

Recent Trade Liberalization in Developing Countries: The Effects on Global Trade and Output

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The success of the market-oriented growth strategies of the East Asian economies over the last decade has led many developing countries to consider trade liberalization programs. A substantial number of developing economies have recently eased or announced their intention to ease import tariffs and other barriers to trade. This study examines the probable impact of such reforms on international trade flows, output, and the U.S. economy.

An important element in this discussion is the ability of developing countries to pay for the increased import demand created by the lifting of trade barriers. Financial flows to developing countries have increased markedly in recent years, easing earlier financing problems. New constraints could potentially arise, however, because financial flows to developing countries are already relatively large and may perhaps have limited scope for further increase.

This article first estimates the effect of liberalization on international trade flows and output when developing countries face no financing constraints. It then assesses the effect when developing countries encounter problems raising additional funds. Estimates of the impact of developing country liberalization on the U.S. economy in particular are provided after the global analysis. The estimated effects derived in both the global and U.S. analyses should be taken as indicative rather than precise given the uncertainties inherent in quantifying reform efforts.

Overall, the estimates suggest that developing country import liberalization will have a substantial long-run positive impact on global trade and output. The extent to which trade and output grow and the distribution of

growth between industrialized and developing countries over the medium term, however, will depend on the severity of the financing constraints facing developing countries. When financing is sharply limited, the willingness of industrialized countries to buy developing countries' products actually becomes a key determinant of the degree to which developing country import liberalization improves world trade and output. In consequence, the trade restrictions imposed by industrial countries may be as influential as the trade practices of developing countries in determining the impact of developing country reforms on the global economy in the medium term.

Changing developing country trade policies

Many developing countries have enacted significant trade liberalization measures in recent years. These measures have typically taken the form of phased-in reductions in tariffs and quantitative controls. Some reductions have already been completed; some are still to be implemented. Other countries have announced plans to introduce significant trade reforms in the near future. This section briefly discusses recent and prospective reform initiatives in the developing countries. It then assesses the level of import liberalization likely to occur over the 1991-95 period.

In 1985, the latest year for which a comprehensive survey of developing country tariff levels is available, the average unweighted tariff level for fifty developing countries was 26 percent.¹ This level substantially

¹This number was not weighted by either the relative size of each country or the relative importance of each listed tariff item within a country's tariff schedule.

exceeds the roughly 5 percent level set in industrialized countries. When other import charges levied by developing countries are included, the average unweighted import tax level for 1985 rises to 34 percent. In addition to imposing these taxes, developing countries typically placed substantial quantitative restraints on imports. For instance, 60 percent of Argentina's imports, 34 percent of Brazil's imports, and over 90 percent of India's imports were subject to quantitative restrictions in the mid-1980s. There was clearly scope for significant import liberalization in developing countries in the second half of the decade.

Many countries took advantage of this scope. Since 1985, more than thirty developing countries have enacted trade reform measures. Most of the reforms have been fairly recent or are to be phased in over the next few years. Table 1 lists the trade liberalization efforts of major developing countries.

As Table 1 indicates, nations that represent some of the largest developing country trade partners of the United States are currently cutting tariffs by roughly 10 to 20 percentage points. They are also significantly reducing quantitative import restrictions. Indeed, Brazil, China, and India have all announced reductions in their restrictive import licensing requirements. The reforms enacted by these large countries are representative of the efforts of many smaller developing countries: in fact, much of the developing world is moving toward freer trade policies.

Nevertheless, some notable Asian developing countries—Hong Kong, Singapore, South Korea, and Taiwan—are not listed on Table 1. The omission of these four newly industrialized economies (the Asian NICs) does not mean that they have continued to suppress imports. Rather, these economies already had relatively low nonagricultural import tariffs and relatively few non-agricultural import restrictions in the second half of the 1980s. Although some of these economies have recently lowered or plan to lower tariff levels further, their current tariff changes are very small in percentage point terms compared with the tariff changes of the countries shown in Table 1.

What do the measures shown in Table 1 suggest about the aggregate magnitude of developing countries' current import liberalization efforts? The countries listed in the table account for roughly two-thirds of total developing country exports and imports other than those of the Asian NICs just mentioned. (The countries listed account for about 75 percent of U.S. imports from developing countries and 70 percent of U.S. exports going to developing countries, again excluding the Asian NICs.) Bearing in mind that other, smaller countries are also liberalizing trade restrictions, we may take the countries shown in Table 1 as representative of

developing countries in general. That is, we may assume that the trade policy changes of the countries listed are indicative of the current decline in the tariff rates of all developing countries. Consequently, we may use the policy changes shown in Table 1 to estimate the magnitude of the current reduction in the tariff level of all developing countries taken as a group (excluding the tariff level of the Asian NICs).

In deriving this estimate, we focus on trade policy changes since 1991. Although Table 1 reports trade policy developments predating this period, the impact of such developments on global trade and output has probably already been felt; we want to estimate the impact yet to occur from trade reforms.

For the countries whose changing average tariff rates have been reported, the declines in these rates between 1991 and 1995 range from 7 to 20 percentage points; the declines average 11 percentage points. For the countries whose peak tariff rates alone have been tracked, the reported declines in these peak rates range from 5 to 43 percentage points and average 19 percentage points. The fall in the average tariff levels of this second group of countries is likely to be somewhat smaller than the fall in their peak tariff rates.

Overall, the reported rate declines suggest that a reasonable estimate of the magnitude of tariff reduction for all developing countries taken as a group would be about 10 percentage points. This estimate is roughly the mean of the reported declines in average tariff rates and is less than the mean of the decline in peak tariff rates for the developing countries with available data. Of course, this estimate is imprecise. However, the relatively narrow range of reported average rate changes suggests that the actual aggregate cut in developing countries' tariff rates is unlikely to be either much greater or much less than 10 percentage points.

