Trade Liberalization and New Imported Inputs

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Understanding the role of international trade in explaining vast differences in productivity across countries remains a key question in international economics. Recent literature emphasizes the microfoundations underlying this relationship. One strand of literature highlights how new export opportunities and toughness of competition generate aggregate productivity gains by reallocating resources from less to more productive firms (Marc J. Melitz 2003; Melitz and Gianmarco Ottaviano 2008). Trade also increases aggregate productivity through improvements in firm productivity (Pavcnik 2002), which have recently been linked to the reallocation of resources across products within firms (Andrew B. Bernard, Stephan J. Redding, and Peter K. Schott 2006) and use of imported inputs (Mary Amiti and Jozef Konings 2007). The latter relate to the idea that trade provides domestic firms access to cheaper and previously unavailable inputs.

The idea that international trade benefits countries by providing access to new products or new varieties of existing products is reflected in many trade and growth models (e.g., Luis Rivera–Batiz and Paul M. Romer 1991, Gene Grossman and Elhanan Helpman 1991). In these models, a country’s access to foreign inputs raises productivity levels, thereby generating static gains from trade. New foreign inputs also lower the cost of innovation, enabling the creation of new varieties, and this generates dynamic gains from trade. With a few exceptions (Robert C. Feenstra et al. 1999; Christian Broda, Joshua Greenfield, and David E. Weinstein 2006), however, the empirical evidence on dynamic gains from trade has remained elusive.

Our research on India (Goldberg, Khandelwal, Pavcnik, and Topalova, henceforth GKPT, 2008a, b) indicates that access to new input varieties from abroad enables the creation of new varieties in the domestic market. The raw data provide initial support for this hypothesis based on two facts following India’s trade liberalization during the 1990s. First, the trade liberalization dramatically increased Indian firms’ access to new imported inputs; two-thirds of the surge in imported inputs occurred in products not imported prior to the reforms. Second, inside India’s borders, firms were expanding their product scope during this same period; during the 1990s, a quarter of India’s manufacturing output growth was driven by new products (GKPT 2008a). In order to connect these two facts, which are consistent with the models mentioned above, we rely on methods developed by Feenstra (1994) and Broda and Weinstein (2006) to quantify the gains from new imported input varieties for Indian firms. We find that these new imported varieties generated an additional annual 4.7 percent decline in the imported input price index, and that firms’ access to new imported inputs increased firms’ ability to manufacture new products.

In this article, we dissect changes in the composition of Indian imports following its 1991 trade liberalization to illustrate the potential scope for previously unavailable inputs to bolster the performance of domestic firms. The analysis reveals that trade reform spurred imports of previously unavailable products and varieties in many products that arguably can be characterized as important inputs for manufacturing firms. New imported inputs in large extent originated from more advanced countries and new imported varieties exhibited higher unit values relative to existing imports. These findings are consistent across narrow classifications of inputs.

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and therefore indicative that India’s trade liberalization relaxed the technological constraints faced by Indian firms under import substitution policies. This more descriptive analysis provides further confirmation of the importance of the extensive product margin in input trade noted in GKPT (2008b).

I. Decomposing Imports

Our analysis relies on official Indian import data from Tips Software Services. The data record the quantity and values of India’s imports at the eight-digit Harmonized Tariff System (HS) level by trade partner from 1987 to 2000. However, we analyze trade flows primarily at the HS6 level, which contains about 5,000 product codes, since HS6 codes are standardized across countries. Thus, the focus on trade flows at the HS6 level ensures that the level of detail of product codes does not reflect factors specific to India’s trade patterns. We rely on the original 1987 HS code classification in order to distinguish “true” product turnover from “false” product changes reflecting the revisions of HS6 classification. Conducting the analysis at the HS6 level provides a more conservative estimate of variety growth and therefore biases our estimate of the extensive margin downward.

The literature on new goods and varieties in international economics often focuses on varieties, where a variety is defined as a product (for example, an HS6 category) imported from a particular country. Since most developed countries import a majority of HS6 products, variation in the extensive margins of trade is driven by the variety margin (Broda et al. 2006). The distinction between products and varieties might be potentially more important in a developing country setting, where a country’s level of economic development or trade policy might constrain not only the varieties they import within a particular product, but also entire sets of products. In what follows, we thus distinguish between products, defined as an HS6 category, and varieties, defined as an HS6 country combination. For example, HS6 854220 (hybrid integrated circuits) is a product that is distinct from HS6 854280 (electronic integrated circuits/microassemblies, not specified elsewhere), while a hybrid integrated circuit imported from Japan is treated as a distinct variety from a German hybrid integrated circuit.

