Multi-product Firms and Product Turnover in the Developing World:

Evidence from India*

Penny Goldberg	Amit Khandelwal	Nina Pavcnik	Petia Topalova
Princeton University	Columbia	Dartmouth College	Asia & Pacific
BREAD, NBER	Business School	BREAD, CEPR, NBER	Department
			IMF

May 2008

Abstract

Recent theoretical work predicts that an important margin of adjustment to deregulation or trade reforms is the reallocation of output *within* firms through changes in their product mix. Empirical work has accordingly shifted its focus towards multi-product firms and their product mix decisions. Existing studies have however focused exclusively on the U.S. Using detailed firm-level data from India, we provide the first evidence on the patterns of multi-product firm production in a large developing country during a period (1989-2003) that spans large-scale trade and other market reforms. We find that in the cross-section, multi-product firms in India look remarkably similar to their U.S. counterparts, confirming the predictions of recent theoretical models. The time-series patterns however exhibit important differences. In contrast to evidence from the U.S., product churning – particularly product rationalization – is far less common in India. We thus find little evidence of "creative destruction". We also find no link between declines in tariffs on final goods induced by Indian's 1991 trade reform and product dropping. The lack of product dropping is consistent with the role of industrial regulation in India, which, like in many other developing countries, may prevent an efficient allocation of resources.

Keywords: Multi-product Firms, Product Churning, Developing Countries, India, Creative Destruction, Trade Liberalization

* We thank Matthew Flagge, Andrew Kaminski and Michael Sloan Rossiter for excellent research assistance and Andy Bernard, Pete Schott, and Steve Redding for comments and discussions. We also thank seminar participants at the UCLA Business School, Notre Dame, World Bank, Columbia, and the IZA/World Bank Employment and Development Conference.

Correspondence to Goldberg at pennykg@princeton.edu, Khandelwal at ak2796@columbia.edu, Pavcnik at nina.pavcnik@dartmouth.edu, or Topalova at PTopalova@imf.org.

1. Introduction

Micro-level empirical studies have uncovered substantial heterogeneity in firm performance within narrowly defined industries in developed and developing countries. Subsequent empirical and theoretical literature has emphasized gains in aggregate output that arise when policy reforms or changes in market fundamentals induce reallocation of resources from low to high performance firms within industries (see, for example, Baily et al. (1992), Dunne et al. (1989a, 1989b), Roberts and Tybout (1996), Hopenhayn (1992) among others). International trade plays an important role in this process (Melitz (2003), Bernard, Eaton, Jensen, and Kortum (2003), Melitz and Ottaviano (2008), Pavcnik (2002), Bernard, Jensen, and Schott (2006), Tybout (2003)). However, this literature typically treats each firm as producing a single product and abstracts from the reallocation of output within multi-product firms through changes in product mix in response to changes in the economic environment.

A notable exception to this pattern is recent work by Bernard, Redding and Schott (BRS henceforth), Nocke and Yeaple (2006), Eckel and Neary (2006), and Baldwin and Gu (2006). The focus on multi-product firms' product mix decisions is relevant to the extent the changes in the product mix account for a significant portion of changes in firms' output over time. BRS (2006a, 2006b) indeed document that the contribution of firms' product margin towards output growth trumps the contribution of firm entry and exit, a widely studied channel in the literature on firm dynamics. Product churning, on net, accounts for a third of the increase in U.S. output between 1972 and 1997 (BRS, 2006a). Thus, the evidence suggests that product mix changes represent a potentially important channel through which resources move from less to more efficient uses *within* U.S. firms.

While this work has uncovered thought-provoking new facts, it has focused exclusively on the U.S. Little is known about the behavior of multi-product firms and the importance of product turnover in developing countries.[1] The main goal of this paper is to fill this gap in the literature by providing evidence on the characteristics and product mix decisions of multi-product firms in a developing country, India. The extension of firms' product mix literature to a developing country setting is relevant for several reasons.

First, it is well known that countries at different stages of development exhibit notable differences in the size distribution of firms as well as differences in the efficiency of resource allocation across heterogeneous firms (see for example Tybout (2000), Hsieh and Klenow (2007),

[1]Roberts and Lee (2008) are an exception. They study multiproduct firms in Taiwanese electronics sector.

Bartelsman, Haltiwanger and Scarpetta (2006), Restuccia and Rogerson (2007), Alfaro et. al. (2007)). These differences stem in part from differences in the regulatory environments in which firms in the U.S. and firms in developing countries operate (Tybout 2000). Firms in developing countries often face constraints that are irrelevant to U.S. firms. In India, for example, private sector activity has in the past been heavily regulated through the "license raj", a system of complex industrial license requirements for establishing and expanding capacity in the manufacturing sector, while the Industrial Disputes Act (1947) provided significant protection for labor in the organized sector (Kochhar et al, 2006). Given these constraints, it is questionable whether Indian firms had the necessary flexibility to adjust their product mix in order to achieve a more efficient allocation of resources.

Second, many developing countries experienced a series of sweeping market reforms in recent years that altered the economic environment in which firms had operated in the past. In India, such reforms include the trade liberalization of the early 1990's and a stepped-up dismantling of the "license raj". These reforms provide an interesting setting for the purpose of investigating how firms adjust product mix in a changing economic environment. Our data is particularly well suited to examine whether Indian firms change their extensive product margin in response to India's large-scale tariff liberalization during the 1990s. Declines in trade costs on final goods are an important motivation for product mix adjustments in the abovementioned theoretical models of multi-product firms. The nature of India's trade reform makes it an attractive setting for the study of changes in product scope, in part because the reform was likely not anticipated by firms. Furthermore, tariff changes in the 1991-1997 period can plausibly be considered economically exogenous, in the sense that they were not the result of the usual political economy process for reasons we discuss later in this paper.

To this end, we exploit information on Indian manufacturing firms from the Prowess database, a firm-level panel database collected by the Center for the Monitoring Indian Economy (CMIE), which records data for medium and large firms in India. The Prowess data set is not a manufacturing census, and therefore it is not suitable for studying firm entry and exit, given that it includes only larger firms, for which entry and exit are not important margins of adjustment.[2] However, it contains detailed information on the products that each firm produces from 1989 to 2003, and thus provides a rare opportunity to study firms' product mix changes in a period that spans

[2] See Hopenhayn (1992), Melitz (2003), and empirical evidence in Dunne et al. (1989a, 1989b) and Roberts and Tybout (1996).

major market reforms in India. Throughout the paper, when we use the term "extensive margin", we refer to the addition or discontinuation of product lines within existing firms rather than entry and exit of firms.

We begin by documenting the characteristics of Indian multi-product firms in a cross section. Interestingly, Indian multi-product firms appear quite similar to their counterparts in U.S. manufacturing along several dimensions. Overall, multi-product firms are strong performers: within narrowly defined industries, India's multi-product firms are larger, more productive, and more likely to export than single-product firms. In sum, they exhibit the same characteristics as the U.S. multi-product firms examined in BRS (2006a). Furthermore, we find a striking resemblance of the within firm product distribution to the U.S. data. Finally, we document a positive correlation between the firms' extensive and intensive margins. These findings are consistent with recent theoretical models of multi-product firms, especially BRS (2006b).

Perhaps more surprisingly, our analysis also suggests that despite the regulatory constraints described above, changes in firms' product mix had a non-negligible contribution to growth; *on net*, they account for approximately 25% of the increase in Indian manufacturing output during our sample period. This validates the focus on firms' product margin in recent empirical work. However, a closer examination of the *gross* changes in the product mix of Indian firms reveals important differences to U.S. firms in the time-series. BRS (2008) uncover a substantial amount of product churning within U.S. firms: about 50 percent of U.S. firms adjust their product mix over 5-year intervals. In contrast to the U.S., only 30 percent of Indian firms show a change in their product-mix over a 5-year period. Moreover, firms in India infrequently drop a product or simultaneously add and drop a product. The contribution of the net product margin to total output growth is driven almost exclusively by product additions, and not by discontinuation of product lines that have become obsolete. We provide compelling evidence that this pattern is a true feature of the adjustment process of Indian firms, and not due to data reporting problems. Hence, our results suggest that product churning, or "creative destruction" along the product dimension, is not happening in India in the 1990's, despite the fact that firms are faced with major trade and other structural reforms during this period. Furthermore, we are unable to connect the changes in firms' product mix to changes in trade policy. The empirical framework that exploits differential changes in tariffs across Indian industries finds no relationship between declines in output tariffs and a firms' extensive margin—the number of products it manufactures.

The lack of product dropping observed in the data is interesting both from a theoretical and an empirical perspective. Recent theoretical models in international trade that focus on the relationship between trade costs and product mix predict that firms adjust to a decline in trade costs through product dropping. For example, BRS (2006b) extend the Melitz (2003) heterogeneous firm framework to model, in addition to the self-selection of more productive firms into production, the selection of products within firms. The model predicts a positive correlation between a firm's intensive (output per product) and extensive margin (number of products), a correlation we do observe in the Indian data. When the model is extended to the open economy, firms respond to symmetric trade liberalization in part by changing the number of products they manufacture. Lower variable trade costs induce firms to rationalize their extensive margin by shedding products with higher marginal costs of production. One might argue that these findings are specific to the case of symmetric liberalization, which may be a poor description of the Indian trade reforms in the early 1990's. However, a multi-product firm extension of Melitz and Ottaviano (2008), a model where product competition intensifies in response to foreign entry and is therefore arguably better suited to studying the consequences of unilateral trade reforms that affect primarily the import competing sectors, also predicts that declines in trade costs are associated with the discontinuation of product lines (Baldwin and Gu (2006)). More generally, theories emphasizing the role of "creative destruction" in the growth process predict that product dropping plays an important role in firms' adjustment to a changing economic environment.