Estimating the quantitative impact of developing country reductions in nontariff barriers is more difficult. Nevertheless, we can make a reasonable assessment of the impact these reductions are likely to have. The tariff equivalents of nontariff barriers—that is, the levels of tariffs that would have the same contractionary impact on imports as that had by the nontariff barriers—have been found to substantially exceed 100 percent for a number of products in highly protected countries, including some of the countries that are now reducing their nontariff barriers.² Given the extent of nontariff

²If import price elasticities of demand equal one, a 100 percent tariff would cut demand 100 percent, an effect equivalent to that of a nontariff barrier that totally blocks import purchases. Since price elasticities typically exceed one for restricted imports, tariff equivalents may exceed 100 percent by a considerable margin. Lewis and Gaisinger report tariff equivalents of over 100 percent for selected imports of Pakistan in Bela Balassa, ed., *The Structure of Protection in Developing Countries* (Johns Hopkins Press, 1971). The

Table 1

Recent Trade Liberalization Measures

Country	Measure
Argentina	Average tariff level reduced from 18% to 11% in 1991; highest tariff rate cut by 15 percentage points in 1992, although import taxes were raised 7 percentage points; import licensing restrictions substantially eased in 1991
Bangladesh	Average tariff rate recently reduced to 25%; further tariff cuts planned for 1993
Brazil	Average tariff level was 32% in 1990, 25% in 1991, and 21% in 1992; it was scheduled to fall to 14% in July 1993. Automobile duties scheduled to fall to 35% in 1994 from 50% in 1992; stringent computer protection ended in October 1992; most nontariff barriers removed in March 1990
Caribbean Community (Caricom): thirteen-member common market	Agreement concluded to drop ceiling rate for common external nonagricultural tariffs to 20% in 1997 from 45% in 1992
China	Agreement concluded in October 1992 with the United States to begin significant liberalization of imports, including end of almost 90% of nontariff barriers by 1998. Substantial tariff cuts also announced in 1992
Colombia	Average import duty, including surcharge, reduced from more than 33% to less than 13% in 1992; top tariff rate to be cut from 63% to 20% by end-1993 under Andean Pact agreement on common external tariff
Ecuador	In June 1992 new tariff range for most products of 5 to 20% replaced previous range of 5 to 35%; further liberalization planned
Egypt	World Bank program that includes trade liberalization is in progress. In 1992 import ban reduced to 10% of tradeable goods from 23% in 1991 and 37% in 1990; in 1993 new tariff range for most products of 5 to 80% replaced previous range of 5 to 100%
India	Many restrictive import licensing requirements (which covered 70% of all imports) eliminated in 1992; substantial tariff reductions enacted or planned; average peak tariff rate reduced to 85% from 110% under fiscal year 1993-94 budget
Indonesia	Trade liberalization packages adopted in 1986, 1987, 1988, 1990, 1991, and July 1992
Israel	Remaining import duties to end in 1995 under free trade agreement signed with the United States in 1985
Mexico	Remaining import duties (which average about 10%) to end in 2007 under free trade agreement signed with the United States in 1992 (U.S. ratification vote is scheduled for November 17, 1993)
Pakistan	Under fiscal year 1992-93 budget, tariffs on consumer durables cut from 80 to 90% to 50% and some machinery tariffs cut in half; list of banned imports cut in half in 1991 and reduced again in 1992
Peru	Tariff range to be reduced from 15 to 25% to 5 to 20% by the end of 1993 as part of Andean Pact common external tariff agreement
Philippines	Trade reform package adopted in 1991 to reduce average tariff rate from 28% to 20% over four years; some quantitative restrictions lifted
Thailand	Significant reduction of tariffs planned
Turkey	Substantial tariff reductions enacted at the end of 1992
Venezuela	Tariffs recently reduced and further cuts planned through 1993; the maximum scheduled tariff for 1993 is 20%, down from 40% in 1991 and 30% in 1992

Footnote 2 continued

World Bank, in its *World Development Report 1987*, observes that when Sri Lanka replaced quantitative restraints with tariffs, the tariff rates went as high as 500 percent. Bhagwati and Srinivasan estimate that quota premiums for India were as high as 230 percent of cif import value for drugs and medicines and more than

Footnote 2 continued

500 percent for certain food products. See Jagdish N. Bhagwati and T.N. Srinivasan, eds., *Foreign Trade Regimes and Economic Development: India* (National Bureau of Economic Research, 1975). Of course, most nontariff barriers are likely to have a significantly smaller tariff equivalent than these extreme examples.

liberalization reported in Table 1, tariff equivalents now appear to have been slashed at least in half in these countries.

We may derive a rough quantitative estimate of the degree of developing country nontariff liberalization by assuming that 40 percent of developing countries (the proportion shown in Table 1) are relaxing nontariff barriers, that these nontariff barriers had covered roughly half of total potential developing country imports (an assumption supported by the average coverage ratios of the countries identified as reducing nontariff barriers in Table 1), and that developing countries are reducing the tariff equivalents of the nontariff barriers by about 50 percentage points (or roughly cutting them in half from a plausible current average level of about 100 percent). These assumptions together imply that the aggregate tariff equivalent of nontariff barriers in developing countries is currently falling about 10 percentage points (that is, 40 percent of countries liberalizing \times 50 percent import coverage ratio \times 50 percentage point cut in rates = 10 percentage points). In other words, our assumptions suggest that the recent and planned reductions in nontariff barriers can be expected to have roughly the same impact on developing countries' imports in aggregate as would a 10 percentage point cut in the average tariff rates for these countries.

Putting the estimated impacts of the tariff and nontariff barrier changes together produces a reasonable estimate of the aggregate impact of developing countries' import liberalization efforts over the 1991-95 time period. This impact is roughly equivalent to an across-the-board 20 percentage point decrease in the countries' tariff rates (excluding those of Hong Kong, Singapore, South Korea, and Taiwan). Ten percentage points of this decrease reflect tariff reductions, while 10 percentage points reflect reductions in nontariff barriers.

We can take these calculations one step further to see what they imply for developing country import prices from the point of view of developing country purchasers. If one assumes that import restrictions had increased the average purchase price of imports by about 40 percent (a reasonable assumption given the level of protection found in the comprehensive 1986 tariff survey and supported by the numbers in Table 1) and that recent liberalization had lowered this protection by 20 percentage points, then the purchase price of imports would have fallen about 15 percent because of import liberalization. That is, if the original pre-protection import price was 100 and protection had increased it to 140 but will now only increase it to 120, the purchase price in the developing countries will have fallen by $(140 - 120)/140$ or roughly 15 percent.

This decline of roughly 15 percent in import prices over the 1991-95 period should significantly affect

global trade flows over the next five or so years. A lag will exist between the liberalization period and the trade flow response time both because much of the liberalization occurred toward the end of 1992 or later and because it takes time for trade flows to adjust to price changes. The trade flow response is likely to be slower than usual when the price change is within the internal, previously closed market of a developing country because it takes substantial time to arrange new sales contracts and to set up new distribution networks.

