic emerging-market economies including China, Taiwan, Korea, India, and Mexico. Hummels and Klenow (2004) find that as countries industrialize and grow, not only do their exports increase in nominal value but also the breadth of variety these countries offer to the world widens. Schott (2004) shows that varieties within a product set differ systematically across countries, with higher unit-value varieties coming from countries with higher productivity. See also Funke and Ruhwedel (2001).

4. Feenstra considers imports of men's leather athletic shoes, men's and boys' cotton knit shirts, stainless steel bars, carbon steel sheets, color television receivers, and portable typewriters, and, for comparison purposes, gold and silver bullion between 1967 and 1987. He treats as variety a good from a particular country (often termed the *Armington assumption*) and calculates each variety's share in actual U.S. expenditure and the U.S. elasticity of substitution between those different varieties. This method takes account of the new varieties produced (in this case, equivalently new trading partners) and exported in ever greater quantities by developing countries, for example.

5. It is called the "45-degree rule" because the growth rates and the ratio of export to import income elasticities for countries can be plotted as a 45-degree line between two axes.

creasing returns to scale and should not experience a deterioration of their trade balance (and therefore face steady depreciation of their currency) because consumers love varieties. Given income, the apparent demand curve for the varieties shifts out, and there is no deterioration in the terms of trade. Peter Schott (2004) finds that fast-growing countries with high productivity growth produce varieties that are high unit value, so for them the demand curve is not only shifting out but also tilting in their favor.

The classic workhorse model (of equation [1]) using the standard complement of income and relative prices may not take account of the effect that trading partners' supply or variety of exports have had on U.S. import prices or import demand. The U.S. import elasticity would tend to be overestimated to the extent that some of the explanation for the rising share of imports in U.S. GDP lies with increased foreign supply (and thus lower prices and thus more demand for imports); and some of the explanation comes from increased domestic taste for variety, holding income constant. Researchers have implemented the global supply-cum-variety measure using several variables.

- Helkie and Hooper (1988) use the ratio of home to foreign productive capital stocks to represent exporters' increased capacity to supply more new products to the U.S. market. Their new variable significantly reduced the inequality between income elasticities for U.S. imports and exports for the time period of their estimation. But in later work using more recent data, the variable is no longer econometrically significant.
- Bayoumi (1999) includes exporters' GDP in a panel estimation for trade flows between 21 industrial countries. He finds that this supply effect is significant and increases in the longer run;[6] the importer's estimated income elasticity decreases over time.
- Marquez (2002) considers immigration as a proxy for American consumers' tastes for varieties from abroad. With a growing share of immigrants in the population, he posits that U.S. demand for imports from immigrants' home countries must be higher, all other things held equal. Including the immigration variable does reduce the estimated U.S. income elasticities for services and consumer goods imports.
- Gagnon, in three recent papers (2003a,b, 2004), finds a significant supply effect (defined as potential output growth or relative GDP of the exporting country). Including this supply variable reduces the coefficient on income in a U.S. import regression. His results for U.S. exports are less robust.

6. The fact that the coefficient on exporters' output increases with increasing lags shows that it is the exporting countries' potential growth that determines its capacity to supply variety, not short-run fluctuations in growth rates.

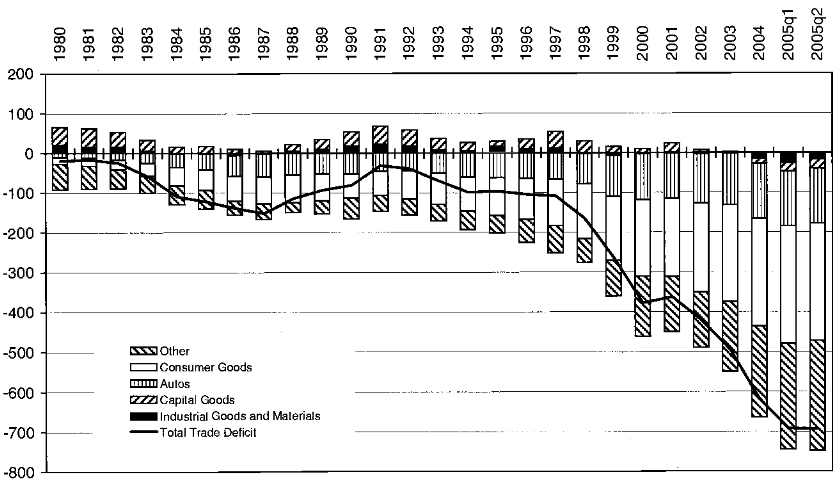

Fig. 7.1 U.S. trade balance by principal end-use categories, billions of U.S. dollars
Source: Bureau of Economic Analysis, International Transactions Accounts Data.

- Similarly, Cline (forthcoming) puts the trading-partner GDP into the workhorse model and finds that it reduces the income elasticities in U.S. trade equations for both exports and imports.

To summarize, considering changes in trading partners and commodity composition of trade, using more disaggregated trade prices, and taking better account of global supply or demand for variety are the predominant directions of the research to date. We will continue in these directions and also investigate the income variable itself, collecting data that better matches this variable to the disaggregated commodity and country composition of trade. So there are five dimensions for our analysis: trading partner, composition of trade, variety-cum-global supply, measures of economic activity, and trade prices.

7.3 Graphical Evidence to Support a Disaggregated Approach

Figure 7.1 and table 7.1 display the *commodity decomposition* of U.S. merchandise trade and are key spurs to this investigation.[7] Figure 7.1 shows the U.S. trade deficit disaggregated into the BEA's end-use categories of capital goods, ISM-ex, consumer goods, and autos and auto parts. (For completeness, the figure also shows net trade in "other"—petroleum and agricultural products.) The bulk of the deterioration in the trade deficit can be accounted for by a widening deficit in autos, consumer

7. Detailed presentation of all the data is available in the appendix figures in Mann and Plück (2005).

Table 7.1 **Trade share by principal end-use category (%)**

	Imports		Exports	
	1980	2004	1980	2004
ISM-ex	31	26	29	14
Capital goods	34	40	13	23
Consumer goods	8	13	14	25
Autos	8	11	11	15
Other	20	12	43	23
Memo: Trade as a share of GDP	10.7	15	9.4	9.8

Source: Bureau of Economic Analysis, International Transactions Account data, table 2.
Notes: ISM-ex = industrial supplies and materials, excluding oil. "Other" defined as petroleum products and feeds, foods, and beverages.

goods, and oil. Capital goods and ISM-ex appear to be more global procyclical.

Table 7.1 decomposes export and imports into these same commodity groups. The largest categories of both imports and exports are capital goods and ISM-ex; from 1980 to 2004, the share of capital goods rose and that of ISM-ex fell. Capital goods is a particularly interesting category because of the potential importance of changing global supply and variety. Moreover, from a macroeconomic perspective, global investment cycles may differ from global GDP cycles, with consequences for U.S. capital goods exports and imports. Consumer goods is a large category with a dramatic increase in the share of U.S. merchandise imports, rising from 14 to 25 percent in twenty-five years. The share of consumer goods in total merchandise exports rose only modestly and accounts for only 13 percent of exports. Consumer goods constitute a particularly interesting category because of the potential role of changes in country source of supply. Moreover, from a macroeconomic perspective, differential growth in personal consumption expenditures in the United States versus that in trading partners may be an important factor in the widening of the U.S. trade deficit.

Table 7.2 shows that the *country composition* of trade, particularly of imports, has changed dramatically.[8] Trade with the industrial countries in general has stayed relatively stable, with the share of imports remaining at about 50 percent and that of exports falling from 60 to 55 percent (1980 to 2004). Within the industrial-country group, exports to Europe and Japan have fallen. The share of imports from certain developing countries and regions has changed dramatically, with the share of imports from China increasing from basically 0 to 13 percent over the period, the share of exports

8. Additional detail on these data can be found in appendix figures A2.1 and A2.2 in Mann and Plück (2005).

Table 7.2 **Trade shares by country/region (%)**

	Exports		Imports	
	1980	2004	1980	2004
Europe	32	23	19	22
Canada	19	24	17	18
Mexico	7	14	5	11
Japan	9	6	13	9
China	2	4	0	13
Asia without China and Japan	15	18	20	17
Latin America without Mexico	11	8	10	7
Australia	1	2	1	1
Other	5	2	15	3

Source: Bureau of Economic Analysis, International Transactions Accounts Data.
Note: "Other" includes Africa and international organizations.

to Mexico doubling to 11 percent, and the share of trade with Latin America (less Mexico) contracting.

Putting the evidence on commodities and countries together with the evolution of trade flows and the trade deficit suggests that closer inspection of trade flows by country *and* commodity is warranted. However, the BEA does not publish bilateral trade data by merchandise categories. The Census Bureau's published trade data by category and trade partner does not extend back further than 1995, and the United States International Trade Commission (USITC) database covers bilateral trade by product only from 1989. Hence, we turn to another comprehensive source of a long time series of data to analyze the changing commodity-and-country composition of U.S. trade.