In light of these theoretical arguments, the limited dynamics of product churning in India seem surprising. A plausible explanation for our findings is that the regulatory constraints characterizing the Indian economy prevent firms from fully adjusting to structural changes. This interpretation is consistent with the explanations put forth for the lack of product dropping in case-studies on product scope of Indian conglomerates by Khanna and Palepu (1999).[3] The models we just reviewed assume that firms are able to efficiently allocate resources within the firm and that factor markets are frictionless. These assumptions are at odds with the conditions firms face in India. Despite the extensive industrial deregulation in the early 1990's, remnants of industrial licensing and rigid labor market regulations continue to affect the daily operations of Indian firms, potentially

[3] Interviews with managers pointed to large costs of reducing the scope of operations of these firms. The commonly mentioned costs "include lack of liquid markets for assets, regulatory restrictions on cost cutting through reduction of employees, lack of professionals with experience in takeovers, buyouts and restructuring, and prohibitive taxes on gains on asset sales." (Khanna and Palepu (1999), p. 226)

precluding them from eliminating unprofitable product lines. For example, an all India amendment to Industrial Disputes Act (1947) in 1982 required firms with more than 100 to seek government approval to dismiss workers (Kochhar et al, 2006). In fact, earlier work has documented that the rigidities imposed by India's industrial and labor policy on manufacturing resulted in lower output and productivity in the affected industries.[4] Some of our results also suggest that declines in tariffs are associated with somewhat bigger changes in firms' product scope in industries no longer subject to licenses at the onset of the 1991 reform compared to regulated industries. Given the high sunk costs facing firms that wanted to expand their operations in the past, it is not surprising that firms that did pay these high sunk costs are reluctant to withdraw established product lines even when these are unprofitable, as markets become more liberalized.

Alternatively, the low degree of product shedding might be due to the fact that India is a fast growing developing country, characterized by huge wealth disparities in its population. In such an economy, it is possible that there is always demand for older products, which would have become obsolete in more developed countries like the U.S. Accordingly, we do not interpret our results as evidence against recent theories.

The remainder of the paper is organized as follows. Section 2 describes our data. Section 3 focuses on the characteristics of multi-product firms in India in the cross-section and interprets the main patterns in the data in light of recent theoretical models. Section 4 examines product mix changes over time and discusses the contribution of such changes to output growth. Section 5 examines whether the observed changes in product mix in India can in part be attributed to declines in tariffs on final goods subsequent to India's trade reform. Section 6 concludes.

2. Data

We compile a firm-level panel data set that spans the period from 1989 to 2003 based on the Prowess database, collected by the Centre for Monitoring the Indian Economy (CMIE).[5] The Prowess database contains information primarily from the income statements and balance sheets of

[4]Studies estimate lower output and productivity in industries with more restrictive trade policy (Krishna and Mitra (1998), Topalova (2007), Sivadasan (2006)); lower output in industries when firms' entry and expansion were subject to regulation under the License Raj and pro-worker labor laws (Aghion et al. (2005), Aghion et al. (forthcoming)); and lower output in registered manufacturing in states after they have implemented pro-worker amendments to labor market legislations (Besley and Burgess (2002), Ahsan and Pages (2008)).

[5] The Prowess database has now been used in several studies including Bertrand et al. (2002), Khanna and Palepu (1999), Fisman and Khanna (2004), Topalova (2007), Dinc and Gupta (2007), and Chari and Gupta (2007).

about 9,500 publicly listed companies, almost 5,000 of which are in the manufacturing sector. The companies in the database together comprise 60 to 70 percent of the economic activity in the organized industrial sector and account for 75 percent of corporate taxes and 95 percent of excise duty collected by the Government of India (CMIE).

The Prowess database is the only Indian database, to our knowledge, that records detailed annual information on firms' product-mix.[6] Indian firms are required by the 1956 Companies Act to disclose product-level information on capacities, production and sales in their annual reports. The Prowess database compiles these detailed quantitative data and therefore enables us to track a firm's adding and dropping of products over time. Furthermore, for each product manufactured by the firm, the dataset provides the value of sales, quantity and units, allowing us to construct a time series of unit values at the firm-product level. Unlike the Annual Survey of Industries (ASI), India's manufacturing census of plants, the Prowess data is a panel of firms, rather than a repeated cross section. The Prowess is therefore particularly well suited for understanding how firms adjust their product lines over time and how their responses may be related to policy changes.[7]

As described in the Data Appendix, CMIE uses an internal product classification that is based on the Harmonized System and National Industry Classification (NIC) schedules. There are a total of 1,886 *products* linked to 108 four-digit NIC *industries* across the 22 manufacturing *sectors* (two-digit NIC codes). As a comparison, the U.S. manufacturing data used by BRS (2006a), contain approximately 1,500 products, defined as five-digit Standard Industrial Classification (SIC) codes, across 455 four-digit SIC industries. Thus, our definition of a product is slightly more detailed than BRS (2006a).

Examples of products within the Basic Metals sector (NIC 27) of this hierarchical mapping are listed in Table 1. The table reports two industries within the sector: Manufacture of Basic Iron & Steel, which contains over 100 products, and Casting of Iron and Steel, which contains 7 products. As with all classifications, the degree of detail varies across industries and sectors. As documented in

[6] Product-level information is available for the 1997/98, 2000/01 and 2001/02 rounds of the Annual Survey of Industries (ASI), but there is no information in years close to the economic reforms implemented in the early 1990s. Furthermore, plant identifiers are unavailable.

[7] The CMIE database is not well suited for understanding firm entry and exit because firms are under no legal obligation to report to the data collecting agency. However, since Prowess contains only the largest Indian firms, entry and exit is not necessarily an important margin for understanding these firms.

Table A1, the number of products ranges from a low of 6 products in the Tobacco industry (NIC 16) to 506 products in the Chemicals industry (NIC 24).

The product classification provides a concordance to the more familiar NIC industry codes used to classify economic activity in India. Each of the 1,886 product codes can therefore be mapped to a five-, four-, three-, two-, or one-digit NIC code. The concordance allows us to assess the relative degree of product disaggregation. Approximately 88 percent of the products map to the most detailed five-digit NIC and 10 percent of the products concord to four-digit NICs. Products mapping to four- or five-digit NIC codes account for 99 percent of total output. With the exception of Printing and Publishing (NIC 22), products within all sectors overwhelmingly map to four- or five-digit NIC codes.[8] This gives us confidence that the variation in product detail is a fundamental feature of sectors rather than a problem with data. Moreover, given that our industrial policy measures are specified at the four-digit NIC, the majority of our product information is specified *at least* at this level of aggregation.

Several features of the product data give us additional confidence in its quality despite the self-reported and non-standardized nature of the dataset. First, as mentioned above, firms are required to report not just the names of the products, but also product-level details about installed capacity, production, sales quantity and value. Table 2 reports that product-level data are available for 85 percent of the firms; this accounts for more than 90 percent of output and exports of the manufacturing firms in Prowess. More importantly, the product-level information and overall output are in separate modules of the Prowess database which enables us to cross check the consistency of the data. The final two rows of Table 2 report that the total product-level sales account for 92 percent of the (independently) reported overall and 99 percent of the reported manufacturing output of the firm.[9] This implies that product-level sales account for virtually all of the firm's total output. Since our study predominantly analyzes firms' product mix, our final database includes the 4,216 manufacturing firms that report product-level information. The data span the period from 1989 to 2003.

[8] These figures are available upon request.

[9] There is some variation in the availability of product level information across sectors. However, with the exception of two of the smaller sectors (Publishing/Printing (NIC 22) and Office, accounting and computing machinery (NIC 30)), product details reporting is very high across sectors. Table A1 shows that in 14 of the 22 sectors, total product-level sales as a share of firm output exceed 85 percent.

We complement the data on firm product mix with various measures on trade policy at the industry level. Data on disaggregated tariffs for 1987-2001 have been compiled in Topalova (2007). Tariffs are reported at the six digit level of the Indian Trade Classification Harmonized System (HS) Code, which are then aggregated to the 116 NIC codes, using the concordance by Debroy and Santhanam (1993) to calculate average industry-level tariffs. We also combine industry-level output tariffs with the Input Output Transaction Table from 1993-1994 to calculate industry input tariffs (see below). To capture changes in the domestic industrial policy over this time period, we use Aghion et al. (forthcoming) measures of industrial delicensing.

3. A Portrait of Multi-Product Firms

In this section, we document the economic significance and characteristics of multi-product firms in India. We organize our empirical investigation and discussion around the predictions of recent multi-product firm and trade models (BRS (2006b), Nocke and Yeaple (2006)). While we are particularly interested in the implications of these theories for the way firms adjust to structural changes in an open economy, these models also yield several predictions about the characteristics of multi-product firms and firms' extensive product margin in a cross section. One of our goals in this section is to examine whether the cross-sectional patterns observed in the Indian data are consistent with these predictions.

We begin by examining the relative importance of single- and multi-product (MP) firms in India. Given the scant empirical evidence on multi-product firms, particularly for developing countries, the facts uncovered by BRS (2006a) for U.S. firms serve as a useful benchmark for the Indian firms. We emphasize however, that comparisons between the two studies should be interpreted with caution given that the U.S. and India are two countries incredibly distinct along several dimensions of their respective economic environments. Table 3 reports the share of each type of firm in the total number of firms, as well as their share in total manufacturing output in the Prowess sample. The table illustrates that multi-product firms account for 47% of manufacturing firms and 80% of manufacturing output.[10] By comparison, 39 percent of U.S. firms manufacture more than one product and these firms account for 87 percent of total output.