The following sections trace the likely overall trade flow impact of the 15 percent reduction in developing countries' import prices over the next five years—a time horizon sufficient to allow trade flows to adjust. The likely effects on global output are also considered. For developing countries, the impact on output is assessed over a somewhat longer period (beyond 1998) to accommodate changes in production patterns resulting from liberalization. A more precise time profile of analysis is impossible given the diverse timing of the countries' liberalization efforts. Bear in mind that the estimated changes discussed in the following sections are indicative rather than precise because the extent of the reform in developing countries cannot be calculated with certainty.

The impact of import liberalization in the absence of financing constraints

Clearly, a fall of roughly 15 percent in import prices can increase developing countries' demand for imports. Assuming that developing countries can afford to pay for additional imports, it is relatively straightforward to estimate the direct, medium-term (roughly five-year) impact of such a price reduction on industrial country sales to these countries and on industrial country output associated with these sales. Estimating the impact of liberalization on developing countries' own output is more difficult, in part because output changes entail the establishment of new production facilities in response to relative price changes. Nevertheless, a qualitative assessment can be made based on the past experiences of liberalizing economies.

Impact on industrial countries

Developing countries' increased demand for imports gives a clear boost to industrialized country exports and hence industrialized country output, assuming that industrialized countries have the resources available to meet this increased demand. How great the boost will be depends on how much the demand for imports increases as developing countries ease trade barriers. Import price elasticities of demand, which measure the percentage change in import demand in response to each 1 percent change in import price, would be the

natural way to gauge this increase.

Unfortunately, estimates of import price elasticities of demand are not available for developing countries (see appendix). In their absence, we may use as a proxy the average price elasticity for imports (from all sources) found for industrial countries. Given their diverse income levels, however, developing countries and their industrial counterparts may well react differently to price changes. Consequently, using industrialized country price elasticities does add another level of uncertainty to our analysis.

Goldstein and Khan list ninety-one industrial country import price elasticities taken from various studies.³ These estimates average -1.0 . Consequently, we will calculate the change in developing countries' import demand due to liberalization using the assumption of a -1.0 developing country price elasticity. To assess the sensitivity of the estimated demand change to alternative price elasticity assumptions, however, we will also calculate the change in developing countries' import demand based on a price elasticity of -1.5 . We choose a larger (negative) elasticity as an alternative assumption because 90 percent of developing country imports from industrialized countries are manufactured goods. Manufactured goods typically face a somewhat higher demand elasticity than do imports in aggregate.

Under the -1.0 assumption, developing country import demand would be expected to increase 15 percent in response to the 15 percent decline in import sales prices arising from liberalization. Under the alternative elasticity assumption, developing country import demand would increase 23 percent. These estimates suggest that developing countries' import purchases from industrialized countries are likely to rise on the order of 20 percent as a result of recent trade reform.

An increase of roughly 20 percent in developing countries' import demand, basically for manufactured goods, translates into a notable rise in industrialized countries' exports and output, assuming that industrialized countries have unemployed resources available to satisfy this demand. The developing countries we are considering account for about \$400 billion, or 15 percent, of industrialized countries' manufactured goods exports. Consequently, a 20 percent rise in developing country purchases would increase the total manufactured goods exports of industrialized countries by roughly \$80 billion, or 3 percent. Given the share of exports in industrialized country GDP, this 3 percent rise in exports would raise GDP by 0.3 percent.

These calculations suggest that recent efforts by developing countries to liberalize trade could add signif-

icantly to the level of industrialized country output. When multiplier effects are considered, moreover, the boost to industrialized countries' output could be substantially higher than these calculations indicate. An initial increase in demand often leads to multiplier effects as those who earn additional income in an expanding sector of an economy spend this income in other sectors. Multiplier effects from an increase in export sales to developing countries could raise industrialized country output well beyond the 0.3 percent increase estimated here.

Impact on developing countries

The medium-term impact of liberalization on developing economies is basically the \$80 billion increase in import purchases. Over a slightly longer horizon, however, the easing of import barriers will likely cause developing countries to shift their output away from import-competing goods toward goods that they can produce more efficiently. Although measured output may initially decline as import-competing firms face increased competition,⁴ output will likely eventually increase well beyond the level it would have reached without liberalization.

The longer term benefits of free trade policies are of two kinds, static and dynamic. Developing economies realize static gains when they remove price distortions that cause a misallocation and underutilization of developing economy resources. Countries that artificially depress import demand tend to have an overvalued exchange rate, which lowers export sales. Domestic resources are pulled away from production of exports to support production of import substitutes. Since production of developing economy exports generally employs labor (typically the developing economies' most abundant resource) more intensely than does production of import substitutes, labor often becomes undervalued and underutilized in an import-substitution regime. More generally, protected developing economies end up channeling resources to import substitution when the underlying imports could be purchased at a lower cost to the economy.⁵ Resources devoted to producing

⁴The decline in the value of import-competing goods will be less than the \$60 billion increase in developing country imports because, given the choice to buy imports priced at their true market value (that is, free of the price increase resulting from import restrictions) or alternative domestic goods, developing country purchasers prefer the imported goods. Although sales of the eventually displaced domestic goods may have registered \$60 billion before liberalization, these goods would not have sold at such high prices if imports had been free of restrictions; import restraints allowed the sales price of these domestic alternatives to rise above their true value, measured at world prices.

⁵The overstatement of domestic output value in the presence of trade restrictions can be quite severe. Indeed, in some cases the value of domestic output has actually been negative in a highly

³Morris Goldstein and Mohsin S. Khan, "Income and Price Effects in Foreign Trade," *Handbook of International Economics* (Elsevier Science Publishers, 1985), p. 1079.

import substitutes become of more value to the economy when they are reallocated to goods they can more efficiently produce. These goods can then be traded on the world market for the previously restricted imports. This trading of goods efficiently produced for those inefficiently produced is the basic source of economic gain arising from international trade.

Developing economies realize dynamic benefits from import liberalization when they remove restrictions that inhibit competition. Protected markets in these countries are typically too small to support more than one or two local producers of a given product. With a protected market position, these producers often become inefficient and fail to invest in technological improvements, thereby slowing the growth of the whole economy. Removal of these restrictions raises an economy's growth path.