7.4 Our Database on U.S. Trade Commodity—By Country

Our empirical investigation of trade by commodity and country requires a new database of disaggregated bilateral trade; it also requires additional country and commodity-specific data. Our database includes (a) a thirty-one-country sample of bilateral trade with the United States aggregated into four commodity groups so as to replicate the BEA's main end-use categories; (b) expenditure data matched by country and matched to the commodity groups; (c) trade prices matched to the commodity groups, and relative prices matched by country and commodity group; and (d) a supply-cum-variety proxy for each commodity group.

7.4.1 Constructing Bilateral Trade Data

To approximate our initial evidence derived using BEA data and because we use the Bureau of Labor Statistics's (BLS) trade price indexes that are matched to the BEA categories, we recreate the BEA's end-use categories using the Standard International Trade Classification (SITC, Revision two-, four-, and five-digit), which in the United Nations Comtrade database spans the longest time period. To match BEA's end-use commodity groups, we use Comtrade's raw materials and intermediate goods for our "ISM-ex" category; "capital goods" encompasses most of SITC chapter 7 and some categories in chapter 8; "autos" includes passenger vehicles and their parts from chapter 7; and "consumer goods" is made up almost entirely of the categories comprising chapter 8. We excluded all of chapter 3 (energy) and all of chapter 1 (food) as these are also excluded from the BEA's end-use categories that are the focus of our graphical evidence. Table 7A.1 in the appendix shows the complete list.

For our econometric technique, we need a uniform panel with the same set of countries for each of the commodity groups for both imports and exports. To select countries to include in the database, we start with bilateral trade between the United States and partner countries by each four-digit or five-digit SITC category. For each country reporting trade data to the United Nations, we calculated its share in U.S. total merchandise imports and total merchandise exports and its share in trade in each of our four commodity groups. Of all countries in the database, we selected those that represented the first 90 percent of trade in each category. We excluded most of the Middle East because of the suspicion that trade with these countries might not be well estimated with the income and relative price formulation of the standard workhorse model. We excluded the countries of the former Soviet Union because there are insufficient data on expenditure and prices. We also excluded South Africa. Hence, our sample of bilateral trade pairs includes thirty-one countries from Asia and the Pacific, North America, Latin America, and Western Europe.[9]

Because of our intended econometric approach, some variation in country composition across the commodity groups is ignored. For example, Bangladesh, Honduras, and Sri Lanka are excluded; even though they are in the first 90 percent of U.S. imports of consumer goods, they were not important trading partners in the other end-use categories. At the other extreme, we included thirty-one countries in U.S. auto imports and exports even though the United States trades autos and parts overwhelmingly with Canada, Mexico, Japan, and Germany.[10]

9. Trade data on thirty countries are from the United Nations's (UN) Comtrade database. Data on a comparable basis for Taiwan come from that country's statistical office.

10. Our econometric estimates in this paper confirm that the coefficients differ across the commodity-and-country composition of trade. In a subsequent analysis, we will drop the requirement to have a uniform panel and allow the country composition of the commodity groups to vary. As noted later, this may improve the in-sample predication of imports of autos and consumer goods.

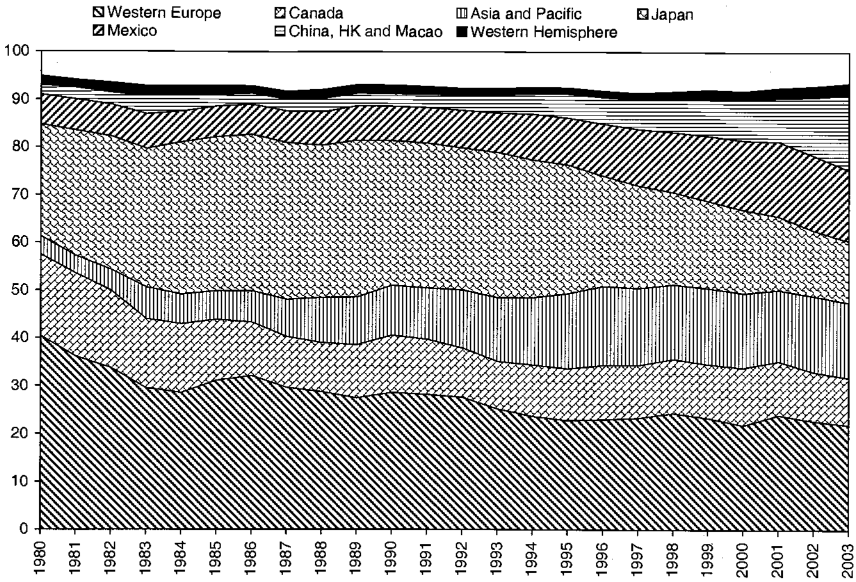

Fig. 7.2 Regional or country shares of U.S. capital goods imports (percent)
Source: United Nations Comtrade database.

Figure 7.2 shows one example—imports of capital goods—of how significant is the change over time in the country-by-commodity shares.[11]

To employ the workhorse model of trade, we need real exports and real imports. We deflate all nominal values by the corresponding end-use export and import price indexes from the BLS's International Price Program.[12]

7.4.2 Constructing Matched Expenditure Variables and Relative Prices

A key part of the analysis is whether the elasticities estimated in the workhorse model differ by the measure of economic activity employed. The standard measure of economic activity used in trade equations is real GDP. Although this makes sense in aggregated trade equations, given the commodity focus of this paper, superior elasticity estimates may be generated by better matching the activity variable to the type of traded commodity.

We construct country-specific measures of real consumption expendi-

11. See appendix figures A4.1 to A4.8 in Mann and Plück (2005) for detailed presentation of the country-by-commodity data over 1980 to 2003.

12. The end-use import and export prices do not differentiate by trading partner. Inspection of some country-specific time series data from the BLS rejects the assumption that prices do not vary by trading partner. However, country-specific trade-price data are unavailable at sufficient time series length and are not disaggregated on an end-use basis.

ture, investment, and GDP from the Penn World Tables.[13] On the import side, U.S. real GDP, real consumption expenditure, and real investment are all from the National Income and Product Accounts (NIPA) tables. In the estimation, we use real consumption expenditures in the trade equations for consumer goods and autos and real investment expenditures in the trade equations for ISM-ex and capital goods.[14] Notably, real investment growth is much more volatile than GDP, and real consumption growth and real GDP growth diverge for extended numbers of years in the 1980s and 1990s.

There is another rationale for using a different measure of economic activity than GDP. The systematic deterioration of the U.S. current account deficit and the comparable rise in current account surpluses around the world (as documented in Truman [2005] and Mann [2005]) suggest a systematic bias in GDP as a measure of economic activity. For chronic surplus countries, GDP growth as a measure of activity generating demand for U.S. exports may be too high as domestic demand growth is less than GDP growth by the share of net exports in those countries' GDPs. For the chronic U.S. deficit, GDP growth as a measure of activity generating demand for U.S. imports may be too low as domestic demand growth is greater than GDP growth by the share of net imports in U.S. GDP. A key econometric exercise is to compare the estimated demand elasticities across these alternative measures of economic activity, controlling for country and commodity-specific effects.

In our analysis, we take the relative price variable of the workhorse model (trade price relative to domestic competing substitute) as given rather than estimate a system of trade and price equations.[15] We construct relative prices for U.S. imports as the ratio of the end-use specific import price index from the BLS and the corresponding U.S. domestic price index from the BLS: The producer price index (PPI) is used for ISM-ex and capital goods. The consumer price index (CPI), excluding energy and food prices, is used for consumer goods and autos. To construct relative export prices, we converted the dollar-based end-use–specific export price index

13. We generate real measures of expenditure by multiplying the real per capita values by population. Because the Penn data only extend through 2000, we use the growth of these expenditure categories from the IMF's *International Financial Statistics* (IFS) deflated by domestic producer price or consumer price indexes to complete the time series to 2003. For a discussion of purchasing power parity (PPP)–adjusted data versus market exchange rate–adjusted data when undertaking comparative country analysis, see Castles and Henderson (2005).

14. Appendix figure A3.1 in Mann and Plück (2005) shows the various export-weighted foreign activity variables and various U.S. activity variables.

15. Most recent studies estimate prices as part of a set of simultaneous equations (Hooper, Johnson, and Marquez 2000). While researchers have always warned of the bias that may be introduced by treating relative prices as exogenous, several recent studies could not confirm that the coefficient on economic activity changed when including different formulations of this price variable or when allowing for simultaneity.

from the BLS into foreign currency using current market exchange rates and divided by the respective trading partner's price index (using CPI or PPI depending on the commodity group, as for the U.S. data).[16] Notably, over the twenty-three-year period, the relative price of capital goods exports and imports exhibit more variation than the relative price of all imports and exports; the relative price of consumer goods imports shows relatively less variation.

7.4.3 Constructing Variety

Recent literature has focused on adding variables to the workhorse model, in part to address the issues, as previously discussed, that have not been embodied in official price indexes. A global supply variable could account for entry of dynamic emerging-market economies into global trade and proxy for an outward shift of the global supply curve, which enables the United States to buy more imports at lower prices. A variety variable could account for differences in quality of goods within a commodity category and how variety in imports (exports) available to U.S. consumers (foreign buyers) has grown. Such quality or variety shifts and changes in taste may not be incorporated into the price indexes we use, hence biasing the overall regression.