[10] The ASI rounds in 1997/98, 1999/2000 and 2001/02 record product-level information for manufacturing plants. Again, these data are not suitable for our analysis of the response to changes in economic policy because the sample

The third column of Table 3 shows that multiple-product firms manufacture on average 3 products, compared to 3.5 products for U.S. multi-product firms.[11] 33 and 24 percent of firms manufacture products that span more than one industry and sector, respectively. These multiple-industry and multiple-sector firms account for 62 percent and 54 percent of output, respectively.[12] Again for comparison's sake, 28 and 10 percent of U.S. firms span multiple industries and sectors, and account for 81 and 66 percent of firms, respectively. Thus, Indian firms appear more diverse on average, but smaller in scale than the U.S. firms. These facts are consistent with observations by Kochhar et al. (2006) that India's economic policies have lead to more diversification and firms of smaller capacity. An alternative explanation, proposed by Khanna and Palepu (1999), is that diversification may be a response to the lack of well-functioning markets (e.g., capital, labor and product markets). As a result, the absence of market intermediaries may force firms to become more diversified to overcome these imperfections.

Multi-product firms do not only dominate manufacturing output, they also differ in observable characteristics from single-product firms. We next examine these characteristics in light of the predictions of theoretical work on multi-product firms.

i. Multi-product firms are stronger performers than single-product firms

A common feature of multi-product firm models is that the presence of headquarter fixed costs implies that the more "able" firms will self-select into becoming multi-product firms. Accordingly, all models predict that multi-product firms will at the equilibrium have higher total sales and will be more likely to export. Table 4a examines these predictions. In the first two rows of the table, column 1, we report results from regressions, in which the log of firm output and the probability that a firm exports were respectively regressed on a multi-product firm dummy, controlling for industry and year fixed effects.[13] The coefficients on the multi-product dummy

---

is not a panel of firms and similar information is not available prior to the reforms. However, in that sample, multiple-product plants are 51 percent of total plants and account for 78 percent of manufacturing output. These figures are remarkably similar to the Prowess sample.

[11]The unconditional mean is 1.97 products per firm.

[12] Appendix table A1 reports the descriptive statistics on the multi-product firms by two digit NIC sectors. While there is variation across sectors in the prevalence of multi-product firms and average number of products, multi-product firms account for over 50% of industry output in 17 out of 22 sectors.

[13]Output is deflated with industry-specific wholesale price indices.

reported in column 1 indicate that multi-product firms have on average 125 percent ($e^{.81}$-1) higher output, and are 13 percent more likely to export than single-product firms. These figures are quite similar to the average percent differences between U.S. single- and multiple-product firms. The comparisons between single- and multiple-industry and single- and multiple-sector firms are similar, as shown in columns 2 and 3.

A somewhat different approach of testing the selection hypothesis is provided in Table 4b where we compare: (a) the performance of single-product firms that eventually became multi-product firms to the performance of single-product firms that stayed single-product, *before* the former firms added any products; and (b) the performance of multi-product firms that added products to the performance of multi-product firms that did not add, again in a year that precedes any product adding by the former group. Specifically, we regress firms' log sales and log export sales in 1990, against a dummy that takes the value of 1, if the firm added a product between 1991 and 1997; as with all our specifications, we control for industry fixed effects. Our results in Table 4b provide strong evidence that firms that eventually expanded their product scope were stronger performers even before the product expansion took place, thus further supporting the selection argument.

While existing models yield similar predictions in terms of the ex-ante "quality" of firms that become multi-product firms, their predictions regarding the ex-post performance of such firms differ. In BRS (2006b), multi-product firms end up having higher overall productivity than single-product firms. This result is driven by the assumption that each product's productivity is the sum of a firm-level ability component, and a product-specific expertise. Though product-specific expertise is assumed to be uncorrelated across products, the presence of the first component induces positive correlation in the productivities of the products offered by each firm, so that "more able" firms will be more productive in all products. In contrast, in Nocke and Yeaple (2006), it is assumed that marginal costs for each product are increasing in the number of products produced by the firm. This implies that at the equilibrium, multi-product firms will have lower productivity for their infra-marginal products, and lower overall productivity than single-product firms, even though such firms were ex-ante better. In row 3 of Table 4a, we examine the correlation between total factor

productivity (TFP)[14] and multi-product firm status. The point estimate on the multi-product firm dummy indicates that multi-product firms are on average 1 percent more productive, though the estimate is not statistically significant). We should note however that when we examined this correlation using the ASI data, which also include smaller firms, we obtained statistically significant results. Furthermore, the ASI data also contain information on the number of workers employed, so that we could construct measures of labor productivity.[15] Again, the results indicated that multi-product firms are more productive. Overall, the evidence suggests that multi-product firms are stronger performers, not only in terms of total sales and exports, but also in terms of total factor and labor productivity.

ii. Skewness of product sales distribution within a firm

Existing models also differ in their predictions regarding the skewness of the distribution of product sales across products within a firm. In Nocke and Yeaple, it is assumed that firms do not differ in their product-specific expertise; this assumption leads to the prediction that output should be evenly distributed across products within each firm. In contrast, BRS assume that firms possess "core competencies", so that output should be highly skewed towards products for which firms have particular expertise. In Table 5, we document the distribution of products within Indian firms by reporting the average share of a product in total sales of a multi-product firm. The table shows that output is highly unevenly distributed across products. Each row denotes the within-firm ranking of a product, in decreasing order, by the product's contribution to a firm's sales. Each column refers to firms producing the number of products noted on top of the column. We focus on firms that produce 10 or less products.[16] Output is highly skewed towards the main product. The share of the largest product declines from 86% to 65% to 46 % of the sales in firms as one moves from firms that produce at most 2, 5, and 10 products, respectively. The distributions are slightly more concentrated towards the main output than for U.S. firms. For example, for the average three-product U.S. firm, the largest product accounts for 70 percent of output, followed by 21 percent and 7 percent. So while the fraction of multiple-product firms in India is slightly higher, within the firm, output is more

[14] See Topalova (2007) for details of the productivity estimation for the Prowess data.
[15] Figures available upon request.

[16] Firms that produce at most 2, 5, and 10 products account for almost 32, 78, and 94 percent of manufacturing sales, respectively.

concentrated. However, the differences to U.S. firms are not large. Overall, the highly skewed distribution of output within the firm supports the BRS (2006b) framework.

iii. Correlation between intensive and extensive product margins of the firm

There is a large literature in economics focusing on the size distribution of firms. The natural question arises what share of the differences in the distribution of output across firms can be attributed to the extensive versus the intensive margin. Table 6 reports the results of regressing the log number of products on the log firm total sales. The first two columns report results for all firms and multi-product firms respectively, in a single cross-section year (2000). In both columns, the coefficient on the log number of products is positive and statistically significant. Columns 3 and 4 pool the data across years and include year and industry fixed effects. This analysis suggests that approximately 8.5 to 11.5 percent of the variation in output across firms can be attributed to the variation in the extensive margin.

Are bigger firms bigger because they produce more output per product or because they produce more products? One important prediction of the theoretical model developed by BRS (2006b) is that a firm's extensive (number of products) and intensive margins (output per product) are positively correlated. We document that this relationship holds in the Indian data by regressing the log average sales per product on the log number of products manufactured by the firm. The results, both for a single cross-section year, and for all years, are reported in Table 7. Column 2 reports a positive correlation (0.43) between multi-product firms' extensive and intensive margins in 2000. This correlation is slightly lower in column 4, which uses all years, but still suggests a strong positive relationship between the two firm margins. Hence, the results from tables 7 and 8 illustrate that the larger Indian firms produce on average more products and firms that produce more products have on average larger sales per product.

In general, differences in the design of firm level surveys and product classifications make it hard to compare results related to firm and product characteristics across countries. With this caveat in mind, we cannot help but note that in the cross-section, Indian firms appear remarkably similar to U.S. firms in terms of the prevalence and characteristics of multiple-product firms, the distribution of products within the firm, and the correlations between the intensive and extensive product margins. These similarities are surprising given the vast differences between the two countries, especially

those related to their regulatory environments. Furthermore, the cross-sectional patterns of multi-product Indian firms are – like the ones documented for U.S. firms - consistent with the main predictions of recent multi-product firm models.

4. Changes in Product Mix over Time

In this section we examine the importance of changes in firms' product margin over time. Systematic evidence on the importance of changes in multi-product firms' product mix is only available for the U.S., where BRS (2006a) document a large degree of product churning within manufacturing firms. The reforms undertaken by India in the early 1990s make the study of product mix changes in India particularly interesting. We start by examining which firms adjust their product mix in India during the period that spans its structural reforms, and whether these changes in product mix are an important component in firms' output adjustment.

Figure 1 illustrates that the average number of products produced by a typical Indian firm in our data increased between 1989 and 2003. The vertical axis plots the coefficients on year dummies that were obtained by regressing the number of products a firm manufactures on firm and year fixed effects. There is a steady increase in the number of products manufactured by the average firm from about 1.4 products per year in 1989 to almost 2.3 products by 2003. The figure therefore suggests that, on average, the extensive margin among Indian firms grew post 1991.

We now examine in greater detail the nature of product mix changes that led to the observed expansion of the extensive margin. We classify firm activity into one of four mutually exclusive groups: no activity, add products only, drop products only, and both add and drop products. A product is added in period *t* if it is produced in period *t* but not in period *t-1*. A product is dropped in period *t,* if it was produced in period *t-1* but it is not produced in period *t*. We compute these figures only for surviving firms, so that the analysis focuses on product mix changes at incumbents. We report the summary of overall, five-year, three-year and annual firm activity in Table 8. The top panel reports the share of firms participating in each activity. The bottom panel weighs participation in each activity by firm output.