Studies have generally found that the static and dynamic gains from liberalization significantly improve the economic performance of developing countries.⁶ After evaluating forty-one countries, the International Monetary Fund concluded that outward-oriented economies achieved on average "significantly higher growth rates of potential GDP and of total factor productivity" than inward-oriented economies.⁷ The World Bank reported that independent studies measuring the static GDP benefits of moving to freer trade found positive gains varying from less than 1 percent to as high as 6 percent of GDP. The World Bank's own analysis of sixty developing countries showed a positive correlation between trade liberalization and productivity growth, a key generator of GDP growth. The World Bank does caution that data problems may distort its results.⁸

Overall impact

Import liberalization by developing countries should

Footnote 5 continued

restricted economy. These negative value-added cases arise when a country spends more on imported inputs to produce a finished good domestically than it would have spent to import the finished good. Cases of negative value-added are reported in Ian Little, Tibor Scitovsky, and Maurice Scott, *Industry and Trade in Some Developing Countries* (London: Oxford University Press, 1970).

⁶Arguments offered in support of import restrictions are typically unsuited to developing economies. Strategic trade arguments stress the advantages of protecting high-technology industries subject to economies of scale. In developing countries, however, import restraints rarely protect advanced technology industries. Infant-industry arguments supporting protection fail to override the benefits likely to accrue from import liberalization. The usual degree of developing country protection has far exceeded, both in magnitude and scope across industry, the level suggested by the infant-industry argument.

⁷International Monetary Fund, *Issues and Developments in International Trade Policy*, August 1992, p. 48.

⁸The World Bank, *World Development Report 1991*, June 1991, p. 98.

provide a significant boon to both industrialized and developing countries. As argued above, industrialized country exports to developing countries are likely to rise on the order of 20 percent if developing countries face no financing constraint. This rise by itself could boost the level of industrialized countries' GDP by about 0.3 percent. Although developing countries may initially see a dip in their own output levels as they adjust to liberalization, evidence indicates that they, too, should benefit substantially in the medium to long run from the potential economic efficiency gains of trade reform. Indeed, output gains on the order of roughly 1 to 5 percent have been found for developing countries that have already liberalized.

As developing countries increase their competitiveness and output over the longer run, they will export more goods to industrialized countries. Industrialized economies should benefit from the lower prices that the increased competitiveness of developing countries is likely to entail. Increased competition will, no doubt, impede growth in some industries in the industrialized countries. Growth should be spurred in other industries, however, as the stronger GDP performance in developing countries arising from their reforms leads to a further increase in developing country import demand. At this point, industrialized countries as well as developing countries should benefit from the standard efficiency gains associated with trade now more closely based on the comparative advantages of both areas.

Impact of import liberalization in the presence of financing constraints

So far the analysis has assumed that developing countries have or can obtain sufficient resources to pay for their increased import demand following liberalization. However, for many developing countries, the ability to pay for imports is a key constraint limiting import purchases. This section will consider how global trade and output will change when developing countries that have adopted freer trade policies face a binding financing constraint. Before estimating these changes, however, we discuss the potential extent of this financing constraint. The section will end with a note on how trade policy decisions by the industrialized countries could significantly affect our estimated results.

Potential financing constraints

To obtain additional resources to pay for increased imports, developing countries must take on more foreign debt or attract foreign funds through foreign investment, aid, or repatriated capital. However, for most of the developing countries considered here (Hong Kong, Singapore, South Korea, and Taiwan are again excluded), the options of increasing foreign debt or

otherwise raising foreign funds to finance trade liberalization are likely to be limited in the short run.⁹ Although developing countries have been able to raise substantial capital inflows in recent years, these inflows have often been tied to specific investment projects rather than general balance-of-payments support. Moreover, given the developing country debt crisis of the 1980s, a large rise in imports (such as we estimated in the previous section) could temporarily depress further growth in foreign financing. Projections released by the International Monetary Fund in May suggest, for example, that average annual capital flows to indebted developing countries could remain at about their 1992 level through 1994.¹⁰ Morgan Guaranty Trust offered an even more pessimistic assessment of developing country financing options last winter; it estimated that the net private capital inflow to Latin America in 1993 may be only about half the level it was in 1992 (\$23 billion compared with \$44 billion).¹¹ Over the medium term, external financing could be more forthcoming as developing country economies become more efficient. In the short run, however, developing countries may well face significant financing constraints.

If developing countries cannot raise sufficient foreign funds to pay for additional import purchases immediately following liberalization, they will have to increase their export sales to earn foreign exchange or reduce their import demand. Developing countries can boost the volume of export sales by depreciating their currencies in nominal terms. Alternatively, they can lower the price of their products through export promotion measures or more efficient production practices (perhaps brought about by privatization) while leaving their nominal exchange rates unchanged (an option developing countries may choose if they want to maintain nominal exchange rate stability). Lowering prices would mean that the countries depreciated their currencies in real, although not nominal, terms. Either form of depreciation would reduce the dollar price and hence increase the world demand for developing country products. How-

⁹Mexico is one country that managed to finance a sharp growth in imports following substantial trade liberalization in 1987 by drawing down reserves and using exceptional financing flows (debt-bond and debt-equity swaps) rather than resorting to a significant real depreciation of the peso. However, for many developing countries these financing sources are not viable options.

¹⁰The level of capital flows to indebted developing countries and countries in Eastern Europe projected for 1993 by the International Monetary Fund, about \$120 billion, is roughly equal in inflation-adjusted terms to the capital flows to these countries in the late 1970s, a period when developing countries were borrowing relatively heavily. See International Monetary Fund, *World Economic Outlook*, May 1993.

¹¹This forecast is cited in Stephen Fidler, "Trouble with the Neighbors," *Financial Times*, February 16, 1993, p. 15.

ever, under both forms of depreciation, the developing countries would earn fewer dollars for each unit sold, so the dollar value of exports might not actually rise.

The more important impact of depreciation on the developing countries' trade balances, measured in dollar terms, would be a reduction in the countries' demand for imports. Whether achieved through exchange rate adjustment or lower developing country domestic prices, depreciation would shift demand away from imports toward developing countries' own products. Since the dollar price of imports is unlikely to have changed (almost all developing country imports come from industrialized countries that are unlikely to change the dollar price of their goods; we assume there is no change between the dollar and other industrialized country currencies), a fall in the volume of import purchases would translate directly into a fall in the dollar value of imports.¹² Thus, the liberalization-induced increase in imports would be effectively curtailed, in aggregate if not in individual industries, by depreciation. In fact, if no additional financing is available, developing countries will likely have to depreciate to the point where the dollar value of imports shows no noticeable increase despite liberalization. The easing of import barriers would consequently affect import composition only.