Following Broda and Weinstein (2004) as well as Gagnon (2003b), we construct a variety proxy by counting the number of SITC four-digit categories that are included in each commodity group for a given country in each year. To compare the growth in variety across countries and categories, we set the number of categories equal to 100 in the first year of our panel. Similar to Broda and Weinstein, we find that the growth in variety was modest for the industrial countries; emerging-market economies on the other hand substantially increased their supply of variety to the United States.

The growth in variety was especially great for capital goods imports—with the number of SITC categories provided by China having grown by more than 250 percent.[17] In 1980, China provided only forty-six categories under the capital goods heading, with "metalworking machine tools" being the biggest in nominal dollar terms ($18 million); in 2003, China supplied 125 goods out of a possible 136 four-digit categories in capital goods, with $9 billion worth of "peripheral automatic data processing units" as the largest and $6 billion of "office-machine accessories" as the second-largest category. Varieties from other developing countries have also risen: capital goods variety from non-Japan Asia increased by 76 percent; varieties in consumer goods from the Western Hemisphere and Asia increased

16. See Mann and Plück (2005), appendix figures A3.2 and A3.3 for the movement of selected relative price variables.

17. Broda and Weinstein's (2004) findings are similar.

by 39 and 30 percent, respectively. The United States's supply to its different trading partners behaved similarly to that of other industrial countries: Between 1980 and 2003, U.S. variety of exports in capital and consumer goods grew, on average, by 10 percent.

7.5 Econometric Implementation

Our panel thus comprises import and export data, activity variables, and relative prices for thirty-one U.S. partner countries, twenty-four years, and four commodity groups (2,976 observations in all). Each commodity group panel contains thirty-one time series of country data. The whole panel consists of the four commodity panels stacked on top of each other.

We use a dynamic panel specification to model bilateral trade flows. Our model allows us to estimate both short-term and long-term effects of changes in the explanatory variables—similar to an error correction model (ECM) common in time-series estimations:

$$\begin{aligned}\ln \Delta\text{trade}_{ij,t} = \beta_0 &+ \beta_1\Delta \ln \text{trade}_{ij,t-1} + \beta_2\Delta \ln \text{activity}_{ij,t} \\ &+ \beta_3\Delta \ln \text{activity}_{ij,t-1} + \beta_4\Delta \ln \text{rel.price}_{ij,t} \\ &+ \beta_5\Delta \ln \text{rel.price}_{ij,t-1} + \beta_6 \ln \text{trade}_{ij,t-1} + \beta_7 \ln \text{activity}_{ij,t-1} \\ &+ \beta_8 \ln \text{rel.price}_{ij,t-1} + \alpha_{ij} + u_{ij,t},\end{aligned}$$

where i denotes the ith trading partner, j denotes the jth commodity group, and $t = 1980–2003$ are the years in our sample; the α_{ij}s are the unobserved fixed effects and the $u_{ij,t}$ denotes the idiosyncratic error.

For the short-run effects, the coefficient on the differenced natural logarithms of economic activity shows the short-run effect of a 1 percent point change in GDP, investment, or personal consumption expenditure on real exports or imports.

For the long-run relationships, the coefficients on the level logs divided by the coefficient on the lagged dependent variable represent long-run effects; as in the long run, we can set the differenced terms equal to zero:

$$\begin{aligned}\ln \text{trade}_{ij,t-1} = -\frac{\beta_0}{\beta_6} - \frac{\beta_7}{\beta_6} \ln \text{activity}_{ij,t-1} - \frac{\beta_8}{\beta_6} \ln \text{rel.price}_{ij,t-1} \\ - \frac{1}{\beta_6}(\alpha_{ij} + u_{ij,t}).\end{aligned}$$

The calculated coefficient on economic activity in this equation shows the effect of a 1 percent increase in GDP, investment, or personal consumption expenditure on real trade flows.

Using a dynamic formulation in a fixed-effects or first-difference context presents econometric problems. The random error terms are correlated both with the differences and the level of the lagged dependent variable, thus biasing the results for the coefficients. Arellano and Bond (1991) and Blundell and Bond (1998) propose an estimation method that instruments the lagged levels of the dependent variable with the lagged differences of this variable and the differences of the dependent variable with its lagged levels. Our results using these instruments and technique were poor. Wooldridge (2002, chapter 11) and Kennedy (2003, 313) discuss the challenge of choosing an econometric technique in the context of dynamic panel data estimation, and note the bias, yet greater precision, of fixed-effects estimators, as opposed to general least squares or instrumental variable regressions. Studies indicate that the bias induced by fixed effects is offset when the time variable exceeds thirty observations. Our time series is twenty-four years, and we proceed.[18]

7.6 Results and Discussion

This section discusses the findings of the econometric exercise. We wish to compare estimated coefficients constrained over the whole panel versus unconstrained over several different dimensions: commodity decomposition; GDP versus alternative activity variables; and industrial versus developing countries.

7.6.1 Benchmark Regression and Matched Expenditure versus GDP

For the first comparison to previous research, we use the thirty-one-country and four-commodity whole panel with country- and commodity-fixed effects to run a benchmark regression for U.S. imports and U.S. exports. An *F*-test of the constrained whole panel against the unconstrained country- and commodity-fixed effects panel rejects the null hypothesis that the constrained and unconstrained regressions are the same. Table 7.3 presents short-run and long-run estimates for the elasticity estimates for income and for relative prices from representative previous work. Wald tests (see note to table 7.3) test the null hypothesis that the short-run and the long-run coefficients are the same. Generally, the null is rejected for the activity variable. For relative prices, the null is rejected for exports but not for imports.

The first question is how our elasticities estimated using our thirty-one-country and four-commodity panel and using *GDP as the measure of economic activity* compare with previous research. Our income elasticities for

18. Ideally, one might try to estimate this panel using a vector error correction model (VECM) suited for dynamic panel data estimation—these techniques go beyond the scope of this paper (see, for example, Beck [2001]; Schich and Pelgrin [2002]; and Smith [2000] for estimation of long and wide panels). In future work, it makes sense to try to generate the cointegrating vector explicitly using panel dynamic ordinary least squares (Mark and Sul 2002; Mark, Ogaki, and Sul 2003) and implement the result in a panel ECM.

Table 7.3 **Estimates for activity and relative price elasticities for U.S. exports and imports**

Previous research	Data period	Method	Level of disaggregation	Exports: Relative price	Exports: Activity	Imports: Relative price	Imports: Activity
Previous research							
Houthakker and Magee (1969)	Annual 1951–66	OLS	Goods and services	–1.51	0.99	–1.03	1.68
					1.8** (SR)	–0.1 (SR)	1.0** (SR)
				–0.5*** (SR)	0.8*** (LR)	–0.3*** (LR)	1.8*** (LR)
Hooper, Johnson, and Marquez (2000)	Quarterly 1956–96	ECM (SR); Johansen (LR)	Goods and services	–1.5*** (LR)			
Wren-Lewis and Driver (1998)	Quarterly 1980–95	ECM (SR); Johansen (LR)	Goods	–0.96 (SR)	1.12 (SR)	–0.38	2.43 (SR)
				–0.65 (SR)	1.21 (LR)	–0.18	2.36 (LR)
Our study							
GDP as income[a]	Annual 1980–2003	Country- and commodity-fixed effects, dynamic panel	Panel of 4 categories of goods	–0.07** (SR)	2.79** (SR)	–0.17 (SR)	4.11** (SR)
				–0.2** (LR)	1.44** (LR)	–0.28 (LR)	2.22** (LR)
				–0.03* (SR)	0.58** (SR)	–0.09 (SR)	1.00** (SR)
Matched expenditure and matched prices[b]				–0.09 (LR)	1.19** (LR)	0.10 (LR)	1.63** (LR)

Notes: SR = short run; LR = long run; ECM = error correction model; OLS = ordinary least squares.

[a]Imports: Null rejected for GDP as income; not rejected for relative prices. Exports: Null rejected for GDP as income; null rejected for relative prices.

[b]Imports: Null rejected for "activity"; not rejected for relative prices. Exports: Null rejected at 1 percent level for "activity"; null rejected at 10 percent level of significance for relative prices.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

both exports and imports are higher in the short run but are similar to the long-run estimates that come from regressions run over sample periods starting from the 1980s, such as Wren-Lewis and Driver (1998). Our price elasticities are generally lower than comparable studies, particularly on the export side and often are not significant. This may be a result of the construction of our relative price index using the GDP deflator for all the categories of trade. (Note that this is not the deflator we construct for subsequent regressions, where we instead use matched trade price and deflators.)

Changing from the workhorse model specification to *matched expenditure as the measure of economic activity and matched prices* makes a large difference to the estimated income elasticities. Both the short-run and long-run elasticities are much lower (with the short-run coefficients almost too low) and the long-run coefficients close to the theoretical priors based on constant share of trade in expenditure of about 1.0. This suggests that the GDP variable may not be the correct measure of economic activity that drives trade flows.