In contrast to the cross-sectional descriptive results, this table shows large differences in the activities of Indian and U.S. firms. First, Indian firms are characterized by less product churning compared to the U.S. firms BRS (2006a) examined. Over a five-year period, only 28 percent of firms

report changes in their product mix, with most of these being larger firms. The firms that switch products over a five-year interval account for 43 percent of the total output.[17] Second, Indian firms that change their product mix are far more likely to add products over time than to shed product lines: 22 percent of the firms report adding at least one product, 4 percent of firms drop a product, and 2 percent of firms simultaneously add and drop a product. This is in contrast to the U.S. where 54 percent of firms report a change in their product mix. However, a common feature of the Indian and U.S. data is that changes in product mix are more common among multi-product than single product firms.

The lack of product dropping in the data raises the concern that it may reflect reporting problems. However, there are several reasons suggesting that the lack of product shedding is not due to data problems. If there were inertia in reporting product lines, this would likely affect both the reporting of product adding and product dropping; however, we do find evidence of product adding. More importantly, firms were required to report not only the product name, but also the quantity produced and value of sales. If firms continued to list products that they no longer produced, we would observe a large share of observations with zero production. Yet, only 13 percent of the original product name-firm-year observations report zero production (we count these products as dropped). Furthermore, as shown in Table 2, the product sales account for 92 and 99 percent of total output and manufacturing output reported by the firm on their annual statements. Finally, we note that apart from the product dropping patterns, the Indian data appear similar to the U.S. data along many dimensions, as we discussed earlier. In the analysis that follows below we also show that the shrinking of products sales is limited as well, suggesting that the lack of reallocation from "shrinking" to "growing" products is real.

Despite the lower product churning in India, the resulting changes in firm-level characteristics are similar to those reported for the U.S. As in BRS (2006a), we observe (results available from the authors upon request) that product additions (deletions) are positively (negatively) associated with firm output and raw materials usage. We also find that conditional on firm size, products with bigger sales are less likely to be dropped; however, unlike the U.S. data, product tenure and age do not appear to play a role.

Changes in product mix provide a non-negligible contribution to changes in output of continuing firms, despite the relatively lower product switching in India relative to the U.S. We

[17] The middle and right part of the table repeats the analysis for single and multi-product firms separately. As in the U.S., multi-product firms in India are more likely to churn products than single product firms.

decompose the aggregate change in output of continuing firms into changes in output due to changes in product mix (i.e., the extensive margin) and changes in output due to existing products (i.e., the intensive margin) in Table 9.[18] Let Y_{ijt} denote the output of product *i* produced by firm *j* at time *t*, *C* the set of products that a firm produces in both periods *t* and *t-1* (i.e., the intensive margin), and *E* the set of products that the firms produces only in *t* or *t-1* (i.e., the extensive margin). Then changes in a firm's total output between periods *t* and *t-1* can be decomposed as follows:

$$\Delta Y_{jt} = \sum_{i \in E} \Delta Y_{ijt} + \sum_{i \in C} \Delta Y_{ijt} ,$$

We decompose output changes due to the extensive margin further into changes in output due to product additions (A) and product droppings (D):

$$\sum_{i \in E} \Delta Y_{ijt} = \sum_{i \in A} \Delta Y_{ijt} + \sum_{i \in D} \Delta Y_{ijt} .$$

Continuing products can be further decomposed into the contributions from growing (G) and shrinking products (S):

$$\sum_{j \in C} \Delta Y_{ijt} = \sum_{j \in G} \Delta Y_{ijt} + \sum_{j \in S} \Delta Y_{ijt} .$$

We can substitute these equations and re-write the aggregate change in output among continuing firms in the Prowess database as

$$\Delta Y_t = \sum_j \left[\sum_{i \in A} \Delta Y_{ijt} + \sum_{i \in D} \Delta Y_{ijt} + \sum_{i \in G} \Delta Y_{ijt} + \sum_{i \in S} \Delta Y_{ijt} \right]$$

The first two terms capture the growth due to changes in the firms' extensive product margin and the final two terms capture changes in the intensive margin.

Table 9 reports the decomposition. As in the U.S., the firm's intensive margin accounts for the majority (75 percent) of output growth over longer time horizons in India. Interestingly, despite the lower product churning observed in India, the extensive margin accounts for a considerable portion of output changes over longer time periods: 25% between 1989 and 2003. However, the importance of the extensive margin fluctuates considerably over shorter horizons.

[18]We report the results of this decomposition by focusing only on the set of continuing firms, as Prowess is not well suited for studying firm entry and exit.

The relative contributions of the extensive and intensive product margins over longer time horizons appear similar to those documented for the U.S. However, a further decomposition of extensive margin into contributions due to product adding and dropping, and a decomposition of the intensive margin into contributions due to growing and shrinking products reveal important differences between the Indian and U.S. firms. While product shedding is an important channel through which firms adjust their output in the U.S., its contribution to changes in output in India is negligible (with the exception of 1992). The changes in output stemming from the extensive margin are almost entirely driven by output growth due to product additions. Consequently, gross changes in output stemming from the extensive margin are of similar order of magnitude as net changes. This is in large contrast to the U.S., where both product additions and product subtractions significantly contribute to output changes, so that the U.S. exhibits gross rates of output change that are an order of magnitude larger than the net changes.

Similar patterns emerge when we decompose the net changes in the intensive margin into changes in output due to growing and shrinking products. The growth in the intensive margin in India is predominately driven by growth in "growing products", with little reallocation of output away from "shrinking products". This again translates into net and gross output changes of similar orders of magnitude. In contrast to India, the U.S. firms experience significantly more reallocation of output from shrinking to growing products within a firm, so that the gross output changes are an order of magnitude bigger than the net changes.

Overall, the patterns we documented suggest that despite many similarities between the U.S. and Indian multi-product firms in the cross section, their dynamic behavior, as measured by the degree of product churning in the time series appears quite distinct. The observed differences speak to how much more dynamic the U.S. economy is. Despite the significant reforms taking place in India during the 1990's, we find little evidence of "creative destruction".

While our data do not allow us to pin down the reasons behind the lower degree of product churning in India, we believe that this pattern could be driven by three factors. First, it is plausible that remnants of industrial regulation still affect the operation of Indian firms, constraining their flexibility to adjust to new economic conditions. While we do not have direct evidence on this hypothesis, we note that earlier work has consistently found that regulation was associated with a less

efficient allocation of resources, i.e., lower output and productivity in manufacturing industries subject to more restrictive trade policy (Krishna and Mitra (1998), Topalova (2007), Sivadasan (2006); lower output in industries when firms' entry and expansion was heavily regulated by industrial licensing requirements and pro-worker labor legislation (Aghion et al. (2005), Aghion et al. (forthcoming)); lower output in registered manufacturing in states after they implemented pro-worker amendments to labor market legislations (Besley and Burgess (2004), Ahsan and Pages (2008)). While this evidence does not cover product turnover, it strongly suggests that the sunk costs of firm entry and new product introduction were high; therefore, it is not surprising that firms that did pay these high sunk costs are reluctant to withdraw products, even as markets become more liberalized.

A second potential explanation for the low degree for product churning in the Indian data is that the presence of regulation made firms particularly careful and precise in their product reporting. A usual concern in studies using data from countries that have little regulation (such as the U.S.) is that the high degree of product turnover may reflect classification or reporting errors by the reporting firms. Such errors are less likely to be present in the Indian data, given that historically, firms had to ask for permission to add product lines and provide detailed documentation on capacity, sales and quantities for each product. Still, we note that we do observe product additions in our data; it is the lack of product shedding that is puzzling. This may be hard to reconcile with an explanation that focuses on lower classification error alone.

Finally, the low degree of product shedding could be due to the fact that India is a fast growing developing country, characterized by huge wealth disparities in its population. In such an economy, it is possible that there is always demand for older products, which would have become obsolete in more developed countries like the U.S. This explanation is also consistent with the fact that when we examine the intensive margin, we find little evidence of "shrinking", but strong evidence of "growing".[19]

As noted above, we are not able to distinguish between these hypotheses given the data available to us. However, a different approach towards explaining product turnover in India (or the lack thereof) is suggested by India's recent trade reforms. India underwent a significant trade

[19] We thank Dr. Janak Raj from the Reserve Bank of India for suggesting this explanation for our findings.

liberalization in the early 1990's, which provides us with fairly precisely measured changes in trade barriers. In the next section we relate these changes in trade policy to changes in firms' product mix to examine if the patterns we observe in the Indian data can at least partly be explained by changes in the economic environment.

5. Product Mix and Trade Policy

Many theoretical and empirical trade papers emphasize the adjustments to trade reform that occur within industries.[20] Several recent papers (BRS (2006b), Eckel and Neary (2006), Nocke and Yeaple (2006), Baldwin and Gu (2006)) focus on the product margin as a channel through which firms adjust to external shocks.

These models generally predict that lower trade costs lead firms to reduce their extensive product margin by dropping products. For example, in BRS (2006b), a symmetric bilateral decline in trade costs induces firms to rationalize their extensive margin by shedding relatively unproductive products. This is because such a decline is associated with an increase in the domestic productivity cut-off (since the increase in exports leads to an increase in domestic labor demand, which in turn leads to higher wages). The least productive domestic firms exit and all firms reduce product scope. Exporters produce a smaller range of products, but they increase the share of products sold abroad and exports per product. This leads to productivity growth within and across firms and in the aggregate. These results are specific to the case of bilateral trade liberalization. But a multi-product firm extension of Melitz and Ottaviano (2008), a model where product competition intensifies in response to foreign entry and that is perhaps better suited to study the consequences of unilateral trade reforms, also predicts that declines in trade costs are associated with product rationalization (Baldwin and Gu (2006)).