One can cite a number of countries where currencies have depreciated during a period of trade liberalization. For instance, the Brazilian cruzeiro depreciated by roughly 40 percent in real terms against the dollar between 1989 and 1992 while Brazil introduced trade reforms. In India the devaluation of the rupee by 70 percent since the end of 1990 has coincided with the opening of the country's market to increased imported goods. Argentina, meanwhile, has emphasized the need to find production efficiencies, in part through privatization, that will lower domestic prices while it liberalizes its import regulations.

Estimating the effects

This subsection presents an estimate of the medium-term impact of import liberalization on global trade and output when developing countries depreciate their currencies to finance increased import demand. We begin our discussion by noting two problems affecting the estimation procedure. (For a full discussion of the

¹²Developing countries could also cut import demand by slowing their economic growth. Some countries that place strong emphasis on stable exchange rates to fight inflation or instill confidence might choose this path. However, unless the developing country economies are overheating, this method of balance of payments adjustment would undercut the expected economic benefits that initially prompted the import liberalization efforts. Depreciation, consequently, is likely to be a more accepted method of handling trade balance pressures.

model used to reach the estimate, see the appendix.)

First, we do not know the extent to which developing countries will be able to raise foreign financing. Thus, we calculate trade and output effects under two alternative scenarios. The first scenario assumes that developing countries are able to raise \$30 billion, or roughly half, of the foreign financing needed to pay for the additional import demand generated by import liberalization.¹³ The second scenario assumes that developing countries are unable to raise any further foreign funds and thus must rely on depreciation to keep their trade balances at their pre-liberalization dollar levels after import restrictions are relaxed.

Second, we do not know industrial country price elasticities of demand specifically for developing country products. To deal with this uncertainty, we follow the same procedure we used to estimate the developing country price elasticities of demand; we use two different price elasticity assumptions, -1.0 and -1.5 , and average the results.

Scenario 1: Limited additional financing. The columns of Table 2 provide estimates, derived from the model in the appendix, of expected developing country currency depreciation and export and import changes following import liberalization. These estimates assume that developing countries are only able to raise sufficient foreign financing to pay for half of the increased import demand arising from trade reform. The top four rows of Table 2 show the estimated changes under alternative price elasticity assumptions for developing and industrialized countries. The fifth row shows the average of the previous four rows' estimates.

The estimated degree of developing country depreciation in this scenario, shown in Column 2, is about 7 percent under all of the elasticity combinations shown. The estimates of the increase in developing countries' export volume that this depreciation generates, shown in Column 3, center around 8 percent. Since depreciation lowers the dollar price of developing countries' exports while increasing export volume, the combined impact of these depreciation and export volume estimates on the dollar value of developing country exports, shown in the next column of the table, is very small. The dollar value of exports is expected to rise a modest 1 percent at most.

The estimated degree of depreciation shown in Column 2 is calculated to cut the volume of developing countries' imports by 9 percent on average, as shown in Column 5. Note that this column does not include the

estimated effect of the initial liberalization on imports. That impact is shown in column 6. The seventh column shows the estimated total impact of import liberalization and currency depreciation on the (dollar) value of developing country imports. As noted earlier, this total value impact is equivalent to the total volume change in imports because the dollar price of imports does not change. The average estimated change in the overall value of imports is 8 percent.

What conclusions may be drawn from the estimates reported in Table 2? Overall, with limited foreign financing covering only half the value of increased import demand arising from trade reform, developing countries' imports rise only half as much after liberalization as they did when foreign financing was unconstrained. The vehicle limiting developing countries' import demand is their moderate currency depreciation. Given an export price elasticity of close to -1 , this depreciation spurs the volume of developing countries' export sales but leaves the dollar value of these sales little changed. Consequently, the value of imports can only increase in line with the restricted amount of financing available.

Before considering the impact of these developments on the economies of the industrialized and developing countries, let us consider what a more severe financing constraint would imply.

Scenario 2: No additional financing. If history is a guide, some additional financing could well materialize in response to the gains expected from trade reform in developing countries. Our second scenario, however, assumes the polar case in which developing countries are unable to attract any additional foreign financing to pay for increased import purchases. Table 3 shows the range of estimated depreciation rates and trade flow changes across the alternative price elasticity assumptions under this scenario.

Not surprisingly, the model estimates that under this scenario, developing countries depreciate their currencies to a greater extent than under the previous scenario; that is, depreciation averages 11 percent instead of 7 percent. In response, developing country export volume rises on average 13 percent instead of 8 percent. The combined impact on the (dollar) value of developing country export sales is still estimated to average a very modest 1 percent (again because the export price elasticity is close to -1).

As for developing countries' imports, the model estimates that depreciation leads to an average 15 percent fall in the volume of import purchases. This decline offsets almost all of the increase in import volume generated by import liberalization. The total value of developing countries' imports rises a scant 1 percent, the same rate of increase as that for the value of

¹³Thirty billion dollars equals about half of the financing needed if the developing country price elasticity of demand for imports is -1.0 .

developing country exports. Only the slight increase in export revenue, in fact, allows any growth in import value, given the severe financing constraint assumption.

Overall results. Overall, when developing countries are subject to financing constraints, import liberalization could have medium-term effects on global trade flows significantly different from those estimated in the previous section. Financing constraints could sharply limit the rise in developing countries' import purchases, while depreciation might substantially expand the volume of developing country export sales. Specifically, when additional foreign financing supports half of the liberalization-induced increase in import purchases, the volume of developing countries' exports is expected to rise almost as much as the volume of their imports. If no additional foreign financing is available, our estimates suggest that developing countries' export volume will actually rise much more than their import volume despite the relaxation of import barriers.

These results have important implications for both developing and industrialized countries. From the perspective of industrialized countries, trade reform in developing countries facing financing constraints is likely to lead to a substantial increase in the volume of developing country goods entering industrial country markets. The industrial countries will benefit from a fall in the dollar price of developing country goods. Industrialized country sales to developing countries will also likely increase, although by significantly less than would be the case if developing countries faced no financing

constraints. This moderation in the growth of industrialized countries' potential sales to developing countries, coupled with greater competition from developing countries in industrial country markets, will likely mean that developing country import liberalization will no longer provide a substantial medium-term boost to industrialized country output. Consequently, the main benefit of developing country trade reforms for industrialized countries during this period may be the reduced price of imports coming from developing countries.

