The Effect of Chinese Competition on the Product Variety of Indian Firms[1]

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Abstract

We make the first attempt to understand when one of the two most technologically similar countries face competition from another; in specific, impact of import penetration from China on the product variety of Indian manufacturing firms. Using detailed firm-product-year data across manufacturing sectors in India, and exploiting the exogenous nature of China's entry into the WTO in 2001, we investigate the potential link. We find very robust and significant effect of 'creative destruction', but only in case of big firms; China's entry to the WTO made big Indian firms to contract their product-mix by 8.39%. The big firms drop their peripheral products and re-focus on the core ones. This observation is acute for exporters and non-exporters; as well as for both final and intermediate goods. Our results are consistent to a battery of robustness checks and IV method.

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I Introduction

Over the last three decades the economies of China and India have undergone extensive structural transformations as a result of the far reaching trade and industrial reforms undertaken by policymakers in both countries. The dominant view in the development literature is that these reforms have primarily been responsible for the very high rates of economic growth and substantial reductions in poverty levels experienced by these two large Asian economies in the post-1990 period. Indeed, the emergence of China and India as major forces in the global economy is regarded by some as one of the most significant economic developments in the past quarter century (Bosworth and Collins, 2008)[4]. China's export performance post-1990, and more so since 2001 (with entry to the WTO), has been nothing short of spectacular! Its exports grew from US$ 62 billion to US$ 1.2 trillion between 1990 and 2007; an average of around 20% per year (Iacovone et al., 2013). In real terms, exports increased by a factor of 25 between 1990 and 2005 (Hanson and Robertson, 2010), while in the same period, exports as a share of GDP more than doubled, from 15.9 to 34.9%. In terms of the sectoral composition of exports, manufacturing exports accounted for 89% of total merchandise exports between 2000 and 2005.[5] On the back of its very strong export performance, China became the world's largest exporter in 2009, and the second largest economy in 2010 (Iacovone et al., 2013).[6]

Naturally, this meteoric rise of China to the status of a global exporting giant, particularly in terms of manufactured goods, has induced many trade and development economists to examine the effects of import competition from low-wage countries, and specifically China, on various firm and industry level outcomes in both developed and developing countries. The bulk of this literature focuses on the evolution of industry level outcomes, such as labour markets, in developed economies (Bernard et al., 2006; Autor et al., 2013; Iacovone et al., 2013; Mion and Zhu, 2013; Utar and Ruiz, 2013; Bloom et al., 2016).[7] With this study, we seek to add to this

[4] The average GDP growth rates are: China 9.87% (1990 – 2000), 10.43% (2001 -2011); India 5.59% (1990-2000), 7.35% (2001-2011) (World Bank Development Indicators). Both China and India along with Brazil, Russia make up the group of countries commonly referred to by the acronym BRIC. The acronym was created by Jim O' Neill (an investment banker) of Goldman Sachs. These countries which were all deemed to be at a similar stage of newly advanced economic development were projected by O' Neill to be the fastest growing market economies. They account for almost half the world's population and until recently contributed the majority of world GDP growth (Economy Watch, 2010). It was speculated that by 2050, China and India will be the world's dominant suppliers of manufactured goods and services while Brazil and Russia will be the dominant suppliers of raw materials. The quartet of countries later became a quintet with the addition of South Africa thus necessitating a modification of the acronym from BRIC to BRICS.

[5] In 2014, manufacturing accounted for more than US$ 1.4 trillion of total exports of US$ 2.34 trillion.

[6] Like China, India also experienced a tremendous increase in exports in the post-1990 period: both as a share of GDP and as a share of world exports. For example, total exports as a share of GDP increased from almost 10% in 1995 to approximately 25% in 2013. Over the same period (1995–2013), Indian goods export as a share of world goods export almost tripled to 1.7%, while the share of services exports in world service exports also tripled to over 3% between 2000 and 2013 (Anand et al., 2015). Finally, for the period 1992–2005, manufacturing accounted for 75.3% of India's merchandise exports.

[7] The results point to heterogeneity in the effects of import competition on labour markets and firm level outcomes for both developed and developing countries. In terms of labour markets, Autor et al. (2013) examines the effects of rising Chinese imports on local US labour markets for the period 1990-2007. They find that increase in Chinese imports causes higher unemployment, lower labour force participation and reduced wages in import competing industries. In contrast, Mion and Zhu (2013) find evidence of skill upgrading in low-tech Belgian manufacturing industries in response to industry level Chinese import competition.

relatively small (but growing) literature exploring the causal effects of Chinese import competition on product variety in developing countries (only other study being on Mexico). In particular, this paper attempts to understand what happens to product variety, when firms in a large developing country, India, face competition from firms in another equally large developing country, China. Our main result is: Chinese import competition (in India's domestic market) induces big Indian firms, both exporters and non-exporters, to re-focus on their core products (by dropping their peripheral products), with the effect for domestic (or non-exporters) firms significantly higher**.**

Our motivation to study, the effect of Chinese import competition on India, rest on the following grounds: First, the technological similarity between these two countries. di Giovanni et al. (2014) on examining the global welfare impacts of China's trade integration and technological change ranks ten developing countries in terms of technological similarity to China, with India ranked as having the closest; India's technological similarity index being 0.928 to that of China. **Table 1** ranks all the ten countries in a decreasing order. Second, as far as the best of our knowledge goes, this is the first study to investigate the effects of import competition from one BRIC country–China–on the product scope of firms in another BRIC country, India. Third, the sharp rise in China's share of imports in total imports post-2001 (in 2001 it was 1827.5 USD Million which increased to 24575.5 USD Million in 2007) as opposed to the moderate increase in India's share in China's imports (in 2001 it was 922.5, increased to 9492 USD Million in 2007). In doing so, we also address a few of the gaps in the current literature: (i) we provide a careful investigation of the causal impact of Chinese import competition on the product variety, at home and export markets, of firms belonging to a technologically most similar country, by using detailed firm-product level data over one and half decades. We explore the effect on the number of product varieties produced by an average Indian manufacturing firm as well as product exit, thereby focusing on both intensive and extensive margins of product variety; (ii) we believe that the effect of competition between firms of two similar countries would be heterogeneous, unlike other studies. Our results rightly point out that, Chinese imports only affects firms, and that too big firms, through competition in the domestic market and not in the export market. It provides strong evidence of product reallocation within firms as competition obliges them to focus on their core competencies (Eckel et al., 2010; Liu, 2010).