With respect to relative prices, although the regressions with matched expenditure also incorporate greater richness with regard to the relative prices (as discussed in the data section), the significance level of relative prices does not improve in this panel specification of the four-commodity model.

Finally, and to be further discussed in the following, we find that the variety variable is statistically significant in the regressions for imports and exports implemented with matched expenditure and matched prices but not for the export regression using GDP as the measure of activity and the GDP deflators in the measure of relative prices.

In sum, a key finding is that although the Houthakker-Magee asymmetry (in estimated elasticity of trade with respect to measures of economic activity) persists both in the short and long run, the magnitude of the asymmetry is dramatically smaller than with the benchmark specification of the workhorse model. Matched expenditure, matched prices, and variety appear to play a key role in reducing the asymmetry of estimated elasticities of trade with respect to economic activity.

7.6.2 Disaggregating by Product Categories

Given that the commodity-by-country composition of trade has changed, in some cases dramatically, do the coefficients on economic activity, relative prices, and variety vary across product categories? Table 7.4 presents regressions by commodity group with country-fixed effects. An F-test of the constrained whole panel with country-fixed effects versus the unconstrained panel with country-fixed effects rejects the null hypothesis that the constrained and unconstrained regressions are the same. Wald tests in general reject the null hypothesis that the short-run and long-run coefficients are the same on the matched expenditure variable but do not reject

Table 7.4 Regressions by commodity group with country fixed effects

Level of disaggregation (R^2M, R^2X)	Exports: Relative price	Exports: Matched expenditure	Exports: Variety categories	Imports: Relative price	Imports: Matched expenditure	Imports: Variety categories
Expenditure and matched prices						
Capital goods (0.16, 0.38)	–0.021 (SR)	0.79** (SR)	4.66**	–0.25 (SR)	0.48** (SR)	1.74**
	0.012 (LR)	0.88** (LR)		1.56* (LR)	1.54** (LR)	
Consumer goods (0.18, 0.32)	–0.02 (SR)	0.713** (SR)	0.16	–0.40* (SR)	3.73** (SR)	–0.21
	0.07 (LR)	1.37** (LR)		3.64 (LR)	1.69** (LR)	
Autos and parts (0.20, 0.26)	–0.07 (SR)	1.03** (SR)	0.92*	0.48 (SR)	9.01** (SR)	0.54
	–0.3* (LR)	1.13** (LR)		1.35 (LR)	2.21** (LR)	
Annual 1980–2003						
ISM-ex (0.26, 0.31)	0.01 (SR)	0.35** (SR)	0.99	–0.13 (SR)	1.03** (SR)	0.52*
	0.02 (LR)	0.94** (LR)		1.36 (LR)	0.64** (LR)	
Panel of 4 categories of goods (0.25, 0.14)	–0.03*** (SR)	0.58** (SR)	0.91**	–0.17 (SR)	1.00** (SR)	0.70**
	–0.09 (LR)	1.09** (LR)		0.16 (LR)	1.40** (LR)	

Notes: SR = short run; LR = long run. Wald Test: Null hypothesis that SR and LR are the same. Autos—Imports: income coefficients reject; prices not reject. Exports: income coefficients reject; prices reject at 5 percent level. Capital goods—Imports: income coefficients reject, prices not reject. Exports: income coefficients reject, prices not reject. Consumer goods—Imports: income coefficients reject, prices not reject. Exports: income coefficients reject, prices not reject. Industrial supplies and materials, excluding oil (ISM-ex)—Imports: income coefficients reject, prices not reject. Exports: income coefficients reject, prices not reject.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

the null hypothesis that the short-run and long-run relative price coefficients are the same (excepting that the null is rejected at the 5 percent level for auto exports).

Comparing the elasticities on matched expenditure and variety across the commodity panels: for exports, the long-run elasticities of autos, capital goods, and consumer goods are greater than the short-run elasticities, as expected. For imports, differences in estimated expenditure elasticities are substantial across the disaggregated commodities groups. Comparing the short-run and the long-run estimates, the short-run cyclical responsiveness of trade with respect to matched economic activity exceeds the long-run responsiveness for U.S. imports of consumer goods and autos and auto parts, but this is not in evidence for capital goods. The situation of short-run exceeding long-run elasticities is consistent with the oft-discussed unsustainability of the trajectory of the U.S. trade deficit (Mann 2005). Whereas most of the estimates make sense and are of plausible magnitudes, those for autos seem unreasonable, particularly the short-run estimate. Based on this analysis that disaggregation of product categories is statistically relevant for understanding the drivers of trade flows, our future program of work will allow the countries included in each product category to vary as we will no longer require the uniform panel.

7.6.3 Disaggregating Industrial and Developing Countries by Product Group

Not only has the commodity composition of trade changed but there has also been a significant change, particularly evident for imports, in the composition of U.S. trade with the industrial versus developing countries. Moreover, apropos our implementation using matched expenditure and trade prices, exchange rate regimes and sources of economic growth may differ between industrial and developing countries. Are differences observed in the estimated activity and relative price coefficients between industrial and developing countries and across product groups? (tables 7.5 and 7.6). *F*-tests of regressions including country-fixed effects reject the null hypotheses that the industrial and developing countries regressions are the same for each of the four product groups. Wald tests of the null hypothesis that short-run and long-run coefficients are the same are as noted.

The following summarizes key aspects of the tables:

- **With respect to relative prices:** The relative price coefficient is of the correct sign and significant for imports of consumer goods and capital goods from industrial countries; it is significant and of the correct sign for all product categories of exports. This is in contrast to the estimates that constrained the relative price coefficient to be the same for industrial and developing countries and that resulted in poorly estimated coefficients.

Table 7.5 **Import regressions using a dummy variable for industrial trading partner with country-fixed effects**

Level of disaggregation	Matched expenditure: Industrial country	Matched expenditure: Developing country	Relative price: Industrial country	Relative price: Developing country	Variety categories, 1980–2003
Capital goods	1.29** (SR)	–0.24* (SR)	–0.31 (SR)	–0.20 (SR)	
	0.78** (LR)	3.12** (LR)	–0.71** (LR)	5.01** (LR)	1.42**
	3.52[a] (SR)	4.156** (SR)	–1.35** (SR)	0.86*** (SR)	
Consumer goods	1.32[a] (LR)	1.96** (SR)	–4.34** (LR)	14.34** (SR)	–0.19
	8.16** (SR)	9.72*** (SR)	0.72 (SR)	2.26* (SR)	
Autos and parts	1.59** (LR)	3.53** (LR)	–1.71 (LR)	6.88 (LR)	0.32
	1.52** (SR)	0.97** (SR)	–0.29 (SR)	0.16 (SR)	
ISM-ex	0.26 (LR)	1.47** (LR)	1.97 (LR)	0.86 (LR)	0.17

Notes: SR = short run; LR = long run. Wald Test: Null hypothesis that LR and SR are the same. Capital goods—Expenditure for both groups rejects the null. Consumer goods—Relative price for both groups rejects the null. Autos—Expenditure for developing countries rejects the null. Industrial supplies and materials, excluding oil (ISM-ex)—Expenditure for developing countries rejects the null and for industrial country at the 10 percent level.

[a]Dummy for industrial countries is not significant.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table 7.6 **Export regressions using a dummy variable for industrial trading partner with country-fixed effects**

Level of disaggregation	Matched expenditure: Industrial country	Matched expenditure: Developing country	Relative price: Industrial country	Relative price: Developing country	Variety categories, 1980–2003
Capital goods	0.67* (SR)	0.79** (SR)	–0.38** (SR)	–0.014 (SR)	
	0.70*** (LR)	0.94** (LR)	0.12 (LR)	0.013 (LR)	5.2**
	0.45** (SR)	0.69** (SR)	–0.45** (SR)	0.014 (SR)	
Consumer goods	1.09** (LR)	1.64** (SR)	–0.58* (LR)	0.022 (LR)	–0.12
	1.19*** (SR)	1.41** (SR)	–0.922** (SR)	0.043 (SR)	
Autos and parts	0.66*** (LR)	1.22** (LR)	–1.55** (LR)	–0.19 (LR)	0.79
	0.32[a] (SR)	0.37** (SR)	–0.02 (SR)	0.01 (SR)	
ISM-ex	0.81** (LR)	1.46** (LR)	–1.18** (LR)	–0.26 (LR)	–0.46

Notes: SR = short run; LR = long run. Wald Test: Null hypothesis that SR and LR are the same. Capital goods—Expenditure for developing countries rejects the null. Consumer goods—Expenditure for developing countries reject (1 percent level); expenditure industrial countries reject (5 percent level); relative prices industrial countries reject (1 percent level). Autos—Expenditure for developing countries and relative prices for industrial countries reject the null. Industrial supplies and materials, excluding oil (ISM-ex)—Expenditure for both groups reject; relative prices for industrial countries reject (5 percent level).

[a]Dummy for industrial countries is not significant.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

- **With respect to activity:** The elasticity for U.S. capital goods exports to industrial countries does not differ significantly from that to developing countries, but U.S. capital goods imports from industrial countries is more responsive in the short run and less responsive in the long run to U.S. activity than imports from developing countries. The U.S. consumer goods exports to industrial countries respond differently to foreign activity in those high-income countries as compared with the response to activity in the developing countries. On the other hand, there is no difference in elasticity of U.S. consumer goods imports with respect to source country.