From the perspective of developing countries, import liberalization under financing constraints leads to a smaller increase in imports coupled with a significant rise in exports. Developing country output may not drop and could actually rise in the short run because of increased export volume. However, higher output for developing countries comes at the cost of some loss of purchasing power in the global market owing to the depreciation of their currencies.

Most important, both industrial and developing countries still reap the long-run efficiency benefits of liberalization. Both areas will ultimately gain from global trade based more directly on comparative advantage. When developing countries face financing constraints, the industrialized countries will have a smaller cushion of increased demand for their products to ease their medium-term transition to this more efficient global allocation of production. Nevertheless, regardless of financing constraints, both industrialized and developing countries stand to benefit in the long run from

Table 2

The Impact of Developing Country Trade Liberalization on Trade Flows in the Presence of Financing Constraints, Scenario 1: Limited Additional External Financing

	Assumed Price Elasticity of Demand for Developing Country Exports	Dollar Price Change of Manufactured Exports (Percent Depreciation)	Volume Change of Manufactured Exports (Percent)	Total Manufactured Export Change (Percent)	Volume Change of Manufactured Imports Due to Depreciation (Percent)	Volume Change of Manufactured Imports Due to Liberalization (Percent)	Total Manufactured Import Change (Percent)
Case A: Developing country price elasticity of demand for imports = -1.5	-1.5 -1.0	-7 -8	11 8	3 -1	-11 -13	23 23	9 7
Case B: Developing country price elasticity of demand for imports = -1.0	-1.5 -1.0	-5 -6	8 6	2 -0	-5 -6	15 15	9 8
Average of above estimates	—	-7	8	1	-9	19	8

developing country trade reform.

Importance of the industrialized countries' trade policy

When developing countries face financing constraints, the willingness of industrialized countries to buy their products becomes a key determinant of the extent to which developing country reforms will boost global trade in the medium term. Indeed, the calculations summarized in Tables 2 and 3 indicate that developing countries' total imports and total exports (measured in dollar terms) are *both* higher when industrial countries show a greater willingness to buy their products (as measured by a higher industrial country price elasticity of demand—that is, a higher export price elasticity faced by developing countries). In contrast, the willingness of developing countries to buy industrialized countries' products (as measured by the developing country price elasticity of demand for industrial country goods) appears to have little influence on the ultimate level of both imports and exports. The willingness of industrial countries to purchase developing countries' products is much more important because it determines the total dollar value of export sales by developing countries. Consequently, it also indirectly determines the total dollar value developing countries can spend on industrialized countries' products and thus the total change of world trade.

Because industrial countries' willingness to purchase the products of developing countries facing financing constraints has such important effects, industrialized

country trade policy may be a prime, although hidden, determinant of the extent to which import liberalization in developing countries boosts the world economy in the medium term. Industrialized country import restrictions clearly reflect less willingness to buy developing country products. If the industrialized countries impose import restrictions in response to depreciation-induced growth in developing country exports, the industrial country demand response to the depreciation will be lower. Since this lower response would mean reduced world trade, increased industrial country trade restraints would ultimately hurt the industrialized countries themselves by reducing their sales to the developing world.

Impact of developing country liberalization on the U.S. economy

Developing countries (excluding the Asian NICs) currently account for about 30 percent of U.S. manufactured goods exports and about 25 percent of U.S. manufactured goods imports. For this reason, a marked rise in the trade volume of developing country manufactured goods should have a substantial impact on U.S. trade and the U.S. economy. This section will briefly discuss the effect of developing countries' trade reforms on U.S. manufacturing trade, output, and employment. It will also note how changes in U.S. trade policy could alter the outcome when developing countries face financing constraints.

Our earlier analysis suggested that developing country imports may be expected to rise roughly 20 percent

Table 3

The Impact of Developing Country Trade Liberalization on Trade Flows in the Presence of Financing Constraints, Scenario 2: No Additional External Financing

	Assumed Price Elasticity of Demand for Developing Country Exports	Dollar Price Change of Manufactured Exports (Percent Depreciation)	Volume Change of Manufactured Exports (Percent)	Total Manufactured Export Change (Percent)	Volume Change of Manufactured Imports Due to Depreciation (Percent)	Volume Change of Manufactured Imports Due to Liberalization (Percent)	Total Manufactured Import Change (Percent)
Case A: Developing country price elasticity of demand for imports = -1.5	-1.5 -1.0	-10 -11	15 11	4 -1	-17 -19	23 23	2 -0
Case B: Developing country price elasticity of demand for imports = -1.0	-1.5 -1.0	-10 -12	15 12	4 -1	-11 -14	15 15	2 -1
Average of above estimates	—	-11	13	1	-15	19	1

in the medium term when the countries are free of financing constraints. It is reasonable to assume that this increase would be spread evenly across all industrialized country suppliers, including those in the United States. Given the developing country share of U.S. exports, a 20 percent increase in developing countries' import demand would translate into roughly a 6 percent, or \$25 billion, rise in total U.S. manufactured goods export sales.

A \$25 billion increase in U.S. export sales would clearly boost U.S. output. U.S. manufactured goods shipments would increase by almost 1 percent, and employment in manufacturing industries would rise by roughly 102,000 jobs.¹⁴ The U.S. industries benefiting most would include electrical and nonelectrical machinery and transportation equipment.

If developing countries face financing constraints, however, the medium-term impact on the U.S. economy is apt to be markedly different. Under the financing scenario that assumes developing countries are able to raise roughly half the financing needed to pay for the liberalization-induced increase in their import demand, developing country imports are only projected to increase by 8 percent. The volume of developing country exports is also expected to rise by 8 percent. If we again assume that developing country trade with the United States changes to the same extent, both total U.S. manufacturing goods exports and total U.S. manufacturing goods imports would rise by about 2 percent (compared with a 6 percent rise in U.S. exports and no rise in U.S. imports in the absence of financing constraints).

With U.S. manufactured goods sales to and purchases from the developing countries (excluding the Asian NICs) about equal in magnitude, the export and import changes expected under this financing constraint scenario would have little net impact on total U.S. manufactured goods output or employment. U.S. output and employment related to U.S. export sales to the developing countries would rise, but U.S. output and employment that compete with developing country sales in the U.S. market would decline by about the same amount.

Under more pessimistic financing scenarios, developing country liberalization could actually have some initial adverse effects on U.S. output. That is, U.S. sales to developing countries could rise less than U.S. purchases from developing countries, putting some immediate downward pressure on U.S. output levels.