Our strategy for identifying a causal relationship between Chinese import competition and the product scope of Indian manufacturing firms is to exploit the exogenous nature of China's entry into the membership of the World Trade Organization (WTO). We treat this outcome as a quasi-natural experiment of a trade shock that resulted in a sharp and sudden increase in the share of Chinese imports in total Indian imports[8]. **Figure 1** shows a monotonically upward trend in the share of India's imports from China in total imports. This share rises by approximately 15 percentage points from roughly 1% of total imports in 1992 to almost 16% in 2007; particularly striking is the dramatic increase in the import share in the post-2001 period i.e.

[8] There is precedence in the literature to treat the sharp rise in China's share in total imports of countries (both developed and developing) as a result of its accession to the WTO in 2001 as a quasi-natural experiment (see, Lu and Yu, 2015; Bloom et al., 2016)

following China's accession to the WTO in December, 2001. Between 1992 and 2001, it grew from 1% to around 5.5%, which shot to 16% between 2002-2007, an increase of 10.5 percentage points over a shorter period relative to the pre-2001 period (where the increase was 4.5 percentage points). A research document from the Department of Industry Policy and Promotion, Government of India (Singh, 2012) uses 268 items for the period of 2004-05 to 2010-11 to check the surge in Chinese imports. They find the import index from all countries (for these 268 items) grew by 1773.1% in this time period, and the same increased by 4618.4% in case of China. Also, the share of import of these 268 items from China in total imports has jumped to 41.3% in 2010-11 from 25.3% in 2005-06.

Table 2 documents India's trade (both exports and imports) with China and imports from other major regions of the world, including total imports, at three different periods of time: 1992, 2001 and 2007. With respect to India's exports to China, there has also been a significant increase, but the rate of increase is far lower than the import flows from China; the increase in exports to China is close to one-third to that of imports from China.[9] As a consequence, India has a large and growing trade deficit with China; the figure increasing from US$ 19.2 billion in 2009-10 to US$ 52.7 billion in 2015-16 (Singh, 2012; EXIM Bank of India, 2016).[10]

Given this phenomenal increase in Chinese share of imports in total imports of India after China's entry to the WTO, as opposed to India's exports to China, we follow Iacovone et al. (2013) and utilize this sharp increase in China's exports to India particularly, and the rest of the world generally, as a unilateral trade shock and not a mutual trade expansion. Additionally, **Figure 2** shows that there is also a lot of heterogeneity across industries within the Indian manufacturing sector in terms of the growth of Chinese imports relative to total imports. For e.g., the share of imports from China rose for some industries; remained almost constant for others; and also declined for a couple of sectors. Unsurprisingly, there has been a steep increase in the share of imports in some of the labour intensive industries (e.g., Textiles, Wearing Apparel, and Leather), which is consistent with China's comparative advantage. Interestingly, however, the figure also points to an increase in the share of imports in capital intensive industries (e.g., Office, Accounting and Computing Machinery; Electrical Machinery and Apparatus; Communication Equipment).

Having this as our background, we use the quasi-natural experiment of China's WTO accession and differential increase in competitive pressure of Chinese imports across Indian manufacturing industries to implement a difference-in-differences estimation strategy. In particular, we average the Chinese share of imports across each 4-digit Indian industry pre-WTO accession (between 1992 and 2001) and then interact with a WTO dummy (which takes a value 1 if year is greater than or equal to 2002). This interaction term would capture the differential effect of Chinese competition on firms according to their trade exposure from China

[9] The share of India's exports to China rose from 1% between 1992-1996 to 6% between 2002-2006 (Reserve Bank of India, 2008).

[10] In light of this steep increase in the share of Chinese imports in India and a growing trade deficit with China there has been increased calls in India for its policymakers to introduce anti-dumping measures against China (Singh, 2012). Out of the 290 anti-dumping cases investigated by the Director General of Anti-Dumping and Allied Duties against various countries since 1992, 159 cases involve imports from China (PTI, August 12, 2013).

prior to 2001. Or, in other words, since we expect shares of Chinese imports to rise across all sectors, it is the change in imports due to the WTO, net of the general change post-2001, and net of possible permanent differences across industries. We do this not only for Indian firms serving the domestic market but also for firms serving its main export market, the U.S. In doing so, we use detailed firm-product-year data across manufacturing sectors in India spanning over one and half decades, to understand the effects of unilateral trade liberalization between two similar countries.

We find no statistically significant evidence that competition from Chinese imports influences (negatively or positively) the product variety of Indian manufacturing firms at the aggregate. However, on dividing the firms across size distribution, we find robust and significant evidence of product drop or 'creative destruction' by the big firms or the firms belonging to the 4th quartile. On investigating the reason for such behavior, our results show us that these firms drop their peripheral products and re-focus on the core ones; a finding consistent with the 'core-competency' hypothesis of the multiproduct firms (Eckel and Neary, 2010; Mayer et al., 2014). Our results also show us that the effect of competition from Chinese imports on product variety of Indian firms only works through the exposure in the domestic and not export market. We also find that both domestic firms and exporters suffer as a result of the growth in Chinese imports, with the effect being half for exporters as opposed to complete domestic firms. The effect is also spread across: (i) domestic-private firms; (ii) both final and intermediate goods; and (iii) high and low-exposure industries. Our results remain largely unchanged when we use all the other standard indices of import competition and instrumental variable (IV) analysis.

Our results contribute to two different strands of literature. With respect to the first, it aligns with the most common prediction regarding the firm-product-level response to a bilateral reduction in trade cost: all firms reduce their product scope (Baldwin and Gu, 2009; Eckel and Neary, 2010; Mayer et al., 2014).[11] One of the earlier studies, which focuses on how firms adjust their product mix (in case of US plants) in response to the import competition from low-wage countries is by Bernard et al. (2006). They argue that plants are more likely to switch industries when exposure to low-wage countries is high; an average of almost 8% of surviving plants in each five-year period switch industries i.e., change their product mix. Instead, we focus on import competition from a low-wage country to the product mix of firms in another similar low-wage country. In doing so, we exploit a unilateral trade liberalization shock and show that all firms don't drop products in response to import competition; we find significant heterogeneity in terms of the responses across firms and markets. Lopresti (2016) also finds heterogeneous effects, but in terms of exposure to foreign markets, as a response to bilateral fall in trade costs.