The raw trade data reveal a large expansion in both products and varieties following India’s trade reform. While India imported 3,249 products and 23,571 varieties in 1987, these numbers grew to 4,443 and 55,819, respectively, by 2000. Not only did India import about 35 percent more products, but products were, on average, sourced by 12.6 countries compared to 7.3 countries prior to the reform.

The observed increases in the number of imported products and variety translate into substantive gains from trade only if the extensive margin of trade accounts for a sizable share of imports. In Table 1, we analyze the role of the extensive margin by decomposing the growth in India’s imports between 1987 and 2000 (column 1) into the contribution due to the (net) extensive product margin (new HS6 codes, column 2), the extensive variety margin (new HS6 country pairs, column 5), and the intensive variety margin (existing HS6 country pairs, column 8). The rows of Table 1 report this decomposition for different subsets of products.

The first row decomposes India’s import growth over all products. Overall, imports increase 130 percentage points between 1987 and 2000. Of this growth, 65 percent (84/130) can be attributed to new HS6 products entering the economy. The remaining growth occurred within existing HS products and about half of this growth is due to growth in imports of new varieties (22/(22 + 23)). Thus, new products and new varieties within existing products account for 82 percent ((84 + 22)/130) of India’s import growth during the reform period.

Further analysis suggests that the growth in the extensive margin of trade is particularly pronounced for products that serve as inputs into the production process of Indian firms. Rows 2 and 3 of Table 1 decompose imports across two mutually exclusive groups: final products and imported inputs. Two features are striking. First, growth in imported inputs is substantially higher than for final goods, 227 percentage

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1 Each HS6 code is assigned to an end use category following the classification from Hasheem Nouroz (2001), which relies on India’s input-output matrix and distinguishes between consumer durables, consumer nondurables, intermediates, capital, and basic products. We group these categories into imported final products (consumer durables and nondurables) and imported inputs (comprising intermediate products, capital products, and basic products).
points versus 90 percentage points. Second, the margins through which each product classification grows differ. While the product intensive margin dominates growth in final goods, 67 percent (153/227) of the growth in intermediate products is driven by new HS6 products. An additional 20 percent of the growth in intermediate imports occurs through new varieties. Thus, new products and new varieties within existing products account for 86 percent ((153 + 42)/227) of India’s imports of inputs during the reform period. The corresponding number for final goods is 65 percent. These figures imply that India’s trade liberalization enabled Indian firms to import more, and new types of, production inputs.

The next three rows of Table 1 reinforce this point by further classifying imported inputs into basic, capital, and intermediate products. The contribution of the product extensive margin for basic, capital, and intermediate import growth is 59, 30, and 93 percent, respectively. Adding the variety-extensive margin indicates that new products and varieties accounted for 83, 59, and 103 percent of each product’s import growth. Thus, the growth of all subcategories of imported inputs is driven predominantly by products and varieties unavailable prior to the trade reform.

While columns 2, 5, and 8 of Table 1 delineate the importance of the extensive margin, these columns are silent on the country-origin of these new products and varieties. Recent research...
in international trade provides compelling evidence that export quality differs across countries, with the finding that richer and more capital-abundant countries export higher quality varieties (see Schott 2004; Khandelwal 2008). We address the origin of imports by decomposing new products and varieties according to OECD countries and the rest of the world. The product extensive margin in column 2 is decomposed into these two mutually exclusive country groupings in columns 3 and 4. Overall, 70 percent (59/84) of the growth in product extensive margin occurred in products exported by OECD countries. New products imported from advanced countries account for 75 percent of the growth in product extensive margin. Looking at the finer classifications of inputs in rows 4–6, OECD countries were responsible for over 70 of the product extensive margin in the basic, capital, and intermediate products.

Columns 6 and 7 provide an analogous decomposition of the variety extensive margin. Overall, OECD countries account for 41 percent of new varieties within existing HS6 products during the reform period. This is a remarkable number given that OECD countries were already likely exporting these products to other countries in 1987; this is suggestive that India’s trade liberalization enabled firms to cover the fixed costs of exporting to India. For basic and capital products, new OECD varieties accounted for more than half of the variety extensive margin. Only in the case of intermediates do we observe some evidence that new varieties are taking away the market share of existing varieties.