What does all this add up to in the context of the recent evolution of the U.S. trade deficit? First, with respect to ***capital goods*** imports and exports, changing *relative prices* in industrial countries, and net trade, these coefficients are consistent with a story that dollar appreciation has, ceteris paribus, dampened capital goods exports and encouraged capital goods imports from the industrial countries. The depreciation of the dollar against these same currencies since 2002, and the somewhat higher pass-through of that exchange rate change vis-à-vis at least the euro[19] may, ceteris paribus, change the trajectory of the trade deficit in capital goods (presented in figure 7.1). But, to the extent that an increasing share of these goods come from developing economies, any dollar depreciation may have less of an effect to reduce capital goods imports or expand capital goods exports to developing countries, given the lack of significance in the estimated coefficient for relative prices of capital goods for developing countries.[20]

Second, with respect to changing *investment activity,* these coefficients are consistent with a story that robust U.S. investment demand has encouraged imports of capital goods with a relatively higher elasticity, whereas slower investment growth abroad (both in the industrial and the developing world) has tended to yield slower growth in capital goods exports.

Third, the fact that the *variety* effect is smaller for imports than for exports suggests that variety importantly underpins U.S. capital goods export growth, which is consistent with Schott (2004). Put together, the deterioration of net trade in capital goods comes from relatively more robust

19. The U.S. import prices from the European Union have risen about 14 percent since the peak of the dollar in February 2002. This represents more than a 25 percent pass-through of the euro appreciation into U.S. import prices. Import prices from Japan, on the other hand, have stayed stable since early 2002, in spite of a more than 25 percent appreciation of the yen against the dollar (Bureau of Labor Statistics)—while this limited pass-through is no doubt due in part to deflation in Japan that cannot be the only story.

20. The large positive and significant long-run coefficient for relative price of capital goods imports from developing countries suggests another missing variable or that the variety variable needs additional work.

U.S. investment with a relatively higher elasticity, a dollar appreciation particularly against the industrial countries where relative prices are estimated significantly, and significant increases in global supply-cum-variety.

For ***consumer goods,*** the story is somewhat different not only because the estimated U.S. consumer demand elasticity is so high in the short-run but also because relative prices are significant and rather high for products from the industrial countries. First, with respect to changing *relative prices* in industrial countries and net trade in consumer goods, these coefficients are consistent with a story that dollar appreciation has, ceteris paribus, hurt consumer goods exports to industrial countries and, particularly given the higher relative price elasticity, encouraged consumer goods imports from industrial countries. The depreciation of the dollar against these same currencies since 2002, and the somewhat higher pass-through of that exchange rate change vis-à-vis at least the euro may, ceteris paribus, reduce the net trade deficit in consumer goods (presented in figure 7.1). But, to the extent that an increasing share of consumer goods come from developing economies, any dollar depreciation may have less of an effect to reduce consumer goods imports, given the poorly estimated coefficient for relative prices of consumer goods from developing countries.[21]

Second, with respect to *consumer demand growth, variety,* and net trade, the coefficients are consistent with a story that relatively more robust U.S. consumer demand along with a very high short-run cyclical demand elasticity has encouraged imports of consumer goods and autos from all trading partners well in excess of the foreign demand for U.S. exports of consumer goods. Surprisingly, global supply-cum-variety does not appear to be a relevant determinant of trade in consumer goods. Put together, the deterioration of net trade in consumer goods comes from relatively strong U.S. consumer demand growth with a relatively higher short-run elasticity, as well as dollar appreciation (with greater imports of luxury, price-sensitive goods from industrial countries, and reduced exports of similarly price-sensitive goods to industrial countries).

7.6.4 Summary of Findings

The paper prepared new estimates of the elasticity of U.S. trade flows using bilateral trade data for thirty-one countries, using different measures of expenditure and including alternative measures of global supply and variety. We examine four categories of goods based on the BEA's end-use classification system—autos, ISM-ex, consumer goods, and capital goods. We consider whether industrial and developing countries differ in their elasticities.

21. The large positive and significant long-run coefficient for relative price of consumer goods imports from developing countries suggests another missing variable or that the variety variable needs additional work.

1. Using expenditure matched to commodity group rather than GDP as the measure of income significantly reduces the Houthakker-Magee asymmetry in the long-run estimates and yields far more plausible values for these income elasticities.

2. Short-run estimates of U.S. consumer goods imports with respect to matched economic activity exhibit very high cyclical elasticity, which is consistent with the unsustainability of the trajectory of the trade deficit.

3. The four product categories behave significantly differently from an aggregated panel.

4. Global supply-cum-variety is a significant variable, particularly for capital goods.

5. Industrial and developing countries have different income and relative price elasticities for these four product groups. In particular, when industrial countries are distinguished from developing countries, the estimated coefficients for relative prices for industrial countries are the correct sign, significant, and of plausible values.

6. We also investigated whether U.S.-China trade is significantly different than industrial country or developing country trade. The results are not conclusive.[22]

7.7 Implications and Direction for Further Work

7.7.1 Do Changing Trade Shares Change Trade Elasticities?

The results indicate that industrial and developing countries differ in their elasticities of economic activity and relative price. The shares of these two groups in trade have changed over time, in particular within product categories for imports. When elasticities for economic activity from the regression that splits the panel into four product categories and allows the elasticities to vary across the industrial and developing countries (tables 7.5 and 7.6) are reaggregated using the annual trade weights of these two groups and for the four product categories in U.S. trade, we conclude that the long-run expenditure elasticity of U.S. imports rises from 1980 to 2003. These results imply that the assumption of a constant elasticity of U.S. imports with respect to U.S. economic activity may have to be rejected and that projections of U.S. imports based on the constant elasticity assumption may be flawed. No similar trend is apparent for the expenditure elas-

22. For a number of reasons, we might expect China to be different from other countries in this specification of U.S. dynamic trade. China's trade shares changed the most. Its net trade deficit is on the steepest trajectory. Its variety increased the most. Its exchange rates have changed the least. Table 6 in Mann and Plück (2005) reports regression results investigating whether China is appreciably different from the rest of the world in the consumer goods and capital goods categories. The bottom line is that the picture is mixed in terms of short-run versus long-run effects. The very large long-run estimates on U.S. economic activity are consistent with the graphical evidence but arguably could not persist.

Table 7.7 Summary of in-sample predictive performance (billions of U.S. dollars)

	Matched expenditure, variety, and industrial country dummies		GDP as income and aggregate trade flows (from table 7.3)	
Total error, 1998–2003	Imports	Exports	Imports	Exports
Using whole-panel estimates	386	134	198	234
Using good-specific elasticities				
Consumer goods	172.99	0.89	20.43	23.27
Capital goods	–73.16	110.50	–0.15	124.83
Autos	273.2	28.99	97.91	42.04
Industrial supplies and materials, excluding oil	12.94	–6.69	106.52	20.41

ticity for exports, which is consistent with the observation that country shares have changed less.[23]

7.7.2 Do These New Elasticities Predict Better?

Research using the workhorse model often addresses the tension between the theoretical plausibility of the estimated elasticities, specifically the Houthakker-Magee asymmetry, and the affirmed excellence of these simple equations to predict U.S. exports and imports in the short and medium terms. By using matched expenditure and trade prices and by disaggregating product groups and industrial versus developing countries, we reduce the Houthakker-Magee asymmetry, but do we "do better" at prediction?

We examine this question by comparing in-sample predictive performance of two alternative models, estimating the models from 1980 to 1997, and then running the model forward from 1998 to 2003 using the short-run and long-run estimated coefficients for matched expenditure and relative prices and the actual values from the right-hand-side variables. We compare the actual with the predicted values in each year and sum the difference as the total error (table 7.7). The horse race is between the benchmark model that uses GDP and aggregated trade (from table 7.3)—a formulation that many forecasters would use because they are interested in aggregate exports and imports; and the matched expenditure model, with variety, with four separate product groups, and with industrial country dummies (from tables 7.5 and 7.6).

The bottom line in terms of predicted performance is the sum of the in-sample predictive errors. For total exports, our country-commodity disaggregated estimates better predict exports compared with the simple model. For total imports, even though we obtain more plausible values for the long-run elasticities, our predictions are poor compared with the benchmark model that uses U.S. GDP as the measure of expenditure because the short-

23. See discussion and presentation of the data, particularly figure 3 in Mann and Plück (2005).

run elasticities are so high, particularly for consumer goods and autos. Our results address the finding that surprised Houthakker and Magee (1969) in their original study: the very low income elasticities for U.S. exports. Our estimations suggest that these elasticities might in fact be closer to those of other industrial countries. But we have more work to do on the import side to estimate elasticities that meet theoretical norms and also predict well.