[11] All these models assume that marginal costs of production vary across products within a firm. In these models, firms each have a core competence, a variety in which the marginal cost of production is lowest, with each additonal variety becoming progressively inefficient. As trade costs fall and competition in the domestic market rises, all firms choose to reduce product scope, dropping products with the highest marginal costs. Bernard et al. (2011) proposes a multiproduct Melitz-type model in which the firm-product level response to trade liberalization is ambiguous.

Second, it also contributes to a small literature on the effects of trade shocks on product variety of Indian firms. Goldberg et al. (2010b) provides evidence of significant increase in domestic product variety over the period 1989-2003 as a response to India's unilateral liberalization policies or input tariff liberalization. They estimate that 25% of the total increase in Indian manufacturing output over this period was accounted for by the net addition of products at the firm level. In other words, the contribution of the net product margin to total output growth in India is driven almost exclusively by product additions as opposed to product discontinuation. In another similar study (Goldberg et al., 2010c), Indian firms were found to infrequently drop products or to simultaneously add or drop a product. Indeed, the authors find no evidence between product rationalization and output tariff declines following India's episode of trade liberalization in 1991. In particular, they find little or no evidence of product churning within Indian manufacturing firms along the product dimension. In contrast, our results show that unilateral tariff liberalization policies from a similar country forces a certain section of firms to drop products, thereby providing significant evidence of product churning or 'creative destruction'.

The rest of the paper is organized as follows. Section 2 reviews and discusses both theoretical and empirical literatures related to this study. We describe the datasets we use in this paper, together with some preliminary analyses in Section 3. The impact of Chinese import competition, in both domestic and export markets, on the product variety of Indian manufacturing firms is estimated in Section 4. Section 5 digs deeper in understanding the logic behind the effect by focusing on core competency, product-sales composition and product exit. We divide the entire sample of firms in different sub-samples according to product, industry and firm characteristics in order to investigate variation in our benchmark results across different categories in Section 6. Section 7 does a battery of robustness checks, while Section 8 concludes.

2 Review of Literature

This section discusses the literature that is most closely related to our work, namely, the studies on multiproduct firms. As a result of the overwhelming dominance of multiproduct firms in production and trade, a range of theoretical models focusing on the behavior of these firms have been developed by trade economists over the last decade or so (Lopresti, 2016).[12] In these models, a fall in trade costs increases within-firm productivity by the reallocation of resources within the firm (Eckel and Neary, 2010; Bernard et al., 2011; Mayer et al., 2014). Notwithstanding the aggregate importance ascribed to multiproduct firms by the different theoretical models, they proffer very different and contradictory conclusions regarding the manner in which multiproduct firms adjust their product mix in response to changes in trade

[12] We find the same evidence for Indian firms as well. **Table B.1** presents average values for sales, capital intensity, assets, wages, TFP, share of output, share of firms for multiproduct and single-product firms. Multiproduct firms sell more; are more capital intensive; are bigger; pay higher wages and control an overwhelming proportion (91%) of the total output produced in an industry.

costs[13]. The most common prediction in terms of firms' product level response to a bilateral reduction in trade costs is that all firms reduce their product scope. This prediction is present in the models of Eckel and Neary (2010) and Mayer et al. (2014). In contrast, Qiu and Zhou (2013) argue that the most productive firms may expand product scope in response to globalization. Therefore, theoretically it is less clear whether there is heterogeneity in the adjustment of product scope by firms following an episode of trade liberalization. For e.g., whether large firms adjust product scope differently compared to smaller firms is not resolved in the theoretical literature and remains an empirical issue that warrants careful investigation; shedding light on the crucial issue of differential response or heterogeneity is one of the fundamental aims of the current paper. Lopresti (2016) also explores a similar kind of effect, but in terms of involvement in the foreign markets.

There is also a range of papers that predict heterogeneous responses across the firm distribution, with the most productive firms expanding product scope as trade costs fall, while the others contract product scope. Dhingra (2013), categorizing firms as a 'brand', argues that varieties within a brand are closer substitutes than varieties across brands, and a cannibalization effect (eating away of the demand for existing products) happens when there is product expansion. Trade liberalization or import competition reduces the cannibalization effect by dropping products. She also shows that there exists a cut-off in the distribution of firms in terms of exports; firms having a larger export share of sales than the cut-off adds products as a result of trade liberalization, while firms below the cut-off drop products. In our empirical setting, we explore the differences between exporters and non-exporters as well as between exporters above and below the median of export share. We find that firms across all categories drop products as a response to Chinese import competition in the domestic market, but the effect for exporters is half that of non-exporters.

Qiu and Zhou (2013) reach a similar conclusion as Dhingra (2013) but by allowing firms to differ in terms of productivity. Following these studies, we divide firms according to their assets into four different quartiles, but find the opposite: the most productive or large firms drop products as a response to Chinese import competition in the domestic market (no effect from the export market); with no effect for the small firms. We also divide firms belonging to industries of least and most-exposed (to competition) and explore the effects. The result remains the same across these two groups. Lastly, Nocke and Yeaple (2014) divide firms according to organizational capital and organizational efficiency and explore the effect with a fall in trade costs. Exporters take the advantage of the fall in trade costs (in terms of increased access to foreign markets) and increase product scope, whereas, firms which produce strictly for the domestic markets reduce product scope as a result of increased competition from abroad. We find similar results, but only in case of non-exporters.

This paper also contributes to the empirical literature on multiproduct firms. Bernard et al. (2011) document evidence of product level response of the U.S. multiproduct firms to the decline in Canadian tariff rates on U.S. manufacturing imports that accompanied CUSFTA.

[13] See Lopresti (2016) for a detailed review of some of the more well cited theoretical models of the multi-product firm in the literature.