Over the longer run, however, the U.S. economy is likely to benefit significantly from developing country

liberalization, even in the presence of severe financing constraints. Trade reform in developing countries will eventually lead to more efficient global trade and production based on the comparative advantages of all participants, regardless of the financial position of developing countries. Given the importance of the United States as a developing country trade partner, the United States should reap a significant share of the gains arising from the more efficient global production pattern.

Despite the long-run gains for the U.S. economy, increased developing country competitiveness arising from depreciation could generate a protectionist reaction in the United States in the medium term. An increase in U.S. import restrictions would be counterproductive for U.S. output and employment. If U.S. import policy reduced the volume of exports that developing countries could sell at any given price level, the developing countries facing financing constraints would probably be forced to depreciate their currencies still further to pay for increased import demand following liberalization. The likely resulting loss in the United States' own sales to developing countries would probably cut U.S. output and employment more than the protection-induced reduction in developing country exports to the United States would save output and jobs.¹⁵

Conclusion

This article has estimated that the recent trade reforms in developing countries will probably lower imported goods prices in their markets on the order of 15 percent. In the absence of financing constraints, this 15 percent price change should raise developing country demand for industrialized country products by about 20 percent in the medium term. A 20 percent rise in developing country demand is equivalent to about 0.3 percent of industrial country GDP. In the longer run, the gain to industrialized countries will be very substantial as developing country liberalization leads to a more efficient pattern of global production and trade benefiting all areas. Developing countries may be expected not only to realize this efficiency gain but also to benefit from the increased economic dynamism that typically arises from significant import liberalization.

¹⁴Mathematical calculations based on the model in the appendix support this conclusion. If increased U.S. import restrictions had a contractionary effect on import demand equivalent to that of lowering the U.S. price elasticity of demand for developing country products to -0.5 , the export and import changes estimated by our model imply that, on net, U.S. manufacturing shipments would fall by \$1½ billion and U.S. manufacturing employment by 5,000 jobs. Moreover, since the import-competing industries that would be protected generally pay lower wages than the U.S. exporting industries hurt by increased U.S. protection, average U.S. earnings would be lowered even more than the job loss figure suggests.

¹⁴This employment effect is calculated on the basis of the composition of developing country import demand and U.S. employment levels measured at the two-digit SIC level.

When developing countries face financing constraints, the medium-term impact of their efforts to relax import barriers is more complicated. Given financing constraints, developing countries will likely have to increase the volume of export sales through nominal or real depreciation to prevent trade balance deterioration as they liberalize. Consequently, although global output will still probably increase, industrialized as well as developing country markets will have to adjust to some extent to greater competition from abroad in the medium term. If industrialized countries respond to this increased competition by raising import barriers, they will likely force developing countries to depreciate further, exacerbating the industrialized countries' adjustment costs. Over the longer run, both industrialized and

developing countries will probably still benefit significantly from the efficiency gains generated by the developing countries' trade reforms.

The U.S. economy is apt to be a prime beneficiary of these reforms because it is a major developing country trade partner. Barring developing country financing constraints, U.S. manufactured goods shipments could rise by about \$25 billion and U.S. employment by more than 100,000 jobs in the medium term as developing countries' demand for U.S. goods rises. Developing country financing constraints, however, could substantially weaken this medium-term result. Nevertheless, regardless of such constraints, the U.S. economy should eventually benefit from global efficiency gains arising from the developing countries' reforms.

Appendix: Developing Country Trade Elasticities and a Model of Developing Country Trade Balance Adjustment

This appendix examines the problems of estimating developing country trade elasticities. It also presents a model for estimating the impact on global trade flows of developing countries' efforts to ease import barriers when financing constraints are present. Developing country trade elasticities are a critical component of this model.

The price elasticities of demand for the manufactured goods imports and exports of developing countries are very difficult to estimate, with the export elasticity proving especially problematic. Data are not available on changes in the price and volume of aggregate developing country manufactured goods exports. Data are available for total developing country exports but the high percentage of commodities in these exports, coupled with very volatile commodity price movements, makes it virtually impossible to derive meaningful price elasticities for manufactured goods trade from this data.

Estimating the export elasticity for any given developing country by itself also poses problems. The world price elasticity of demand for total manufactured goods exports from developing countries is likely to be considerably lower than the elasticity for any one developing country's exports. That is, if all developing countries try to increase exports, they will have a harder sell than a single developing country acting on its own.

A final problem with estimating developing country export elasticities is that they are likely to depend significantly on how industrialized countries respond to a large, rapid increase in developing country sales. If industrialized countries try to impede these sales through protectionist actions, the de facto price elasticities of demand for industrialized countries will be lowered.

As for developing country import price elasticities of

demand, estimation difficulties include the unavailability of data on total manufactured goods import volume and price for developing countries. Estimating an individual developing country's import price elasticity may give a false reading on the aggregate developing country import price elasticity if the individual country has a significantly different import structure than the developing countries as a group.

Lacking satisfactory price elasticity estimates, we can examine the sensitivity of developing country export and import volume changes to varying price elasticity assumptions. Reasonable elasticity assumptions are -1.0 and -1.5 .[†] We will use these elasticity assumptions in our model, which is designed to calculate the impact of developing country import liberalization in the presence of financing constraints.

The model

Let us begin by defining % chg M_L as the initial increase in the dollar value of developing country imports due to developing country import liberalization, % chg X_D as the change in the dollar value of exports due to depreciation, and % chg M_D as the change in the dollar value of imports due to depreciation. Let us also define MB as the developing countries' initial import base and XB as the developing countries' initial export base, both measured in dollar terms.

In the simpler modeling case, which assumes that

[†]As noted in the text, the average of the 184 individual export and import price elasticity estimates for industrialized countries reported by Goldstein and Khan is -1.0 ("Income and Price Effects"). Manufactured goods price elasticities are typically found to be somewhat higher than these all-commodity elasticities.