Does our matched expenditure model do equally well (or poorly) in the four commodity groups? We examined each of the four product groups comparing the model results for the matched expenditure, variety, and industrial-country dummies with the simple model that uses GDP as the driver of trade. (See table 7.7.) Within product groups, auto trade and consumer goods imports are particularly poorly explained in-sample by the new disaggregated model. But all the export categories are better predicted in-sample by the matched expenditure and variety model than when GDP is used as the measure of economic activity. Hence, future work should focus on narrowing the country group for autos and reestimating the equation for consumer goods, including augmenting the drivers of economic activity (beyond personal consumption expenditures to add a wealth variable for example) and recalculating the variety variable with more detailed data.

7.7.3 "What If" U.S. Spending Slows and Foreign Spending Booms?

In recent policymaker confabs such as the G8, it has been common to call for increased U.S. savings and greater foreign growth as well as more flexibility in exchange rate regimes.[24] Suppose the United States saves more and growth abroad increases over the next several years to 2007 [2006?]? How much would the U.S. trade deficit be different from a scenario where growth is as projected by *Consensus Economics Forecasts,* a well-known economic forecasting group?

The assumptions for real consumption and investment growth for our sample of countries from *Consensus Economics Forecasts* and our estimated elasticities are the starting points for illustrative scenarios for how U.S. trade deficit adjustment might take place for 2007 [2006?] (figure 7.3 and table 7.8). Given the estimated short-run and long-run elasticities, the *Consensus Economics Forecasts,* and no change in the exchange value of the dollar (from mid-2005), the real nonoil trade deficit in 2006 would be about $725 billion.

A rest-of-world investment boom and a rest-of-world consumption boom (as quantified in table 7.8, where *boom* is defined as the average high value for consumption or investment growth over the 1980 to 2003 period) yield some narrowing of the U.S. trade deficit. But because most of our capital goods exports go to mature industrial markets, whose average booms are modest, and because the short-run and long-run elasticities for exports are relatively low, our capital goods exports do not increase that much. And because the share of consumption goods in U.S. exports is rel-

24. This section draws on Mann (2006).

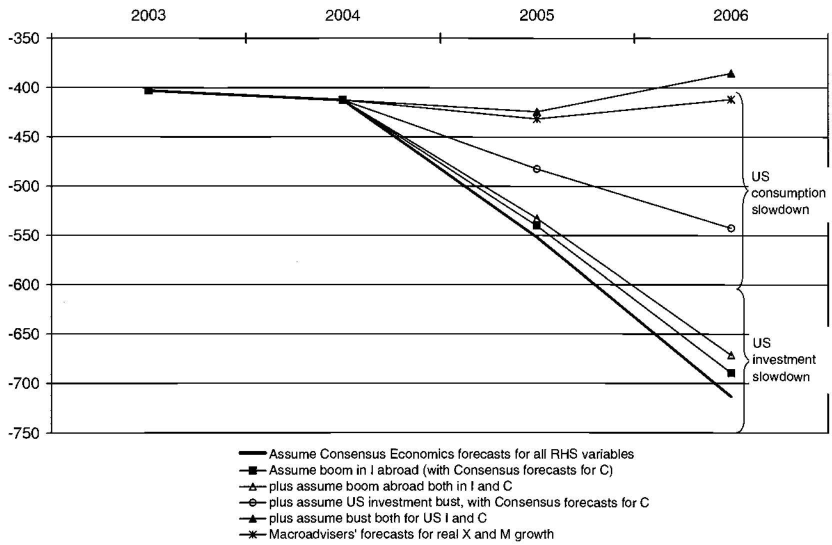

Fig. 7.3 Projected real trade deficit (ex. Oil), using commodity-specific elasticity estimates, billions of U.S. dollars

Source: Authors' calculations using regression estimates and forecasts for country investment and personal consumption expenditure from Consensus Economics Forecasts, August 2005 (http://www.consensusforecasts.com); Macroadvisers' Economic Outlook; United Nations Comtrade database; Macroadvisers forecast for real *X* and *M* growth are generated from macroadviser's forecast from June 22, 2005 (volume 23, number 5).

atively small, booming consumption abroad does little to improve the trade account. Overall, global consumption and investment booms do not play a very large role in narrowing the trade deficit in the short term because the geographical and commodity patterns of trade on the export side have been remarkably stable for twenty-five years. Over the longer term, however, as the long-term elasticities for exports are larger than the short-run elasticities, *sustained* foreign growth could have a larger impact on the trajectory of the U.S. trade deficit.

In contrast, investment and consumption slowdowns in the United States (compared to historical cycles from the 1980 to 2003 period) would yield a quick stabilizing of the real trade deficit. This is because consumption goods and autos are a large share of imports, and both have high estimated short-run elasticity of demand. The consumption slow-down assumed for the United States is modest by historical standards of the last twenty-five years but, nevertheless, is outside recent experience and therefore likely to be painful.[25]

What about a role for the exchange value of the dollar? Based on our estimates, the exchange rate plays an important role in expenditure switching for trade with industrial countries, but has little empirical significance for

25. See also Truman (2005) for a similar conclusion.

Table 7.8 Assumptions for growth scenarios in figure 7.3

Consensus forecasts (real growth, percentage points)	2005	2006	Add percentage points to achieve:	Average for "boom" in ROW/ "realistic slowdown" for the U.S. (based on 1980–2003 data)
		Gross fixed capital formation		
Europe and Japan	3.5	3.7	5.0	8.4
Other industrial countries	7.4	7.2	7.0	14.8
Developing countries	9.2	7.5	1.0	9.9
United States	8.8	7.5	–13.0	–6.0
		Personal consumption expenditures		
Europe and Japan	1.3	1.7	7.0	8.3
Other industrial countries	3.1	3.1	5.0	8.3
Developing countries	4.9	4.4	11.0	15.2
United States	3.5	3.1	–3.0	0

Source: Authors' calculations using regression estimates and forecasts for country investment and personal consumption expenditure from Consensus Economics Forecasts, August 2005 (http://www.consensusforecasts.com).

Note: ROW = Rest of the world.

exports to or imports from developing countries, for which real exchange rates have moved relatively little.

Our results are consistent with the findings of Freund and Warnock (chap. 4 in this volume), and Faruqee, Laxton, Muir, and Pesenti (chap. 10 in this volume). Freund and Warnock conclude that adjustments to consumption-driven current account deficits require significantly steeper exchange rate depreciation and thus more pain than adjustments to trade deficits that have financed private investment. Faruqee et al. determine that a loss of foreign appetite for U.S. assets (reflected in a dollar depreciation) and a consolidation of the U.S. fiscal position have a much larger impact on the current account deficit than do structural reforms in Japan and Europe. To the extent that a consolidation in the U.S. fiscal position took place via a sun-setting of the income tax cuts, then fiscal consolidation and demand for consumer goods imports would be more clearly linked.

On the other hand, our findings that the relative price elasticities are significant, but not large, and are limited to industrial countries, implies a challenge to the mechanism for adjustment emphasized in Obstfeld and Rogoff (chap. 9 in this volume). Their mechanism for adjustment depends on the relative price signal shifting resources between traded and nontraded sectors. Our relative price signal appears to play a more modest role in directing trade flows.

7.7.4 Conclusions and Further Work

These new elasticities yield insights into the sources of the widening of the U.S. trade deficit and help to understand the nature of global competition and how it is impacting broad sectors of the U.S. economy.

The differences in demand elasticities for consumer goods versus for other product categories—with consumer goods more responsive to consumption patterns in the United States—yields insights into how robust U.S. consumer demand through trending lower household saving rates, as augmented by higher stock-market valuation in the 1990s and residential housing values and tax cuts in the 2000s, contributes to widening the consumer goods share of the trade deficit.

The differences in relative price elasticities between the industrial and developing countries—with relative prices significant and of correct sign for industrial countries but not for developing countries—yields insights into how certain exchange rate regimes, pricing-to-market behavior, or other factors more prevalent to developing country exporters mute the price signal, which is consistent with recent work on disaggregate pass-through (Campa and Goldberg 2004; Marazzi et al. 2005).

The evidence from this analysis suggests that the matched-expenditure model for exports, disaggregated across commodity groups and income class (industrial versus developing), is worth continued investigation. Not only do the elasticities have more plausible values, particularly in the long-run, but also the equation performs better in-sample than the benchmark model for exports. Simultaneous specification with an equation for relative prices warrants consideration.

For imports, the matched-expenditure disaggregated model yields more plausible values for trade elasticities in the long run. However, the in-sample predictive performance is much worse than for the benchmark model because the short-run elasticities are very high. To understand the factors underpinning robust U.S. imports of consumer goods and autos, in particular, requires additional work. Future work will focus on narrowing the country set for trade in autos and investigating a more detailed variable for variety for consumer goods as well as incorporating a wealth variable into the consumption goods equation.

Going forward, these new elasticities have implications for demand management and exchange rate policies. In particular, slack U.S. exports appear importantly related to slack consumption and investment abroad and low long-term growth prospects in the major markets for U.S. exports, which have been masked by measures of GDP that incorporate net exports to the United States. On the other hand, factors beyond strong U.S. consumer demand or love of variety are bolstering U.S. imports of consumer goods. Different relative price elasticities between the industrial and developing countries suggest long-run implications for U.S. trade of certain exchange rate regimes. Exchange rate regimes that limit the transmission of relative price signals appear to have been important in the past. A change in these regimes will be an important part of the change in the trajectory of the U.S. trade deficit going forward.