They find that firms experiencing export tariff reductions greater than the median reduces product scope relative to firms facing tariff reduction less than the median. Iacovone et al. (2013) examine the effect of Chinese import competition on intensive and extensive margins of Mexican firms and conclude that the import competition shock causes selection and reallocation at both firm and product levels and that its impact is highly heterogeneous at the intensive and extensive margins. Arkolakis et al. (2015) examine Brazilian exporters and point out that the importance of firm-product extensive margin varies widely across firms of different sizes. Baldwin and Gu (2009), Liu (2010) and Lopresti (2016) all investigate the responses of multiproduct firms to CUSFTA. Baldwin and Gu (2009) and Lopresti (2016) find heterogeneous responses between non-exporters and exporters and within exporters, respectively, while Liu (2010) finds that multiproduct firms are more likely to drop "peripheral" products as import competition rises. In a similar study, Martin and Mejean (2014) explore the impact of low-wage competition on the product quality of French exporters. Their results show that product quality upgrading is greater in sectors and destinations where firms are exposed to more intense competition from low-wage countries.

A different set of studies also look at the effect of import competition, or competition from China, on different aspects of firms and industries, such as innovation, plant survival, employment growth, total sales, productivity, skill intensity (Bernard et al., 2006; Utar and Ruiz, 2013; Mion and Zhu, 2013; Ashournia et al., 2014; Balsvik et al., 2015; Bloom et al., 2016; Autor et al., 2016). However, apart from Iacovone et al. (2013) and Utar and Ruiz, (2013) (where both look at the effect of Chinese competition on Mexico) all the other studies focus on the impact on developed economies (U.S., Belgium, Denmark, Norway, E.U., etc). We differ from these current cohort of studies by focusing on the most technological similar country to China (Mexico is 7th technologically similar according to di Giovanni et al., (2014)) and explores the effect on product variety of manufacturing firms. Overall, our results conform to the standard theoretical multiproduct firm literature with import competition, firms re-focusing more on their 'core competencies', with heterogeneity in effect coming from the product drop by only the most productive or big firms.

Lastly, there exists a section of studies, which looks at the dynamic aspects of multiproduct firms or product churning. Bernard et al. (2010) finds 54% of manufacturing firms alter their product mix every five years between Manufacturing Censuses. On average, one-third of the output of a given product is produced by firms that either didn't produce the product at the time of the previous Census or have dropped the product by the next Census. In short, there is widespread evidence of product churning. Moreover, this product churning has substantial effects on the aggregate economy because changes in the firms' product mix can account for significant changes in their output over time (Lopresti, 2016; Goldberg et al., 2013). Indeed, Bernard et al. (2010, 2011) shows that the contribution of firms' product margin toward output growth exceeds the contribution of firms' entry and exit. Consequently, product mix changes represent a potentially important channel through which resources are reallocated from less to more efficient firms. Iacovone and Javorcik (2010) also show evidence of product churning by focusing on Mexican manufacturing firms in response to NAFTA.

3 Data and Preliminary Analysis

3.1 Datasets

3.1.1 Firm level data (PROWESS)

The foundation of our empirical analysis is based on Indian firm level data across different manufacturing industries. This dataset gives detailed data on various indicators from the balance sheets of firms, in addition to other important firm level and industry level characteristics. We discuss our dataset in detail below.

The primary data source for our analysis is the PROWESS[14] dataset, which is maintained by the Centre for Monitoring the Indian Economy (CMIE); a privately-owned business information company. This dataset contains information primarily from the income statements and balance sheets of the listed (in major stock exchanges) companies and publicly traded firms. The PROWESS dataset contains information on about 27,400 publicly listed companies, of which almost 11,500 are in the manufacturing sector. We use information for around 9000+ firms for our analysis for the years 1992-2007[15]. Firms in the dataset are placed according to the five-digit 2008 National Industrial Classification (NIC) level, but are reclassified at the four-digit 2004 NIC level in order to facilitate matching with industry-level trade data. The dataset covers large companies, companies listed on the major stock exchanges and also many small enterprises. Data for big companies are worked out from balance sheets, while CMIE periodically surveys smaller companies for their data. Therefore, PROWESS provides a reasonably good aggregate picture in terms of the mix of small and big firms. Further, it includes the set of variables typically found in firm level production datasets. For example, the dataset reports direct measures on gross value-added, capital employed, total wages, total sales, exports, imports, research and development (R&D) expenditures, royalty payments for technical knowhow, assets, firm ownership, etc. The variables are measured in Indian Rupees (INR) Million. Around 20% of the firms in the dataset belong to the Chemical and Pharmaceutical industries, followed by Food Products and Beverages (13.74%), Textiles (10.99%) and Basic Metals (10.46%). We use an unbalanced panel for our estimations.

PROWESS has some features and advantages over other available data sources, such as the Indian ANNUAL SURVEY of INDUSTRIES (ASI) dataset, that make it particularly appealing and relevant for the period and purpose of our study. First, in contrast to the repeated cross-section of earlier versions of the ASI, PROWESS comprises a panel of firms which enables us to track firms' performance over time[16]. As a consequence, we can undertake within firm

[14] Our description of the PROWESS dataset draws heavily, but not exclusively, on the well-known studies of Goldberg et al. (2010a, 2010b) and the recent study of de Loecker et al. (2016). All three studies have utilised manufacturing data from PROWESS to conduct their empirical analyses and have provided excellent descriptions of the data.

[15] Although data are available till 2013, we consciously choose 2007 as the final year in order to avoid any possible effect of the financial crisis of 2008-2009 on our results. As part of our robustness checks on our results we extend our sample period to 2013. The results remain qualitatively the same.

[16] Recently, a panel data set containing similar product-level information like PROWESS has been released by the ASI. While this newer version of the ASI has some advantages over PROWESS (see de Loecker et al., 2016), it doesn't span the

comparisons over the period of our analysis. Second, the data cover the fifteen-year period, which coincides with significant trade and industrial reforms undertaken independently by both India and China.

Third, a unique feature of the dataset, upon which our study is partly based, is that it gives detailed product level information for each firm. Consequently, we are able to distinguish between single and multiproduct firms and also can track changes in firms' product mix over the sample period. In particular, we can examine the dynamics of the product mix of firms as a response to Chinese import competition; that is, whether manufacturing firms add products; drop products; add and drop products simultaneously; or engaged in none of the preceding activities. The ability to track a firm's product mix over time is primarily due to the Companies Act of 1956, which requires Indian firms to disclose product level information on capacities, production and sales in their annual reports. As discussed in Goldberg et al. (2010a, b), product level information is available for 85% of the manufacturing firms who in turn accounts for more than 90% of PROWESS' manufacturing output and exports. Additionally, product level sales are said to comprise 99% of the (independently) reported manufacturing sales. To define a product CMIE uses an internal product classification that is based on the Harmonized System (hereafter, HS) and National Industrial Classification (hereafter, NIC) schedules.[17] **Table 3** provides summary statistics of all the variables that we use.