To our knowledge, this link between declines in trade costs and firms' extensive margin has not been previously examined empirically in the context of developing countries, which have experienced substantial declines in their trade barriers in the last two decades. The large tariff declines resulting from India's 1991 trade liberalization provide a nice setting for investigating the adjustment of Indian firms' extensive margin for several reasons. First, India's reforms came as a surprise, so it is reasonable to assume that they were not anticipated by firms prior to the reform. Second, tariff cuts were large (average tariffs where reduced from over 90% in 1987 to about 30% in 1997) and brought a substantial decline in the dispersion of tariffs across industries. Industries with larger pre-reform tariffs experienced larger tariff declines, a pattern unlikely to be observed if

[20]See Melitz (2003), Bernard et. al. (2003), Melitz and Ottaviano (2008), Pavcnik (2002), Trefler (2004), Bernard, Jensen, and Schott (2006), and Tybout (2003) for a survey.

traditional political economy concerns played an important role in India's trade liberalization of 1991. In fact, there is no evidence that industry tariff changes, which were mostly spelled out in the Eighth Five Year Plan (1992-1997) were correlated with pre-reform industry characteristics such as productivity, industry size, etc (Topalova, 2007). However, at the time the government announced the export-import policy in the Ninth Plan (1997-2002), sweeping reforms outlined in the previous Plan had been undertaken and pressure for further reforms from external sources had abated. Since variation in tariffs in this latter period may reflect various political economy factors, we restrict the analysis of the impact of the trade liberalization on the firms' extensive margin from 1989-1997.[21]

To this end, we regressed the (log) number of products manufactured by firm *j* in time *t*, n_{it}, on the tariff rate of the firm's main industry (*m*), lagged one year, $\tau_{m,t-1}$[22]

$$\log n_{jt} = \alpha_j + \alpha_t + \beta \tau_{m,t-1} + \varepsilon_{jt}. \quad (1)$$

The regression includes firm fixed effects to control for time-invariant firm characteristics, and year fixed effects to capture unobserved aggregate shocks. Standard errors are clustered at the industry level.

Column 1 of Table 10 reports the results using output tariffs as the trade policy measure. The coefficient is negative but statistically insignificant. This suggests that declines in tariffs are uncorrelated with changes in the number of products at the firm-level. In column 2, we use industry import penetration as an alternative measure of industry exposure to foreign competition. This measure is clearly endogenous; still we experimented with it, as we are interested in documenting the simple correlation between imports and firms' extensive margin. As is the case with output tariffs, we find that import penetration is uncorrelated with firms' extensive margin.[23] In column 3, we estimate equation (1) with contemporaneous (rather than lagged) measure of tariffs, and obtain similar findings to those in column 1.

[21] Restricting the analysis to the 1989 -1997 period yields 2,872 unique firms.

[22] Tariffs are matched to the firm's 4-digit NIC industry code provided by Prowess. This industry code reflects each firm's main line of business.

[23] Import penetration is defined as the value of imports divided by net domestic output (computed from Prowess) plus imports. Schott (2004), Bernard, Jensen, and Schott (2006), and Khandelwal (2007) emphasize the importance of distinguishing import competition from low-income versus high-income countries. In unreported specifications, we have replicated the regressions in column 2 by distinguishing between imports from low and high income countries; still, we found no relationship between declines in output tariffs and changes in the number of products a firm produces.

Given that some sectors were still subject to non-tariff barriers (NTBs) during this period, the lack of relationship between changes in product mix and output tariffs could be due to the fact that these sectors remained protected despite the decline in tariffs. By 2001, however, over 90% of the HS6 lines were not subject to NTBs. We therefore estimated regression (1) using data on only one pre- (1990) and one post-reform year (2001), by which the majority of NTBs were dismantled. The results of this regression are shown in column 4; the coefficient on the output tariff continues to be small in magnitude and insignificant.

If lower output tariffs induce firms to simultaneously add and drop products in response to tariffs, this would leave the firm's extensive margin unchanged. While none of the existing models generate product switching in response to trade reforms, Bernard, Schott, and Jensen (2006) find that U.S. firms that are exposed to a greater degree of low-wage competition are more likely to switch an industry. Recall from Table 8 that simultaneous adding and dropping of product lines is quite rare for Indian firms. Nevertheless, in columns 6 and 7 of Table 10, we replace the dependent variable in equation (1) with an indicator (add_{it}) if firm *i* adds a product in year *t*, and a separate indicator ($drop_{it}$) if firm *i* drops a product in time *t* that it manufactured at *t-1*, respectively. The coefficients on the output tariffs remain small and statistically insignificant in both cases.

As discussed in the introduction, in addition to trade barriers, extensive licensing requirements and strict labor regulations were important parts of the economic climate in India during this period. These additional distortions may have constrained Indian firms in their product lines. In addition to liberalizing trade, the 1991 reforms stepped up the process of dismantling the pervasive industrial regulation in India. The share of delicensed industries increased from almost 40 to 91 percent from 1990 and 1997, with most of the delicensing occurring in 1991. The delicensed industries corresponded to 57 and 92 percent of manufacturing output in 1990 and 1991, respectively (Aghion et al., forthcoming). The removal of licenses would have lowered product-specific entry costs and may have enabled firms to increase their extensive margins. On the other hand, it may have allowed firms to become more flexible to shocks by shutting down or restarting a product line in the absence of license requirements. Column 5 reports the regression of the extensive margin on output tariff, and a dummy variable that takes a value of one if the industry was license free. The inclusion of delicensed variable does not affect the coefficient on output tariffs. Interestingly, the coefficient

on delicensed is statistically insignificant.[24] The take-away message of Table 10 is that the number of products manufactured by the firm does not appear correlated with output tariffs.

The lack of a relationship between declines in trade costs and firms' extensive margin is somewhat surprising in light of the predictions of theoretical models. As we noted earlier, the Indian trade liberalization of the early 1990's is best characterized as a unilateral trade reform, so that there is no tension between our results and the predictions of models that focus on symmetric bilateral trade reductions (e.g., BRS). However, the tension does exist, when one considers models that encompass the case of unilateral trade reform. At this point it is important to note that the previous literature on the effects of the Indian trade reforms does find firm adjustments to the 1991 trade barrier reductions. In particular, both Sivadasan (2006) and Topalova (2007) show that lower output tariffs induce firm productivity gains in India. Yet, our results suggest that lower tariffs are not associated with product rationalization within surviving firms in India.[25]

A potential explanation for our findings is that remnants of the strict industrial regulation of the past may be inhibiting firms from shedding existing product lines, even when these become less profitable; the lack of shedding could in this sense be interpreted as indirect evidence that Indian firms faced high sunk costs when introducing a new product. In order to examine this more directly we distinguish between industries that were delicensed in the 1980s and those that continued to be regulated after 1988. One would expect tariff declines to have a larger effect on product scope in industries that were no longer regulated by licenses at the onset of trade reform. We interact an indicator for whether an industry was delicensed by 1988 with the output tariff and include this interaction as an additional regressor in equation (1). Column 1 of Table 11 presents the results. The tariff coefficient suggests no association between firms' product scope and tariff declines in firms whose main line of business was subject to licenses at the onset of trade reform. However, the

[24]The coefficient on the delicensed dummy is similar in the unconditional regressions. Note that Aghion et al (forthcoming) use the ASI data at the industry level from 1980 to 1997 to show that de-licensing only affected manufacturing output in states that pass more flexible labor market legislation, but our results (not reported) find no heterogeneous impact of delicensing on the firm's extensive margin across labor markets. A reason for the difference in findings could be the fact that many Prowess firms have plants in states with different labor markets which may wash away any heterogeneity. In addition, Besley and Burgess (2002) and Aghion et. al. (forthcoming) rely on state amendments to labor regulation for identification. There were no state amendments to labor market regulation after 1989 during the period of our sample (Aghion et. el. (forthcoming), Ahsan and Pages (2008)).

[25] Firms could be dropping products by exiting the market but again, our data is not well suited to examine this channel. Moreover, given the size of these firms, firm entry and exit is unlikely to be an important margin of adjustment.

negative and significant coefficient on the interaction suggests that lower tariffs are associated with more product additions in industries that were delicensed by 1988. These results are robust to the inclusion of a variable capturing contemporaneous delicensing in column 2 and the inclusion of input tariffs in column 3. Overall, these results provide some tentative evidence that regulation might play some role in explaining the limited product churning in Indian firms.

Still, a striking feature of our data is that they indicate that firms expand their product scope during a period of substantial reforms; changes in the extensive margin are driven by product addition, not product destruction. Existing models focus on product scope *reduction* as a channel through which firms adjust to external shocks. Against this background, it may not come as a surprise that we cannot relate the product additions we observe to changes in trade policy, as suggested in these models.

6. Conclusion

In this paper we provided a portrait of multi-product firms in a large developing country that underwent significant reforms recently: India. We documented how in the cross-section, multi-product firms in India look remarkably similar to U.S. firms, despite many differences in the regulatory environments in which these firms operate. We also found that changes in firms' product mix had a non-negligible contribution to growth; *on net*, they account for approximately 25% of the increase in Indian manufacturing output during our sample period. However, the examination of the time-series patterns in the data revealed important differences between Indian and U.S. firms. Product churning is substantially lower among Indian firms. Moreover, these less frequent changes in the product mix of multi-product firms in India are almost entirely driven by product additions and not shedding of existing product lines.

Our analysis leaves us with two puzzling observations. First, despite the fact that India underwent a series of important structural reforms in the 1990's, we do not see any evidence of "creative destruction". Second, the changes in the product mix we document in our data -- which, as noted earlier, are entirely driven by product additions – seem unrelated to the major changes in trade barriers on final goods that India experienced in the 1990's. In some sense, the two puzzles are consistent with each other. Recent trade models focusing on multi-product firms predict that the adjustment of firms' extensive margin to trade reform should occur through the shedding of

unprofitable product lines, not through the addition of new products. In the data, we do not find evidence of shedding, and – perhaps not surprisingly – we are then unable to connect the changes in firms' product mix through product additions to changes in trade policy. In future work, we plan to investigate additional channels through which changes in the economic environment, trade policy in particular, affect the product decisions of multi-product firms.