Appendix

Table 7A.1 **Definition of proxy end-use commodity groups**

Autos	Capital goods	Consumer goods	Industrial supplies and materials
7810–7849, 7861, 7869: road vehicles and parts except motorcycles and bicycles and their parts. 6251, 6252: tires for road vehicles.	6253: tires for aircraft. 71–75: heavy machines for all industrial sectors and agriculture, office machines. 7641–7649: telecommunications and broadcasting equipment. 771–774, 778: electrical equipment and electronic equipment. 7911–7938: transport equipment other than road vehicles. 87: laboratory and medical and other scientific equipment; precision instruments.	1221–1223: tobacco manufactured. 5411–5419: pharmaceuticals and cosmetics. 5530–5543: perfumes, soaps and detergents. 6121–6129: articles of leather and footwear. 6354: manufactures of wood for domestic use. 6581–6597: textile and nontextile furnishing, floor coverings, rugs and other articles made from fabric. 6651–6674: china, glassware, precious stones. 6960–6978: household items made of metal. 7611–7631: televisions, radio, etc. 775: household appliances. 785: motorcycles, bicycles, and parts. 821: furniture. 8310: travel goods. 84–85: apparel and footwear. 88–89: photographic equipment, spectacles, watches, printed matter, and miscellaneous consumer goods.	Chapter 2: crude materials inedible, except fuels. Chapter 4: animal and vegetable oils and waxes. 51–53: organic and inorganic chemicals; dyeing, tanning, and coloring supplies. 551: Essential oils. 56–59: fertilizers, explosives, plastics, and miscellaneous chemical materials. 611, 613: leather and fu661–664: nonmetallic mineral products. r. 621, 628: rubber. 633–635: wood and cork manufactures (except 6354 for domestic use). 64: paper and pulp. 655–657: yarn and textiles. 67, 68: iron and steel and nonferrous metals. 691–695, 699: manufactures of metal. 776: semiconductors, cathodes, diodes, photocells, etc. 81: sanitary, plumbing, heating and lighting fixtures, and other building material.

Note: This table is constructed using the Standard International Trade Classification (SITC), Revision 2 (United Nations 1975).

References

Adler, J. Hans. 1945. United States import demand during the interwar period. *The American Economic Review* 35:418–30.

———. 1946. The postwar demand for United States exports. *Review of Economic Statistics* 28:23–33.

Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data. *The Review of Economic Studies* 58:277–97.

Bayoumi, Tamim. 1999. Estimating trade equations from aggregate bilateral data. IMF Working Paper no. WP/99/74. Washington, DC: International Monetary Fund, May.

Beck, Nathaniel. 2001. Time series cross-section data. *Statistica Neerlandica* 55: 111–33.

Blundell, Richard, and Stephen Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87:115–43.

Broda, Christian, and David E. Weinstein. 2004. Globalization and the Gains from Variety. NBER Working Paper no. 10314. Cambridge, MA: National Bureau of Economic Research, February.

Campa, José Manuel, and Linda S. Goldberg. 2004. Exchange rate pass-through into import prices. New York: Federal Reserve Bank of New York.

Castles, Ian, and David Henderson. 2005. International comparisons of GDP: Issues of theory and practice. *World Economics* 6 (1): 55–84.

Chang, Tse Chun. 1945–1946. International comparison of demand for imports. *The Review of Economic Studies* 13:53–67.

Cline, William R. (forthcoming). *The United States as a debtor nation.* Washington, DC: Institute for International Economics.

Deardorff, Alan S., Saul H. Humans, Robert M. Stern, and Chong Xiang. 2001. Forecasting U.S. trade in services. In *Services in the international economy,* ed. Robert M. Stern, 53–83. Ann Arbor, MI: University of Michigan Press.

Feenstra, Robert C. 1994. New product varieties and the measurement of international prices. *The American Economic Review* 84:157–77.

Funke, Michael, and Ralf Ruhwedel. 2001. Product variety and economic growth: Empirical evidence for the OECD countries. *IMF Staff Papers* 48:225–42. Washington, DC: International Monetary Fund.

Gagnon, Joseph E. 2003b. Productive capacity, product varieties, and the elasticities approach to the trade balance. International Finance Discussion Papers no. 781. Washington, DC: Board of Governors of the Federal Reserve System.

———. 2003a. Long-run supply effects and the elasticities approach to trade. International Finance Discussion Papers no. 754. Washington, DC: Board of Governors of the Federal Reserve System.

———. 2004. Growth-led exports: Is variety the spice of trade? International Finance Discussion Papers no. 822. Washington, DC: Board of Governors of the Federal Reserve System.

Goldstein, Morris, and Mohsin S. Khan. 1985. Income and price effects in foreign trade. In *Handbook of international economics* Vol. 2, ed. R. W. Jones and P. B. Kenen, 1041–1105. Amsterdam: Elsevier Science.

Helkie, William L., and Peter Hooper. 1988. An empirical analysis of the external deficit, 1980–86. In *External deficits and the dollar, the pit, and the pendulum,* ed. Ralph C. Bryant, Gerald Holtham, and Peter Hooper, passim. Washington, DC: Brookings Institution.

Hooper, Peter, Karen Johnson, and Jaime Marquez. 2000. *Trade elasticities for the*

G-7 countries. Princeton, NJ: Princeton University, Department of Economics, International Economics Section.

Houthakker, Hendrik S., and Stephen P. Magee. 1969. Income and price elasticities in world trade. *Review of Economics and Statistics* 51:111–23.

Hummels, David, and Peter Klenow. 2004. The variety and quality of a nation's exports. *The American Economic Review,* forthcoming.

Kennedy, Peter. 2003. *A guide to econometrics.* 5th ed. Cambridge, MA: MIT Press.

Krugman, Paul. 1989. Differences in income elasticities and trends in real exchange rates. *European Economic Review* 33:1031–54.

Krugman, Paul R., and Richard E. Baldwin. 1987. The persistence of the U.S. trade deficit. *Brookings Papers on Economic Activity,* Issue no. 1:1–55. Washington, DC: Brookings Institution.

Mann, Catherine L. 1999. *Is the U.S. trade deficit sustainable?* Washington, DC: Institute for International Economics.

———. 2004. The U.S. current account, new economy services, and implications for sustainability. *Review of International Economics* 12:262–76.

———. 2005. Breaking up is hard to do: Global co-dependency, collective action, and the challenges of global adjustment. *CESifo Forum* 6 (1): 16–23.

———. 2006. Current account imbalances: How will *ours* end? http://www.kansascityfed.org/PUBLICAT/SYMPOS/PDF/Mann2005.pdf.

Mann, Catherine L., and Katharina Plück. 2005. The U.S. trade deficit: A disaggregate perspective. IIE Working Paper no. 05-11. Washington, DC: Institute for International Economics, September.

Marazzi, Mario, Nathan Sheets, Robert Vigfusson, et al. 2005. Exchange rate pass-through to U.S. import prices: Some new evidence. International Finance Discussion Papers no. 833. Washington, DC: Board of Governors of the Federal Reserve System.

Mark, Nelson C., Masao Ogaki, and Donggyu Sul. 2003. Dynamic Seemingly Unrelated Cointegration Regression. NBER Technical Working Paper no. 292. Cambridge, MA: National Bureau of Economic Research.

Mark, Nelson C., and Donggyu Sul. 2002. Cointegration vector estimation by panel DOLS and long-run money demand. Technical Working Paper no. 287. Cambridge, MA: National Bureau of Economic Research.

Marquez, Jaime. 1999. Long-period trade elasticities for Canada, Japan, and the United States. *Review of International Economics* 7 (1): 102–16.

———. 2002. Estimating trade elasticities. In *Advanced Studies in Theoretical and Applied Econometrics 39.* Boston: Kluwer Academic.

Sawyer, W. Charles, and Richard L. Sprinkle. 1996. The demand for imports and exports in the U.S.: A survey. *Journal of Economics and Finance* 20:147–78.

Schich, Sebastian, and Florian Pelgrin. 2002. Financial development and investment: Panel data evidence for OECD countries from 1970 to 1997. *Applied Economics Letters* 9:1–7.

Schott, Peter K. 2004. Across product versus within-product specialization in international trade. *The Quarterly Journal of Economics* 119:647–77.

Smith, Ron P. 2000. Estimation and inference with non-stationary panel time-series data. Paper prepared for the RC33 conference. 2 October, Cologne, Germany.

Stern, Robert M., Christopher F. Baum, and Mark N. Greene. 1979. Evidence on structural change in the demand for aggregate U.S. imports and exports. *Journal of Political Economy* 87:179–92.

Stone, Joe A. 1979. Price elasticities of demand for imports and exports: Industry estimates for the U.S., the E.E.C., and Japan. *Review of Economics and Statistics* 61:306–12.

Truman, Edwin. 2005. Postponing global adjustment: An analysis of the pending adjustment of global imbalances. Institute for International Economics Working Paper no. 05-6. Washington, DC: IIE.