However, there are also a few limitations of PROWESS. First, the dataset doesn't cover the unorganized sector. Second, because firms are not under any legal obligation to report to the data collection agency, PROWESS is not well suited for studying firm entry and exit[18]. Third, the dataset doesn't give either the trade (neither export or import) destinations of the firms or the products traded by firms. In order to overcome this latter deficiency, we complement our firm level dataset with product level trade data from UN-COMTRADE using an industry-trade concordance table. We describe this process in more detail below.

3.1.2 UN-COMTRADE

UN-COMTRADE presents destination-wise official foreign trade statistics of all the countries of the world. This is the most comprehensive dataset on trade flows that is collected and maintained by the United Nations (UN). It gives detailed information of every country's trade according to each of their trade destinations. The dataset is detailed up to HS six-digit level of classification. UN-COMTRADE follows the Harmonized System (HS) of Classification and provides both yearly and monthly statistics of countries' trade flows. The dataset provides quantity, value and unit value with respect to each of the products exported or imported and their respective destinations. The annual series is available from 1992 onwards

entire period during which the trade and economic liberalization policies, with which our study is concerned, were undertaken by China and India.

[17] As Goldberg et al. (2010c) notes, there are a total of 1,886 products linked to 108 four-digit NIC industries across the 22 manufacturing sectors (two-digit NIC codes) spanning the industrial composition of the Indian economy. In comparison, the U.S. manufacturing data contains approximately 1,500 products, as defined by the Standard Industrial Classification (SIC) codes, thus suggesting that the definition of product in India is slightly more detailed.

[18] As indicated by Goldberg et al. (2010b), entry and exit is not necessarily an important margin for understanding firms in the PROWESS dataset since the dataset contains only the large Indian firms.

till 2012. It also enables a comparative analysis of any country's trade performance in specific markets vis-à-vis its competitors. The trade flows are given in US Dollars (US$).

3.1.3 Matching PROWESS data with UN-COMTRADE data

Our main objective is to create a variable which reflects the extent of import competition, both in the domestic and export markets, from China on Indian firms. To overcome the disadvantage of the PROWESS dataset regarding the trade destinations of the firms, we match the firm level data from PROWESS with the trade-destination based product level UN-COMTRADE dataset. The classification of the firms in the PROWESS dataset after reclassifying is at the four-digit 2004 NIC level, whereas data in UN-COMTRADE are in HS Code. In order to facilitate the matching between trade flows and firm level data, Debroy and Santhanam (1993) provides us with a document which matches the HS code items with the industrial groups (classified according to NIC). However, Debroy and Santhanam (1993) used 1987 NIC classification to match the industrial groups with the HS code items. Therefore, before the matching of the firm level with trade flows data, we do the following: we first match 1987 NIC codes with the NIC 1998 codes, which is the next revision of the industrial group classification, and then match the NIC 1998 codes with NIC 2004 classification, which is the current version or the version in which the firm level dataset is provided.

We then proceed as follows: first, using the concordance of Debroy and Santhanam (1993), we match all the relevant product lines (HS six-digit level) for each of the industrial categories (2004 NIC 4-digit level). After putting both the datasets into NIC 2004 classification, we would like to create a region-specific, in our case China, import competition index which we can use to explore the effects of Chinese import competition on the product variety of Indian manufacturing firms. We then sum the values of all the HS code items belonging to each of the industrial group (let's say Food Products) to obtain the total amount of imports by that particular industrial group (Food Products) with respect to China and total imports of India, or the regions of interest. In essence, we use the UN-COMTRADE dataset to construct industry level measures of imports competition from China. In other words, the product level import flows data is aggregated to the industry-level to create such a measure of import competition, in this case from China. We follow the same procedure for the total imports of India. In the end, we are able to match around 90-95% of the HS six-digit level products with each of the 2004 NIC four-digit level industrial chapters. These industry level measures are then matched with firms in the firm level dataset, PROWESS, on the basis of the firms' identified industry. An average industrial sector of India imports around 8.5% of its total imports from China (over the period 1992-2007), whereas the maximum is 93.25%, pointing out a significant amount of heterogeneity across different industrial sectors. Therefore, the estimations that we will eventually run will use the number of firm level product varieties as reported in PROWESS to see if the industry level measure of import competition has an effect on the product scope of manufacturing firms.

We acknowledge the fact that it would be ideal to have firm level information on import competition from different countries, as our industry level exposure measure is likely to leave a lot of intra-industry heterogeneity unexplained. However, in the absence of any such dataset

in the case of India, which gives firm level trade information by countries, ours is a workable second-best option that is commonly used in the literature. Iacovone et al. (2013) and Utar and Ruiz (2013) also use such kind of industry level import competition index in order to measure the effect of import competition on Mexican firm and industry level outcomes.

3.2 Preliminary Analysis: Trends in Product Variety and India's Imports

Having discussed different datasets, we use for this particular study, we now turn our attention to analyzing some of the very crucial stylized facts about the product scope of Indian firms and how it varies over the time period and different industrial categories, as well as the Chinese import competition index. First, we plot the number of products manufactured by a representative Indian manufacturing firm over the period 1992-2007 in **Figure 3**. It points to a clear upward trend over time. The average number of products produced by an average Indian manufacturing firm rises from around 1 during the early 1990s to almost 3 in 2007. The steady increase exhibited in the number of products is consistent with the finding of Goldberg et al. (2013). However, closer inspection of **Figure 3** points to a slight drop in the post-2001 period, followed by small increases and finally the number of products remaining constant after a couple of years; the rate of growth in the increase in the number of products also slowing down. During the period 1992-2001, the rate of growth of products produced by a firm increased by more than 200%, whereas in the post-2001 period, the increase dropped to a mere 20%. We also calculate the average number of products produced by an industry (at the NIC 2004 2-digit level) for two different time periods: 1992-2001 and 2002-2007 in **Table 4**. For an average Indian manufacturing industry, the number of varieties produced dropped from 5.4 to 5.1, which is a change of about 6%. However, if we look across different industries, the response is mixed. In some of the industrial categories, there has been an increase in the number of product varieties, whereas, we find the opposite for others. This gives us a hint to explore whether (a) there is a causal impact of import competition or it is due to other factors; and (b) there is some amount of heterogeneity involved in the effect (if any).