Data Appendix

Product classification

The reporting of products by Indian firms is not governed by any particular product classification. Although CMIE has developed a classification of 5,800 codes based on the NIC and the HS schedule, the agency has not explicitly linked the product names reported by the firms to this classification. The names of products reported by the firm could differ in aggregation, or even in spelling (e.g., "Steel Rod" versus "Steel Rods"). We therefore standardized the approximately 8,500 product names to the 5,800 possible CMIE product codes. This mapping process was extremely time consuming and involved subjective calls. To minimize the scope for error and subjectivity in assigning the codes, the mapping was performed independently by two research assistants. The research assistants assigned product codes with identical NIC codes in 80% of the cases which represents 91% of output. A third research assistant resolved the differences between the mappings done by the first two research assistants by again manually checking the classifications.

Our final sample includes 1,886 product codes out of the universe of 5,800 product codes. The seemingly low coverage of products in the Prowess is not a source of concern. First, the distribution of unused codes is remarkably similar across sectors. Secondly, 25% of the unused codes are products in the agriculture and services sectors, which, of course, are not produced by manufacturing firms. The remaining unmatched codes appear to be a result of excess detail in the product codes. For many of these sectors, the number of potential CMIE products exceeds, by a large margin, the number of five-digit SIC products in BRS (2006a). The correlation between an industry's share in total unused codes and the number of possible codes in an industry is .99. Moreover, the chemicals sector alone account for 40% of the unused manufacturing product codes. Thus, if anything, the low coverage stems from the overly detailed CMIE product classification in certain sectors.

In all the analysis above, we refer to a *product* as the CMIE product code and not the reported product name.

Output tariffs. Data on disaggregated tariffs for 1987-2001 have been compiled in Topalova (2007). Tariffs are reported at the six digit level of the Indian Trade Classification Harmonized System (HS) Code, which are then aggregated to the 116 NIC codes, using the concordance by Debroy and Santhanam (1993), to calculate average industry-level tariffs.

Input tariffs. We rely on the Indian national input-output (IO) table for 1993-94 and output tariffs in the construction of the industry input tariffs. For each industry, we create an input tariff for that industry as the weighted average of tariffs on inputs used in production for industry. The weights are constructed as input industry's share of the output industry's total output value. Formally, input tariffs are defined as $InputTariff_{mt} = \sum_{s} \alpha_{sm} Tariff_{smt}$, where α_{sm} is the share of input s in the value of industry m. For example, if a final good uses two intermediates with tariffs of 10 and 20 percent and value shares of .25 and .75, respectively, the input tariff for this good is 17.5 percent.

Delicensed. Delicensed is an indicator equal to one if the industry is not subject to licensing requirements in that particular year and zero otherwise. The information is obtained from Aghion et al. (forthcoming).

References

Ahsan, A. and C. Pages (2008). "Are all labor regulations equal? Evidence from Indian Manufacturing," *IZA DP no. 3394*.

Aghion, P., R. Burgess, S. Redding and F. Zilibotti (2005). "Entry Liberalization and Inequality in Industrial Performance." *Journal of the European Economic Association*, 3(2-3), pp. 291-302.

Aghion, P., R. Burgess, S. Redding and F. Zilibotti (forthcoming). "The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India" *American Economic Review,* 2007, forthcoming.

Alfaro, L., A. Charlton, F. Kanczuk (2007). "Firm-Size Distribution and Cross-Country Income Differences, Harvard Business School Working Paper 07-086.

Baily, M., C. Hulten, and D. Campbell (1992). "Productivity Dynamics in Manufacturing Establishments," *Brookings Papers on Economic Activity*, (Microeconomics), pp. 198-249.

Baldwin, J. and W. Gu (2006). "The Impact of Trade on Plant Scale, Production-Run Length and Diversification", Economic Analysis Research Paper Series, #038, Statistics Canada.

Bartelsman, E. J. Haltiwanger, and S. Scarpetta (2006). "Cross Country Differences in Productivity: The Role of Allocative Efficiency," mimeo.

Bernard, A. and J. Eaton, J.B. Jensen, and S. Kortum (2003). "Plants and Productivity in International Trade," *American Economic Review* 93, pp. 1268-1290.

Bernard. A., J. Jensen, and P. Schott (2006). 'Trade Costs, Firms and Productivity', *Journal of Monetary Economics*, 53(5), July, pp. 917-937.

Bernard, A., S. Redding, and P. Schott (2006a). "Multi-product Firms and Product Switching," *NBER Working Paper* No. 12293.

Bernard, A., S. Redding, and P. Schott (2006b). "Multi-product Firms and Trade Liberalization," *NBER Working Paper* No. 12782.

Bernard, A., S. Redding, and P. Schott (2008). "Multi-product Firms and Product Switching," *mimeo*.

Bernard, A., B. Jensen, and P. Schott (2006). "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants." *Journal of International Economics*, 68(1), pp. 219-227.

Bertrand, M, P. Mehta and S. Mullainathan (2002). "Ferreting Out Tunneling: An Application to Indian Business groups," *Quarterly Journal of Economics*, pp. 121-148.

Besley, Timothy and Robin Burgess (2004). "Can Labor Regulation Hinder Economic Performance? Evidence from India." *Quarterly Journal of Economics*, 119(1), pp. 91-134.

Chari, A. and N. Gupta (2007). "Incumbents and Protectionism: The Political Economy of Foreign Entry Liberalization," Forthcoming *Journal of Financial Economics*.

Debroy B. and A. T. Santhanam (1993). "Matching Trade Codes with Industrial Codes." *Foreign Trade Bulletin*, 24(1).

Dinc, I. S. and N. Gupta (2007). "The Decision to Privatize: Finance, Politics and Patronage," mimeo, MIT.

Dunne, T., M. J. Roberts, and L. Samuelson (1989a). "The Growth and Failure of U.S. Manufacturing Plants," *Quarterly Journal of Economics* 104(4), pp. 671–698.

Dunne, T. , M. J. Roberts, and L. Samuelson. (1989b). "Plant Turnover and Gross Employment Flows in the U.S. Manufacturing Sector" *Journal of Labor Economics*, 7(1), pp. 48-71

Eckel, C and Neary, P (2006). "Multi-product Firms and Flexible Manufacturing in the Global Economy," University College Dublin, mimeograph.

Fisman, R. and T. Khanna (2004). "Facilitating Development: The Role of Business Groups," *World Development*, 32(4).

Hopenhayn, H. (1992). "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica*, 60, pp. 1127-1150.

Hsieh, C. and P. Klenow (2007). "Misallocation and Manufacturing TFP in China and India," UC Berkeley mimeo.

Khandelwal, A. (2007) "The Long and Short (of) Quality Ladders," mimeo, Columbia University.

Khanna, T. and K. Palepu (1999). "Policy Shocks, Market Intermediaries and Corporate Strategy: the Evolution of Business Groups in Chile and India." *Journal of Economics & Management Strategy*, 8(2), pp. 271-310.

Kochhar, K. U. Kumar, R. Rajan, A. Subramanian, I. Tokatlidis (2006). "India's Pattern of Development: What Happened, What Follows," *Journal of Monetary Economics* 53(2006), pp. 981-1019.

Krishna, Pravin and Devashish Mitra (1998). "Trade Liberalization, Market Discipline and Productivity Growth: New Evidence from India." *Journal of Development Economics*, 56(2), pp. 447-462.

Melitz, Mark J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*, 71, pp. 1695-1725.

Melitz, M.J. and G. Ottaviano (2008). "Market Size, Trade, and Productivity" *Review of Economic Studies* 75 (1), pp. 291-316.

Nocke, V and Yeaple, S (2006). 'Globalization and Endogenous Firm Scope', NBER Working Paper, 12322.

Nouroz, H. (2001). *Protection in Indian Manufacturing: An Empirical Study*, MacMillan India Ltd.,Delhi.

Pavcnik, Nina (2002). "Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants" *Review of Economic Studies*, 69, pp. 245-276.

Roberts, Bee Yan and Yi Lee (2008). "Multiproduct Plants in Taiwanese Electronics Sector," Penn State Mimeo.

Roberts, Mark and James Tybout (1996). *Industrial Evolution in Developing Countries*. Oxford University Press, 1996.

Restuccia, D. and R. Rogerson (2007). "Policy Distortions and Aggregate Productivity with Heterogeneous Plants," NBER Working Paper 13018.

Schott, P. (2004). Across-product versus within-product specialization in international trade. *Quarterly Journal of Economics,* 119, pp. 647-678.

Sivadasan, Jagadeesh (2006). "Productivity Consequences of Product Market Liberalization: Microevidence from Indian Manufacturing Sector Reforms." October 2006.