United Nations, Department of Economics and Social Affairs, Statistical Office. 1975. Standard international trade classification, revision 2. Statistical Papers, Series M No. 34/Rev. 2. New York: United Nations.

Welsch, Heinz. 1987. An aggregate import demand model for long-term projections. *Jahrbücher für Nationalökonomie und Statistik* 203:372–89.

Wilson, John F., and Wendy E. Takacs. 1979. Differential responses to price and exchange rate influences in the foreign trade of selected industrial countries. *Review of Economics and Statistics* 61:267–79.

Wooldridge, Jeffrey M. 2002. *Econometric analysis of cross-section and panel data.* Cambridge, MA: MIT Press.

Wren-Lewis, Simon, and Rebecca L. Driver. 1998. Real exchange rates for the year 2000. In *Policy Analyses in International Economics 54.* Washington, DC: Institute for International Economics.

Comment Peter B. Kenen

I begin with thanks to the organizer of this conference and the authors of this paper—thanks to the organizer for the compliment implied by asking me to comment on a technically sophisticated paper, and thanks to the authors for a meticulous effort to answer some rather important questions.

There is a strong conceptual case for disaggregating trade flows, especially for the United States, which trades with many countries and in many goods. Otherwise, estimates of income and price elasticities may be badly biased by changes in the country and commodity composition of U.S. trade. I am not sure, however, that the paper by Mann and Plück deals decisively with that need. They do disaggregate by commodity group, which allows them to ask whether it is better to use different measures of economic activity for different commodity groups rather than follow the common practice of using GDP for each and every group. They also distinguish between U.S. trade with industrial countries and with developing countries. Nevertheless, their strategy and findings raise several questions.

The first question pertains to the treatment of industrial materials. Shouldn't the demand for those goods be more responsive to changes in industrial production than to changes in investment? Use of the two GDP components, consumption and investment, as explanatory variables is appealing; they are mutually exclusive categories, whereas industrial production may be destined for consumption or investment. Furthermore, their use of the two GDP components helps them to compare the trade-balance

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effect of a change in household consumption with the trade-balance effect of a change in business investment. Yet that comparison may be badly flawed insofar as trade in industrial materials truly reflects the *joint* effects of household and business demand for final products that embody large amounts of industrial materials. I wonder, moreover, whether the use of investment as the expenditure variable in the trade equations for industrial materials accounts for one of the striking results shown in table 7.4 of the paper; this is the only case in which the expenditure coefficient in the long-run demand equation for U.S. exports exceeds the expenditure coefficient in the long-run demand equation for U.S. imports.

The second question pertains to the pooling of time series and country data, which constrains the price and income elasticities to be the same for the thirty-one countries in their sample. To what extent does this blur the effects of changes in the country composition of U.S. foreign trade? In tables 7.5 and 7.6 of their paper, Mann and Plück present results for two groups of countries—industrial and developing countries. In a previous version of their paper, moreover, they presented separate results for U.S. trade with China.[1] It might be useful, however, to derive separate equations for some other countries, especially Canada and Mexico, given their very large trade with the United States, and to compare the resulting equations with those for other countries or country groups. Disaggregation by country or country group would be especially helpful when, as in the final part of the paper, Mann and Plück discuss the likely effects of various changes in economic conditions at home and abroad, including changes in exchange rates. Disaggregation by country or country group would be more useful for this purpose than disaggregation by commodity group.

The third question pertains to the effects of omitting completely trade in oil and food. Mann and Plück had to do that, for reasons explained in their paper. But they should perhaps have warned their readers that the exclusion of oil and food may impair the comparability of their regression results with those obtained by other studies. Could it perhaps help to explain why their results differ appreciably from those of the other three studies shown in table 7.3—why in particular they succeed in narrowing the Houthakker-Magee asymmetry, a matter to which I return in the following.

Thus far, I have focused on what Mann and Plück did. Let me turn now to some of the things they say, especially their quasi-normative use of the Houthakker-Magee asymmetry—the fact that, in most studies, as well as in most of their own trade equations, the income elasticity of the U.S. demand for imports exceeds the income elasticity of the foreign demand for U.S. exports. Citing Krugman and Baldwin (1987), they say that this finding is incompatible with a global long-run equilibrium:

1. See also footnote 22 to the present version.

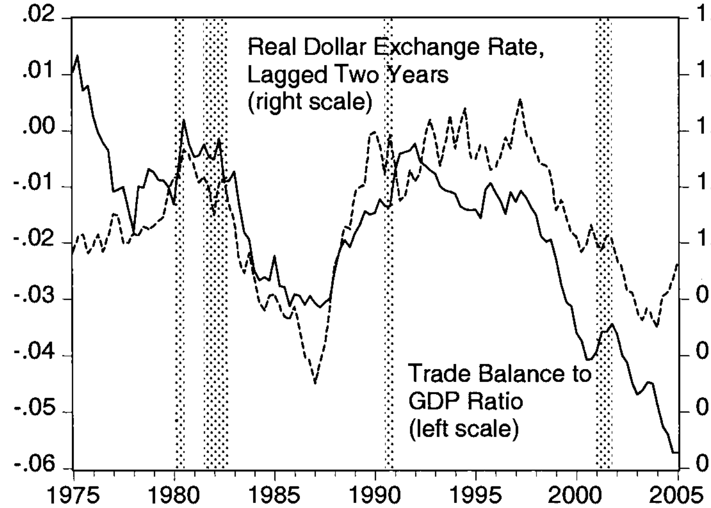

Fig. 7C.1 The trade balance to GDP ratio and the real dollar exchange rate, lagged two years

Source: Chinn (2005, 11). Reprinted with permission.

> The estimates imply that if the United States and the rest of the world grow at the same pace (long-run convergence), the U.S. trade deficit would worsen, absent a trend change in relative price—which is also inconsistent with long-run equilibrium.

The Houthakker-Magee asymmetry is, as they say, manifestly inconsistent with the long-run convergence of real incomes at constant relative prices. But a trend change in relative prices, while inconsistent with long-run convergence, is not inconsistent with long-run equilibrium. Recall the models developed by Harry Johnson and others many years ago, in which equal rates of growth in output, due either to capital accumulation or technical progress, can lead to continuing changes in relative prices (i.e., the terms of trade).[2] It may therefore be wrong to dismiss a robust empirical finding merely because it is inconsistent with uniform global growth at constant relative prices. A world displaying that property would be pretty indeed, but we should not be dismayed by a world that does not display it. Yet Mann and Plück, while not dismayed, tend too much to use the reduction of the Houthakker-Magee asymmetry as a normative criterion—to prefer empirical results in which it is smaller.

My chief concern, however, derives not from the author's treatment of the Houthakker-Magee asymmetry but from their results regarding the price elasticities of demand for U.S. exports and imports. The conventional

2. See, for example, Johnson (1959).

wisdom holds that a reduction of the U.S. current-account deficit requires a combination of expenditure changes and expenditure switching and that the latter can be achieved by dollar depreciation, which should have two effects—switching U.S. expenditure from traded to nontraded goods, and switching U.S. and foreign expenditure between U.S. tradables and foreign tradables. Mann and Plück express concern about the implications of their findings for the efficacy of the first type of switching, but I am more concerned about the implications for the second type.

Consider the price elasticities shown in table 7.3 of their paper. They are, without exception, lower than the ones obtained by the earlier studies listed in that table. The long-run price elasticities are much larger for U.S. imports of consumer goods, as shown in table 7.5 and likewise larger for U.S. imports of autos and parts (although the regression coefficient falls short of significance). But it is wrong-signed for industrial materials. And all of the price elasticities for U.S. imports from the developing countries are wrong-signed, while those for U.S. exports to developing countries in table 7.5 are not significantly different from zero.

I find it quite hard to square these results with the story told by figure 7C.1, which plots the U.S. trade balance relative to GDP along with the log of the U.S. real exchange lagged two years. How can these series be so closely correlated if the relevant price elasticities are as low as those in Mann and Plück's paper?

Finally, a policy question: given the large difference between the computed price elasticities for U.S. trade with industrial countries and those for U.S. trade with developing countries, are we perhaps expecting too much from any future appreciation of the Asian currencies? Papers elsewhere in this volume give good reasons for believing that the renminbi and other Asian currencies are undervalued; the huge accumulation of foreign-exchange reserves is itself indicative. But Mann and Plück's paper makes me wonder how much to expect from a significant appreciation of the Asian currencies and thus to repeat my previous suggestion that the authors look more closely at smaller country groups.

References

Chinn, Menzie D. 2005. *Getting serious about the twin deficits: A Council special report.* New York: Council on Foreign Relations Press.

Johnson, Harry G. 1959. Economic development and international trade. *Nationaløkonomisk Tidsskrift* 97:252–72. Repr., in *Money, trade and economic growth,* ed. H. G. Johnson, 75–103.

Krugman, Paul R., and Richard Baldwin. 1987. The persistence of the U.S. trade deficit. *Brookings Papers on Economic Activity,* Issue no. 1:1–43. Washington, DC: Brookings Institution.