Next, we present some stylized facts on trends in the share of India's imports from China by each industrial category (two-digit NIC 2004). Columns (1) – (3) of **Table 5** show the average share of imports from China relative to total Indian imports for three different time periods: 1992-1997, 1998-2001 and 2002-2007. For e.g., the number 2.21% (Row 1, Column 1) is the average share of Food and Beverages (NIC 2004, Sector 15) imports from China for the period 1992-1997. When evaluated across the three sub-periods, **Table 5** shows that most of the industrial categories significantly increased their share of imports from China in total imports, especially after 2001; the growth in the share of imports from China being significantly higher in the post-2001 period compared to the period before-2001. Among the industries that experienced phenomenal growth in their share of imports from China are Textiles; Leather Products; Communication Equipment; Non-Metallic Mineral Products; Fabricated Metal Products; and Office, Accounting and Computing Machinery among others. In contrast, only the Food & Beverage industry recorded a decline in its share of Chinese imports[19]. Lastly, in

[19] By considering the average share of Chinese imports for individual industries by sub-periods instead of annually, we mask some of the heterogeneity in import shares between industries observed in **Figure 2**.

Table 6, we divide the 108 industrial groupings (at NIC 2004 4-digit level) into two major product categories–intermediate and final goods–and calculate the share of Chinese imports and the average number of products produced. We find that imports from China have increased for both types of product categories, with rate of growth slightly higher in case of intermediate goods. The finding of a higher share (and rate of growth) of intermediate imports vis-à-vis final goods imports is consistent with the documented evidence of Goldberg et al. (2010b), which showed that India's domestic product growth between 1989 -2003 was largely driven by greater access to (cheaper and higher quality) intermediate imports as a result of input tariff liberalization. On the other hand, product variety of both types of goods decreased over time, with the drop in intermediate products being higher. Using these stylized facts as our background, we now investigate whether the increase in the import share from China is significantly correlated with (or at best caused) variations in the product mix of the manufacturing firms in India.

4 Chinese Competition and Product Variety of Indian firms

4.1 Benchmark Results

This section empirically investigates the link between increased product market competition due to China's rising share of exports to India and its main export market, the U.S., and product variety of Indian manufacturing firms. To establish causality between greater import competition and the product mix of Indian manufacturing firms, we use China's entry to the WTO on December 11th, 2001 (November 10 was the date approval, but actual joining took place in December), as a quasi-natural experiment, together with the differential competitive pressure faced by Indian firms due to this trade shock, as our identification strategy. We argue that the pursuit of this unilateral trade liberalization policy by China led to an increase in the import share of Chinese products relative to total imports by India from the world, and thus intensified the competition faced by Indian firms in their domestic market. We also look at the effect of the Chinese share of imports in one of their (both China and India) main export markets, the U.S., on the product variety of Indian firms.

The trade and other economic reforms undertaken by China in the post-1990 period in anticipation of becoming a member of the WTO, and thus fully integrated into the global economy, provide an important element of our empirical strategy. Since China's membership to the WTO in 2001 was influenced by factors not related to the activities of Indian firms in their domestic market, therefore the former's accession to the WTO can be interpreted as an exogenous shock from the standpoint of India. Furthermore, there were no trade agreements signed by India with China in the period prior to accession, so there is little probability that China's visibility in the world trade matrix (in terms of becoming a WTO member) could be confounded with other factors.

Notwithstanding the assumptions underlying our empirical strategy, there are a few concerns that we need to address getting on to the details. First and foremost is the potential endogeneity

or reverse causality problem associated with our import competition index. For instance, there is a distinct possibility of the amount of imports of a firm being influenced by the number of products that that firm produces. This reverse causality will endogenize the relation between Chinese import competition and the product mix decision of a firm. Second, it may also be the case that the importing some goods (for e.g., intermediate inputs) is cheaper for Indian firms than producing them domestically. As noted by Goldberg et al. (2010a), the trade liberalization measures (particularly with respect to input tariffs) undertaken by India's policymakers during the 1990s lowered the price of imported intermediate inputs for domestic Indian firms, and this led to an increase in the volume and variety of this category of imports by these firms. They further contend that access to this source of cheaper, higher quality and greater variety of inputs is a significant determinant of the expanding product mix and higher productivity levels that characterized the globally engaged Indian firms during this period.

Failure to address these above concerns may result in biased coefficient estimates and therefore, likely to lead to incorrect inferences drawn from our findings. Therefore, in order to control for these issues, we use an empirical strategy similar to Guadalupe and Wulf (2010), and Lu and Yu (2015) among others[20]. To avoid the possible endogeneity of the import competition variable, we treat all industries equally and exploit the share of imports from China prior to its WTO membership. Specifically, we calculate the average share of Chinese imports before China's entry to the WTO by taking a simple mean of the share of imports from China by India for the years 1992-2001. This variable captures the extent of the prevailing competition from China for any given industrial category before the latter's entry to the WTO. We define $AvgM01_j$ as a measure of Chinese competition that an industry faces as a result of the unilateral liberalization policies pursued by China; it is a 10-year average of the share of imports by industry j for the period 1992-2001. To create the $AvgM01_j$ index, we match the Indian firm level data with the HS six-digit product level destination-specific data (for China**)** on import flows to create a ratio that reflects the amount of competition faced by a firm i belonging to an industry j. We create this index at the NIC 2004 4-digit level using the concordance table by Debroy and Santhanam (1993). It is defined as the share of imports by an industrial sector, say j, from China in proportion to total imports by that sector. For example, let's consider the Textiles sector. The $AvgM01_j$ for the Textiles sector would be the total amount of Textile imports from China, relative to the total imports of Textiles from all countries for the years 1992-2001. To elaborate, we write $AvgM01_j$ in the following way:

$$AvgM01_j = Avg_{1992-2001}\left[\frac{(imports^{jt}_{China})}{(imports^{jt}_{Total})}\right]$$

$$= Avg\left[\frac{\text{imports from China for the years } 1992-2001 \text{ for the industrial category } j}{\text{imports from World for the years } 1992-2001 \text{ for the industrial category } j}\right]$$

[20] These studies use reductions in tariff levels as their measure of trade liberalisation in contrast to the import share and import penetration ratios employed in this paper.