Appendix: Developing Country Trade Elasticities and a Model of Developing Country Trade Balance Adjustment (Continued)

developing countries are unable to raise any additional financing to pay for increasing import purchases, the dollar value of the developing countries' trade balance must remain unchanged. Therefore, the impact of liberalization must be offset by the impact of depreciation, or algebraically:

$$(\% \text{ chg } M_L) (\text{MB}) = (\% \text{ chg } X_D) (\text{XB}) + (\% \text{ chg } M_D) (\text{MB}).$$

Under the other financing constraint scenario, which assumes that developing countries can raise limited additional financing, one-half of the impact of liberalization must be offset by the impact of depreciation, or algebraically:

$$\frac{1}{2} (\% \text{ chg } M_L) (\text{MB}) = (\% \text{ chg } X_D) (\text{XB}) + (\% \text{ chg } M_D) (\text{MB}).$$

Currency depreciation will in general not affect the dollar value of the developing countries' commodity exports, which are 35 percent of their total exports (with manufacturing goods accounting for 65 percent of total exports), since commodities typically sell at a world dollar price. Nor will currency depreciation likely have a large impact on developing country purchases of commodity imports (measured in dollar terms) since neither the dollar price nor the quantity of these imports is likely to change. Developing country import liberalization, moreover, will primarily affect purchases of manufactured goods, which account for about 90 percent of total developing country imports from industrialized countries.[‡] Consequently, we can rewrite our first equation as:

$$(\% \text{ chg } M_{L\text{manuf}}) (0.90 \text{ MB}) = (\% \text{ chg } X_{D\text{manuf}}) (0.65 \text{ XB}) + (\% \text{ chg } M_{D\text{manuf}}) (0.90 \text{ MB}),$$

where the _{manuf} subscript refers to percent changes in the manufacturing sector. Our second equation can be similarly modified.

On the export side, the change in the dollar value of developing country export purchases will be the net effect of a fall in the dollar price of exports and a rise in the volume of exports induced by this dollar price fall.

[‡]These manufacturing shares of total developing country exports and imports are calculated based on the share of manufactured goods in total developing country (excluding the Asian NICs) trade with the United States. U.N. data suggest that these shares should be comparable to shares for developing country trade with all industrial countries.

Consequently,

$$\% \text{ chg } X_{D\text{manuf}} = (0.65) (\% \text{ chg } P_{x\text{manuf}} + \% \text{ chg } V_{x\text{manuf}}),$$

where $P_{x\text{manuf}}$ and $V_{x\text{manuf}}$ are the dollar price and volume of manufactured goods exports.

On the import side, developing country depreciation will likely have negligible impact on the dollar price of developing country import purchases, the vast majority of which are made from industrial country suppliers. The impact of depreciation will basically fall on import volume. Therefore,

$$\% \text{ chg } M_{D\text{manuf}} = \% \text{ chg } V_{M\text{manuf}},$$

where $\% \text{ chg } V_{M\text{manuf}}$ equals the depreciation's impact on import volume.

Finally, MB about equals XB for the developing countries we are considering. Rewriting the initial equation, we now have

$$\% \text{ chg } M_L (0.90 \text{ XB}) = (\% \text{ chg } P_{x\text{manuf}} + \% \text{ chg } V_{x\text{manuf}}) (0.65 \text{ XB}) + \% \text{ chg } V_{M\text{manuf}} (0.90 \text{ XB}).$$

For the second scenario, the equation would be

$$\frac{1}{2} \% \text{ chg } M_L (0.90 \text{ XB}) = (\% \text{ chg } P_{x\text{manuf}} + \% \text{ chg } V_{x\text{manuf}}) (0.65 \text{ XB}) + \% \text{ chg } V_{M\text{manuf}} (0.90 \text{ XB}).$$

Our next step is to note that for any given level of depreciation, the changes in export and import volume will depend on the price elasticities of demand for developing country exports and imports. That is,

$$\% \text{ chg } V_{x\text{manuf}} = e_{px} \% \text{ chg } (P_{x\text{manuf}}/P^*)$$

$$\% \text{ chg } V_{M\text{manuf}} = e_{pm} \% \text{ chg } (P^*/P_D),$$

where the e 's are the respective price elasticities of demand, $P_{x\text{manuf}}/P^*$ equals the ratio of the dollar price of developing country exports to the dollar price of industrialized country products, and P^*/P_D equals the ratio of the dollar price of industrial country products to the dollar price of developing country manufactured goods sold domestically in the developing country markets.

We can assume that the dollar price of industrialized country manufactured goods does not change and that the dollar price of developing country manufactured

Appendix: Developing Country Trade Elasticities and a Model of Developing Country Trade Balance Adjustment (Continued)

goods moves uniformly across all products and also moves one for one with the real exchange rate when developing country currencies depreciate. Consequently,

$$\begin{aligned} \% \text{ chg } P_{x\text{manuf}} &= \% \text{ chg } (P_{x\text{manuf}}/P') = 1/\% \text{ chg } (P'/P_D) \\ &= \text{the real rate of developing country depreciation.} \end{aligned}$$

The percentage change in developing country import purchases due to trade liberalization will also depend on the developing country price elasticity of demand. Specifically, it will equal this price elasticity of demand times the 15 percent reduction in import prices due to trade liberalization that we estimated in the text. Consequently, we may write

$$\% \text{ chg } M_{L\text{manuf}} (0.90 \text{ XB}) = e_{pm} (0.15) (0.90 \text{ XB}).$$

Restating the equations with all side conditions yields the following model:[§]

[§]This model is actually an approximation applicable to small changes because it adds percentage changes (based on taking derivatives). Cross-products are missing. The results in

With no additional external financing—

$$\begin{aligned} \% \text{ chg } M_{L\text{manuf}} (0.90 \text{ XB}) &= (\% \text{ chg } P_{x\text{manuf}} \\ &\quad + \% \text{ chg } V_{x\text{manuf}}) (0.65 \text{ XB}) \\ &\quad + \% \text{ chg } V_{M\text{manuf}} (0.90 \text{ XB}). \end{aligned}$$

With additional external financing—

$$\begin{aligned} \frac{1}{2}\% \text{ chg } M_{L\text{manuf}} (0.90 \text{ XB}) &= (\% \text{ chg } P_{x\text{manuf}} \\ &\quad + \% \text{ chg } V_{x\text{manuf}}) (0.65 \text{ XB}) \\ &\quad + \% \text{ chg } V_{M\text{manuf}} (0.90 \text{ XB}). \end{aligned}$$

$$\begin{aligned} \text{In both cases, } \% \text{ chg } V_{x\text{manuf}} &= e_{px} \% \text{ chg } P_{x\text{manuf}} \\ \% \text{ chg } V_{M\text{manuf}} &= e_{pm} \% \text{ chg } P_{x\text{manuf}} \\ \% \text{ chg } M_{L\text{manuf}} &= e_{pm} (0.15). \end{aligned}$$

The estimations shown in Tables 2 and 3 are derived from these equations under price elasticity assumptions of -1.0 and -1.5 .

Footnote § continued

Table 2 include cross-product effects since the predicted changes are relatively large.