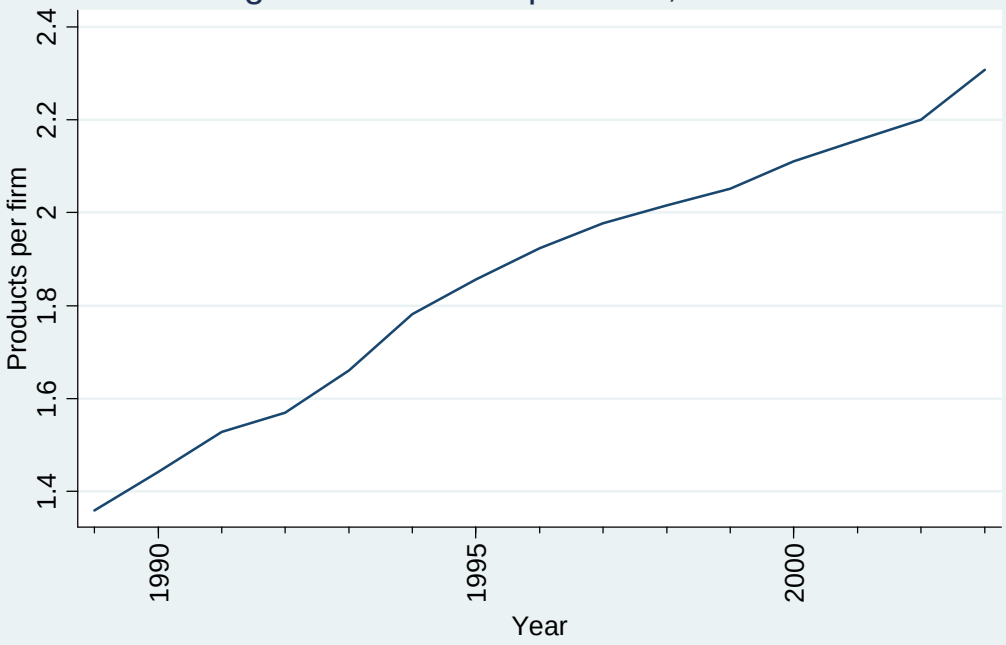
Topalova, P. (2007). "Trade Liberalization and Firm Productivity: The Case of India." *IMF Working Paper, WP/04/28*.

Trefler, Daniel (2004). "The Long and Short of the Canada-U.S. Free Trade Agreement." *American Economic Review*, 94(3), pp. 870-895.

Tybout, J. (2000). "Manufacturing Firms in Developing Countries: How Well do They do and Why?" Journal of Economic Literature, Vol. XXXVIII (March 2000), pp. 11-44.

Tybout, J. (2003). "Plant and Firm Level Evidence on the "New" Trade Theories," in E. K. Choi and J. Harrigan, ed., *Handbook of International Trade*, Blackwell: Malden, MA, 388-415.

Figure 1: Products per Firm, 1989-2003



Year coefficients of regression of product/firm on year and firm fixed effects

Table 1: Examples of Industries, Sectors and Products

NIC		Description
27		Basic Metal Industries (Sector)
2710		Manufacture of Basic Iron & Steel (Industry)
	130101010000	Pig iron
	130101020000	Sponge iron
	130101030000	Ferro alloys
	130106040800	Welded steel tubular poles
	130106040900	Steel tubular structural poles
	130106050000	Tube & pipe fittings
	130106100000	Wires & ropes of iron & steel
	130106100300	Stranded wire
2731		Casting of iron and steel (Industry)
	130106030000	Castings & forgings
	130106030100	Castings
	130106030101	Steel castings
	130106030102	Cast iron castings
	130106030103	Maleable iron castings
	130106030104	S.G. iron castings
	130106030199	Castings, nec

Products

Notes: For NIC 2710, there are a total of 111 products, but only a subset are listed in the table. For NIC 2731, all products are listed in the table. Source: Prowess database and authors' matching of product names to product codes (see text).

Table 2: Summary Statistics of Product-Reporting Firms

Description	Statistic
Years	1989-2003
Firms	4,971
Product-Reporting Firms	4,216
Share of output of reporting firms	0.92
Share of exports of reporting firms	0.91
Median product share of total output	0.92
Median product share of total manufacturing output	0.99

Notes: Table summarizes aggregate statistics of product reporting manufacturing firms. Row 4 and 5 report the share of total manufacturing output and exports in Prowess by product-reporting firms, respectively. Rows 6 and 7 report the median share of product-reporting firms' total output and total manufacturing output, respectively, accounted by the listed products. Source: Authors' calculations from the Prowess database.

Table 3: Prevalence of Single- and Multiple-Product Firms

Type of Firm	Share of Firms	Share of Output	Mean Products, Industries or Sectors per Firm
Single-Product	0.53	0.20	1
Multiple-Product	0.47	0.80	3.06
Multiple-Industry	0.33	0.62	2.01
Multiple-Sector	0.24	0.54	1.68

Notes: Table classifies firms by single product, multiple product, multiple industry (four-digit NIC) and multiple-sector (two-digit NIC). Note that the unconditional products per firm is 1.97 over the sample period from 1989-2003. Source: Authors' calculations from Prowess database.

Table 4a: Characteristics of Multi-Product Firms

	Multiple Product	Multiple Industry	Multiple Sector
Output	0.81	0.73	0.73
Probability of Export	0.13	0.12	0.14
TFP	0.01^	0.00^	0.00^

Notes: Table summarizes the differences in 2000 between single-product and multiple-product firms. Each cell reports a separate regression of the dependent variable (reported in column 1) on a dummy that takes a value of one if the firm produces more than one product (column 2), industry (column 2) and sector (column 3), respectively. Regressions also include industry fixed effects and standard errors are clustered at the industry level. All coefficients are statistically significant at conventional levels with the exception of coefficients denoted with a ^. Probability of export is a linear probability regression. There are 2,889 observations in each regression. Source: Authors' calculations from the Prowess database.

Table 4b: Characteristics of Firms that Add Products from 1990 and 1997

	Log Total Sales in 1990			Log Export Sales in 1990		
	All Firms	Single-product firms	Multiple-product firms	All Firms	Single-product firms	Multiple-product firms
Add Product between 1991 and 1997	0.532 ***	0.272 *	0.595 ***	0.222 **	-0.044	0.329 *
	0.130	0.150	0.182	0.113	0.159	0.175
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry
R-squared	0.31	0.36	0.41	0.22	0.34	0.27
Observations	874	449	425	874	449	425

Notes: Columns 1-3 report regressions of total (log) sales in 1990 on an indicator if a firm adds at least one product between 1991 and 1997. Columns 4-6 report regressions of total (log) export sales in 1990 on an indicator if a firm adds at least one product between 1991 and 1997. All regressions include initial industry fixed effects. Standard errors clustered at the industry level. Significance: * 10 percent, ** 5 percent, *** 1 percent. Source: Authors' calculations from the Prowess database.

Table 5: Distribution of Products Within the Firm

Average Share of Product in Firm Sales (High to Low)	Number of Products Produced by the Firm									
	1	2	3	4	5	6	7	8	9	10+
1	100	86	75	70	65	63	62	64	53	46
2		14	20	21	21	21	19	16	22	20
3			4	7	9	9	9	9	12	13
4				2	4	4	6	5	7	7
5					2	2	3	3	3	4
6						1	1	2	2	3
7							0	1	1	2
8								0	1	2
9									0	1
10+										2

Notes: Columns indicate the number of products produced by the firm (truncated at 10 products). Rows indicate the share of the product, in decreasing order of size. Each cell is the (simple) average across the relevant firm-products in the sample (1989-2003).

Table 6: Intensive and Extensive Decomposition

	Number of Products (2000)	Number of Products (MP firms, 2000)	Number of Products (all years)	Number of Products (MP firms, all years)
Log Firm Sales	0.107	0.086	0.114	0.089
	0.006	0.006	0.005	0.006
Fixed Effects	Industry	Industry	Industry, Year	Industry, Year
R-squared	0.21	0.22	0.23	0.21
Observations	3,091	1,479	32,553	15,419

Notes: Table summarizes OLS regression of a log number of products on log total firm sales. Columns 1-2 are run on 2000 data, only, while columns 3-4 pool across all years. Columns 2 and 4 are run on multiple-product firms only. All regressions are significant at the 1 percent level. Columsn 3-4 cluster at the firm level. Source: Authors' calculations from Prowess database.

Table 7: Correlation between Intensive and Extensive Product Margins

	Log Avg Sales/Product (2000)	Log Avg Sales/Product (MP firms, 2000)	Log Avg Sales/Product	Log Avg Sales/Product (MP firms)
Log Number of Products	0.036	0.434 ***	0.091 **	0.356 ***
	0.054	0.103	0.043	0.075
Fixed Effects	Industry	Industry	Industry, Year	Industry, Year
R-squared	0.13	0.20	0.13	0.20
Observations	3,091	1,479	32,553	15,419

Notes: Table summarizes OLS regression of a log number of products on log total firm sales. Columns 1-2 are run on 2000 data, only, while columns 3-4 pool across all years. Columns 2 and 4 are run on multiple-product firms only. All regressions are significant at the 1 percent level. Columsn 3-4 cluster at the firm level. Source: Authors' calculations from Prowess database.

Table 8: Firm Activity

Percent of Firms

	All Firms				Single-Product Firms				Multiple-Product Firms			
Period	No Activity	Add only	Drop only	Add and Drop	No Activity	Add only	Drop only	Add and Drop	No Activity	Add only	Drop only	Add and Drop
Overall	42	45	5	8	53	42	na	5	29	48	11	11
Five-Year Average	72	22	4	2	80	19	na	1	63	26	8	3
Three-Year Average	80	15	3	1	87	13	na	1	73	17	7	2
Annual Average	90	7	2	0	94	6	na	0	86	9	5	1

Output-Weighted Percent of Firms

	All Firms				Single-Product Firms				Multiple-Product Firms			
Period	No Activity	Add only	Drop only	Add and Drop	No Activity	Add only	Drop only	Add and Drop	No Activity	Add only	Drop only	Add and Drop
Overall	22	72	1	5	46	52	na	2	17	76	1	5
Five-Year Average	57	28	2	12	76	24	na	0	53	29	3	15
Three-Year Average	69	23	2	6	84	16	na	0	65	25	3	7
Annual Average	83	13	3	1	93	7	na	0	81	14	4	1

Notes: Table classifies continuing firms into four mutually exclusive groups: no activity, add only, drop only and both. A product addition is defined as a firm adding a product in period t that it did not produce in the previous period. A drop in defined as a firm dropping a product in period t that it produced in the previous time period. These definitions imply that a single-product firm cannot drop a product only. Source: Authors' calculations from the Prowess database.