Using the above as our variable of interest, the basic empirical specification is the following fixed effects linear regression of the type shown in Equation (1):

$$ln(x_{ijt}) = \beta_1(AvgM01_j * WTO_t) + \beta_2 WTO_t + \beta_3\, firmcontrols + \mu_j + \eta_t + \theta_t^j + \epsilon_{ijt} \quad (1)$$

where our dependent variable, x_{ijt}, is the number of product varieties produced by an Indian manufacturing firm i belonging to sector j at time t[21]. WTO_t is a year dummy variable intended to capture the effect of China's entry into the WTO. It takes a value of 1 for the years following the signing of the WTO agreement by China. Therefore, WTO_t equals 1 for the years 2002-2007. So, our variable of interest, $AvgM01_j * WTO_t$, will provide a measure of the amount of competition faced by Indian firms as a result of China becoming a member of the WTO. The interaction of $AvgM01_j$ with WTO_t provides a clear and exogenous measure of import competition from China and represents a difference-in-differences approach to measure the effect of Chinese import competition on the product variety of Indian manufacturing firms. This interaction term would capture the differential effect of Chinese competition on firms according to their trade exposure from China prior to 2001. Or, in other words, since we expect shares of Chinese imports to rise across all sectors, it is the change in imports due to the WTO, net of the general change post-2001, and net of possible permanent differences across industries. We do this exercise not only for Indian firms serving the domestic market but also for serving its main export market, the U.S. However, in the latter case, we use Chinese share of total imports by U.S.

$firmcontrols_{it}$ is a vector of variables that includes firm size, age, age squared, an indicator for domestic or foreign ownership and a proxy for the extent of a firm's technology adoption. We use total assets of a firm as its size indicator[22]. The extent of technology adoption is measured as the share of R&D expenditure plus royalty payments for technical knowhow in Gross Value-Added (GVA). This captures technology differences between firms, which can potentially affect manufacturing of a product. Since our main variable of interest is at the industry-level, we follow Moulton (1990) and include industry fixed effects (μ_j) in Equation (1). η_t proxies for year fixed effects which control for any time-specific shocks that affect all firms equally. We cluster our standard errors at the industry level.

As mentioned before, product variety of a firm is also influenced by many other concurrent policy shocks. One such is the effects of tariff liberalization. This facilitates a firm to import more of higher quality intermediate goods to produce output or directly import finished products. In order to control for such events, we include measures of input and output tariffs in our estimation. Other import shocks at the industry level, which varies over time, such as share of imports from rest of the world is captured by the θ_t^j, which refers to an interaction between industry fixed effects and time trend. Since, our coefficient of interest is at the industry level

[21] Since the dependent variable is logged, we add 1 to accurately account for single product firms.

[22] Using the PROWESS dataset to examine the effects of trade liberalisation on wages in India, Ahsan and Mitra (2014) also used the firms' total assets as an indicator of firm size.

(4-digit NIC), it would not be possible to interact industry and year fixed effects as it would absorb all the possible variations in import competition index across industry. Therefore, in order to control for other simultaneous effects at the industry level which might induce some changes in product variety of firms, such as labour policy change, availability of more finance, etc. I interact all possible pairs of industry fixed effects with time trends.

We start by estimating Equation (1), for which results are shown in **Table 7**. Columns (1) – (4) show the results for natural logarithm of the number of products produced by an Indian manufacturing firm in a single year regressed on the interaction of $AvgM01_j * WTO_t$. In addition to the industry and time specific fixed effects included in the estimation in Column (1), we use interactions of industry fixed effects with a time trend, and industry fixed effects (2-digit) with year fixed effects in columns (2) and (3), respectively to control for all other factors, which can potentially influence the outcome of interest. Following Goldberg et al. (2010b), column (4) additionally uses input tariffs at the 4-digit level of NIC 2004 as a control. Across all the estimations, the statistical significance (or lack thereof) of our coefficient of interest doesn't change. We find no significant effect of the Chinese competition on the product mix of the Indian firms at the aggregate.

Iacovone et al. (2013) argues that competition may be felt as strongly in the export markets of the country that is the subject of import competition as in its home market. Keeping this in mind, we also evaluate the causal link of Chinese imports on the product scope of Indian firms not only in their domestic market but also in one of their main export markets, U.S. Columns (1) – (3) in **Table B.2** in Appendix B presents the result. In this case, firstly, we repeat our previous exercise of matching trade flows data with firm level data by matching the total imports by the U.S. and imports from China at the 2004 NIC 4-digit level and then use the following import competition index:

$$AvgM01_j^{US} = Avg_{1992-2001}\left[\frac{(imports_{China}^{jt})}{(imports_{Total}^{jt})}\right]$$

We continue to find no effect on product scope of Indian firms as a result of competition from one of its main export markets.

Heterogeneous Effects: Following the current set of papers (Dhingra, 2013; Qiu and Zhou, 2013; Lopresti, 2016) on the issue hetereogeneity in the effect of trade shocks on multiproduct firms, we divide the set of the firms into different size distributions based on their total assets. The rationale for this is to test whether there are heterogeneous effects of Chinese import competition on the basis of firm size that are masked when no allowance is made for such heterogeneity across the sample of firms. In other words, a majority of the recent studies point out that firms at the right tail of the productivity distribution significantly drive economy-wide welfare changes, it is imperative to understand whether these firms behave differently from other. To do so, we divide the entire sample of firms into four different quartiles according to the total assets of a firm. That is, total assets are used as the size indicator of the firms. The different size categories of firms are indicated by a dummy variable. For e.g., if the total assets of a particular firm are below the 25th percentile of the total assets of the industry, then that firm