Table 1 therefore offers compelling evidence that not only did India experience a surge in new types of inputs to be used in the manufacturing process from abroad following the trade liberalization, but these new inputs were sourced from more advanced countries. We also find that within HS6 products, new OECD varieties were 2.7 percent more expensive than existing OECD varieties, and new non-OECD varieties were 5.5 percent more expensive than existing non-OECD varieties. While acknowledging the caveat of interpreting unit values as quality (Khandelwal 2008), these price differences reflect differentiation in products and are consistent with new imported varieties plausibly possessing higher quality than existing varieties.

The results discussed so far are obtained from fairly coarse product classifications. The bottom panel of Table 1 focuses on specific HS two-digit sectors to obtain a better understanding of specific imported inputs that India began importing following the trade liberalization. We focus on two-digit HS codes related to the imports of fuels (HS 27), chemicals (HS 28 and 29), precious stones and metals (HS 71), iron and steel (HS 72), and machinery (HS 84 and 85). These sectors account for two-thirds of India’s imports in 2000 and include many products classified as imported inputs. The analysis of these more detailed categories paints the picture consistent with the findings from more aggregate groups of imported inputs. Although the importance of the (net) extensive product and variety margin differs across sectors, new products and varieties account anywhere from 40 (organic chemicals) to 214 (iron and steel) percent of the import growth in the sector.

II. Case in Point: Machinery

The results up to now do not condition on the substitutability of the imports. As discussed extensively in Feenstra (1994) and Broda and Weinstein (2006), the importance of new varieties is diminished if the varieties have a high elasticity of substitution. We use the methodology developed by Feenstra (1994) and Broda and Weinstein (2006) to compute a variety index that accounts for the both the share of expenditure

\[3 \text{ We define the OECD countries as Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Hong Kong, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Poland, Slovak Republic, Singapore, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom, and United States.}\]
tilted towards new varieties and the elasticity of substitution. This variety index is defined as

$$\Lambda = \left( \frac{\sum_{\Omega} v_i / \sum_{\Omega' \cap \Omega} v'_i}{\sum_{\Omega} v_i / \sum_{\Omega' \cap \Omega} v_i} \right)^{1/(1-\sigma)},$$

where $v_i$ denotes imports from a country-product pair in 1989, $\Omega$ is the set of country-product pairs imported in 1989, and the corresponding values with primes refer to 1997 data. In assessing the gains from variety, this index accounts for both the increase in expenditure on new varieties in 1997 and for the elasticity of substitution across varieties. So, an increase in imports will not deliver substantial gains to the price index if the imported varieties are highly substitutable.

We compute the index for each HS4 category. We obtain estimates for the elasticity of substitution from Broda et al. (2006), who estimate India’s elasticities of substitution at the three-digit HS level.

Note: This table reports the variety index developed by Feenstra (1994) for selected HS4 codes within sector HS 84 between 1989 and 1997. The top panel reports the five largest HS4 codes in 1997. Summary statistics computed over the 85 possible HS4 codes within HS 84 are reported in the bottom panel. Estimates for the elasticity of substitution are from Broda, Greenfield, and Weinstein (2006), who estimate India’s elasticities of substitution at the HS3 level.
low variety index. For instance, the index for machine tools for forging metal (HS 8462) was 0.702 over this period. This implies that new varieties deflated the conventional import price index, which only considers changes in prices of existing varieties, by an additional 30 percent. This is indicative of the substantial benefit for firms using forging machinery in their production process. Furthermore, Table 2 shows that while there was heterogeneity in the importance of new varieties across machinery types, the average variety index over these machinery codes was 0.861. Thus, this detailed picture of the types of new inputs that Indian firms began to use provides evidence for dismantling trade barriers potentially can deliver both static and dynamic gains from trade.

III. Concluding Remarks

This article provides evidence that trade reform might have benefited Indian firms not only by providing access to more and cheaper inputs, but also, crucially, through importing of new input goods and varieties as trade barriers fell. In future work we plan to more directly link increased access to a broader range of imported inputs to dynamic gains from trade. While our work focuses on a particular developing country, India, Estevadeordal and Taylor (2008) offer cross-country evidence that declines in tariffs on capital and intermediate goods can raise GDP growth in countries that implement trade reforms. This suggests that the microeconomic mechanisms uncovered from detailed analyses of firms in specific developing countries may be generalizable.

More generally, the availability of detailed firm and trade flow data enables researchers to explore the exact mechanisms through which international trade affects the performance of domestic firms, and ultimately productivity growth. Examining the microfoundation of the link between international trade and growth will thus likely continue to be a promising area of research.

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