Table 9: Decomposition of Output for Continuing firms

		Extensive Margin			Intensive Margin		
Year	Gross Sales	Net	Product Entry	Product Exit	Net	Growing Products	Shrinking Products
1989							
1990	7.8	0.7	1.4	-0.8	7.1	10.5	-3.3
1991	10.6	1.0	1.3	-0.3	9.6	12.8	-3.2
1992	-0.7	0.3	1.6	-1.3	-1.0	7.8	-8.9
1993	0.9	0.8	1.4	-0.6	0.2	7.3	-7.1
1994	13.9	3.6	3.8	-0.1	10.3	14.8	-4.5
1995	13.9	3.1	3.4	-0.3	10.8	15.4	-4.6
1996	18.1	0.7	0.8	-0.1	17.4	21.1	-3.7
1997	8.3	1.5	1.7	-0.2	6.8	12.6	-5.8
1998	7.2	0.4	0.6	-0.3	6.8	12.7	-5.9
1999	10.9	0.6	0.9	-0.3	10.3	15.4	-5.1
2000	13.5	0.2	0.5	-0.3	13.3	18.0	-4.7
2001	11.4	1.0	1.1	-0.1	10.4	15.8	-5.3
2002	3.1	4.5	4.7	-0.2	-1.4	6.7	-8.1
2003	13.6	1.3	1.4	-0.2	12.3	16.7	-4.4
1989-1993	15.0	3.2	4.2	-1.0	11.7	20.2	-8.4
1994-1998	52.7	10.5	11.1	-0.6	42.3	49.4	-7.1
1999-2003	42.5	10.0	10.7	-0.6	32.5	41.3	-8.9
1989-2003	197.7	49.8	52.5	-2.7	147.9	156.6	-8.7

Notes: Table decomposes aggregate sales growth into contribution of the extensive and intensive product margin within Prowess from 1989-2003. The table reports the aggregate output growth of continuing firms. Column 2 reports gross sales growth. Columns 3-5 report the contribution contribution of growth from the firms' extensive margin. Columns 6-8 report the contribution of growth from the firms' intensive margin. Source: Authors' calculations from the Prowess database.

Table 10: Firm Extensive Margin and Tariffs

	Products	Products	Products	Products (1990, 2001)	Products	Add	Drop
Lagged Tariffs	-0.033			0.032	-0.046	-0.016	0.006
	0.038			0.122	0.037	0.023	0.017
Lagged Import Penetration		0.054					
		0.045					
Tariffs			-0.043				
			0.039				
Lagged Delicensed					-0.032		
					0.025		
Year FEs	yes	yes	yes	yes	yes	yes	yes
Firm FEs	yes	yes	yes	yes	yes	yes	yes
R-squared	0.90	0.92	0.9	0.94	0.90	0.27	0.25
Observations	14,864	11,646	14,864	4,115	13,435	11,615	11,615

Notes: Table summarizes firm-level regressions where the dependent variable is (log) number of products in columns 1-5, and add and drop dummies in columns 6-7, respectively. The independent variable for each regression is reported in the column rows. Column 1 uses lagged tariffs. Column 2 uses import penetration and column 3 uses contemporaneous tariffs. Column 4 uses a pre- (1990) and post (2001) year. For 2001, the 1997 tariff is assigned. This regression is designed to estimate the impact of non-tariff barriers which were still in place in 1997, but dismantled in 80% of HS codes by 2001 (see text). Columns 6-7 report add and drop dummies, where drop is defined as the firm manufacturing the product in *t-1* but not in period *t*. With the exception of column 4, regressions are run on data from 1989-1997. For each specification, trade policy variables are matched to the firm's industry of its main product line in the first year that the firm appears in the sample. Standard errors clustered at the industry level except column 4 which clusters at the industry-year level. Significance: * 10 percent, ** 5 percent, *** 1 percent.

Table 11: Firm Extensive Margin, Tariffs and Licenses

	Products	Products	Products
Lagged Tariff	0.024	0.021	0.034
	0.046	0.045	0.041
Lagged Tariff x Delicensed by 1988	-0.081 *	-0.074 *	-0.072 *
	0.046	0.044	0.042
Lagged Delicense		-0.012	
		0.022	
Lagged Input Tariff			-0.330 **
			0.143
Year FEs	yes	yes	yes
Firm FEs	yes	yes	yes
R-squared	0.9	0.9	0.9
Observations	13,435	13,435	13,435

Notes: Table summarizes firm-level regressions where the dependent variable is (log) number of products. The independent variable for each regression is reported in the row . Column 1 interacts lagged tariffs with an indicator for if the industry was delicensed by 1988 (the main effect of the delicensed variable is not identified because of the firm fixed effect). Column 2 includes the contemporaneous (lagged one period) delicensed variable. Column 3 includes lagged input tariffs that are constructed from input-output tables (see Data Appendix). For each specification, trade policy variables are matched to the firm's industry of its main product line in the first year that the firm appears in the sample. Standard errors clustered at the industry level. Significance: * 10 percent, ** 5 percent, *** 1 percent.

Table A1: Products and Multi-product Firms by Sector

NIC Sector	Products	Industries	Products per Industry	Products per Firm	NIC4 per Firm	MP Firm Share	Multiple-Industry Firm Share	Multiple-Sector Firm Share	MP Share of Output	Multiple-Industry Share of Ouput	Multiple-Sector Share of Ouput	Products per MP Firm	Industries per MP Firm	Sectors per MP Firm
15 Food products and beverages	135	17	7.9	2.12	1.55	0.53	0.35	0.21	0.67	0.54	0.35	3.11	2.03	1.51
16 Tobacco products	6	1	6.0	2.04	1.73	0.58	0.49	0.45	0.85	0.84	0.84	2.78	2.25	2.17
17 Textiles	83	7	11.9	1.76	1.42	0.45	0.32	0.28	0.63	0.46	0.42	2.67	1.92	1.76
18 Wearing apparel	14	1	14.0	1.24	1.18	0.18	0.17	0.17	0.14	0.14	0.14	2.38	2.03	2.03
19 Tanning and dressing of leather	21	3	7.0	2.01	1.51	0.50	0.34	0.13	0.82	0.73	0.10	3.03	2.02	1.32
20 Wood and products of wood	13	2	6.5	2.20	1.77	0.61	0.45	0.37	0.73	0.39	0.38	2.94	2.21	1.82
21 Paper and paper products	32	3	10.7	1.40	1.21	0.24	0.19	0.15	0.50	0.47	0.44	2.68	1.88	1.72
22 Publishing/printing	13	3	4.3	1.61	1.29	0.36	0.64	0.29	0.22	0.84	0.19	2.71	1.48	1.88
23 Coke, refined petroleum products	24	2	12.0	2.77	1.77	0.60	0.44	0.44	0.98	0.81	0.81	3.97	2.29	2.12
24 Chemicals	506	9	56.2	2.26	1.43	0.53	0.32	0.17	0.79	0.61	0.34	3.36	1.79	1.38
25 Rubber and Plastic	85	3	28.3	1.68	1.34	0.40	0.26	0.21	0.67	0.33	0.31	2.72	1.82	1.71
26 Non-metallic mineral products	63	8	7.9	1.62	1.41	0.37	0.26	0.20	0.59	0.48	0.28	2.69	2.12	1.76
27 Basic Metal	103	3	34.3	1.85	1.34	0.46	0.26	0.20	0.85	0.44	0.40	2.84	1.71	1.54
28 Fabricated metal products	50	6	8.3	1.70	1.52	0.38	0.38	0.30	0.61	0.61	0.53	2.84	2.29	2.13
29 Machinery/equipment n.e.c.	195	14	13.9	2.20	1.81	0.55	0.48	0.32	0.78	0.74	0.62	3.20	2.46	1.87
30 Office, accounting and computing machines	19	1	19.0	1.56	1.36	0.29	0.20	0.20	0.37	0.10	0.10	2.96	2.26	2.28
31 Electrical machinery and apparatus	105	6	17.5	2.20	1.76	0.49	0.39	0.37	0.71	0.63	0.62	3.44	2.54	2.11
32 Radio, TV and communication	91	3	30.3	1.93	1.52	0.40	0.31	0.28	0.68	0.58	0.56	3.29	2.29	2.07
33 Medical, precision and optical instruments	71	5	14.2	1.63	1.38	0.30	0.22	0.18	0.48	0.45	0.42	3.10	2.25	1.95
34 Motor vehicles, trailers	96	2	48.0	2.03	1.52	0.51	0.39	0.35	0.63	0.59	0.57	3.02	1.97	1.97
35 Other transport	22	4	5.5	2.12	1.86	0.60	0.57	0.50	0.63	0.52	0.47	2.88	2.36	2.32
36 Furniture	22	5	4.4	1.53	1.29	0.24	0.09	0.09	0.34	0.07	0.07	3.21	2.20	2.01
Total	1,886*	108	17.5	1.97	1.48	0.47	0.33	0.24	0.80	0.62	0.54	3.06	2.00	1.68

Notes: Table reports summary statistics, by sector, for product-reporting firms. Column 1 our reports the total product codes by industry. Note that this column sums to 1,769 products, but there are 117 products in non-manufacturing industries (but produced by manufacturing firms) which we include in the analysis; a total of 1,886 product codes comprise the multiple-product Prowess sample. Column 2 reports the number of industries within each sector. Column 3 is the first column divided by the second column. Columns 4 and 5 report average products per firm and industries per firm, respectively. Column 6-8 report the fraction of firms that produce multiple products, industries and sectors, respectively. Columns 9-11 report the multiple-product (or industry or sector) firms' share of total output. Columns 12-14 report mean products, industries and sectors per MP firm. All figures are unweighted averages over 1989-2003. Industry refers to a 4-digit NIC code. Sector refers to a 2-digit NIC code. Source: Authors' calculations from the Prowess database.