belongs to the first Quartile and the variable would indicate 1 for that particular firm, and zero otherwise. Likewise, if a firm's total assets lie between the 25th percentile and the 50th percentile; the 50th percentile to the 75th percentile; and above the 75th percentile of the total assets of the industry, the firm belongs to the categories of second, third and fourth Quartile, respectively. In each case, the variable measuring the different size category takes a value of 1 for the firms that meet the respective measurement criterion and zero otherwise. We then interact different quartile dummies with our variable of interest, $AvgM01_j * WTO_t$, in order to measure the effect of competition from Chinese imports on that particular quartile of firms. Since, firms can change quartiles over the period of analysis, we use the rank of the firms in the base year of the sample, which is 1992.[23] Our modified equation for estimating the effects on the different quartiles of the firms is specified as Equation (2) below:

$$\ln(x_{ijt}) = \beta^r \sum_{r=1}^{4} (AvgM01_j * WTO_t * Q_{it}^r) + firmcontrols_{ijt} + \mu_j + \eta_t + \theta_t^j + \epsilon_{ijt} \quad (2)$$

Columns (5) – (8) **Table 7** and **Table B.2** shows the results from our estimations of Equation (2) for domestic and export market, respectively and variations thereof. Unlike our earlier results, where no distinction was made on the basis of firm size, we now unearth robust evidence of within firm reallocation of products by Indian firms. First, across all the specifications, firms in the 4th Quartile (i.e. the largest firms) are shown to drop products from their product mix when import competition increases in the domestic market. We also do find some evidence of product dropping by the same category of firms as a result of Chinese competition in the export market, but the result is weak. This finding is consistent with the standard theoretical predictions of response of multiproduct firms to import competition or trade liberalization (Eckel and Neary, 2010; Bernard et al., 2011; Mayer et al., 2014). Our benchmark result, Chinese competition leads to product drop by the big firms, is robust across all specifications, even when we control for trade policy reforms by including input tariffs at NIC 4-digit level in column (8). In short, our results point to significant evidence of heterogeneity in the effects of Chinese exports on Indian manufacturing firms. Large firms clearly exhibit significant evidence of creative destruction as a result of import competition from China in the domestic market, whereas, there is no effect from the export market. The coefficients say that a 10 percentage point increase in Chinese share of imports by India reduces the product scope of manufacturing firms by 1% at the mean. In other words, the large firms have contracted their product-mix by 8.39% after China's entry to the WTO.[24] Our result adds to the small but growing theoretical and empirical literature on the presence of heterogeneity in the responses of multiproduct firms. However, unlike Qiu and Zhu (2013), where most productive firms add products as a result to import competition, we find the opposite – the big firms reduce their product diversification.

[23] We also use the average rank of the firms over the entire time period (1992-2007), but the results remain the same.

[24] This is calculated on the basis of India's average import share from China between 1992 and 2001, which was 8.39%. And, our coefficients are 0.01. So, multiplying 8.39*0.01 = 0.84, which almost 1%. This analysis is based on Goldberg et al. (2010b). However, since we have a log-log specification, therefore, our to understand a unit change in the coefficient one has to multiply it by 100. Therefore, our coefficients would be 1 after multiplying it by 100 and given that the import share before China's entry to WTO in 2001 is 8.39%, the adjustment in product scope is 8.39*1 = 8.39.

IV Analysis: While in principle it is useful to use pre-trade shock (signing the WTO agreement in 2001) data (using average of the 'share of Chinese imports' for the years 1992-2001) as an instrument for the contemporaneous 'import competition index', this could be more a measure of long-term trade patterns rather than a meaningful reflection of import competition shocks after the signing of the WTO agreement itself. Therefore, the concern regarding the results to be biased may continue to persist. Also, if there is an increase in the demand for particular products in India after 2001, which triggers a disproportionate increase in Chinese imports in those categories, such as labour-intensive products (as we saw evidences of it from our stylized facts), then it is likely to have the same effect on Indian firms in those categories and for the same reason. This could be also true for some unobserved technology shocks, say new innovations on labour cost saving technology, which is common to both the countries (Utar and Ruiz, 2013). These types of biases or unobservable shocks would make the effect of Chinese competition on product variety of Indian firms as endogeneous.

Following the current literature, we use Chinese share of imports of EU as the instrument for import competition in the domestic market (Iacovone et al., 2013) and Chinese share of total world imports minus US, EU and India as the same for import competition in the export market. We define the instruments in the following way:

$$\text{for domestic market: } ChIMP_{jt} = \frac{Chinese\ Imports\ by\ EU_{jt}}{Total\ Imports\ by\ EU_{jt}}$$

$$\text{for export market: } ChIMP_{jt} = \frac{Total\ World\ Imports\ from\ China_{jt}}{Total\ World\ Imports - US - EU - India_{jt}}$$

The Chinese share of EU imports and world imports must be exogeneous from the perspective of Indian firms as it is expected to be driven by China itself. By interacting this with the WTO_t dummy, we get the cross-industry variation in the degree of Chinese comparative advantage. Results for domestic market are presented in **Table 8**, and for export market in **Table B.3**. The results from IV estimation reconfirms our initial findings. Big Indian firms reduce their product scope as a result of Chinese import competition in the domestic market with no effect on Indian firms from competition in the export market. Our IV results present two additional findings: (i) small firms (firms belonging to the 1st Quartile) in addition to the big firms (4th Quartile) also shed their products, which indicates the effect of Chinese import competition to be significant across firm-size distribution; and (ii) as a result of the previous finding, we obtain significant effect of the Chinese share of imports on product scope of the Indian firms in the aggregate. Since, we don't get any significant effect (on the product variety of firms) from the export market competition (for OLS as well as IV), we use only the import competition index of the domestic market for our future results.

4.2 Additional Controls

Even though, we use interaction of industry fixed effects (4-digit) with time trends and industry fixed effects (2-digit) with year fixed effects, it is still possible that there could be other factors that may drive our benchmark findings. To the extent that these underlying factors are

not captured by the industry and year fixed effects included (either singly or interacted) in our earlier regressions, then our estimates could possibly be affected by omitted variable bias. To determine whether this is in fact the case, we examine other possible channels of influence by incorporating additional controls, both at the industry and firm levels, in our estimations. Results appear in **Table 9**.

In terms of industry-level controls, skill-intensity is a crucial factor in determining the product scope of a firm. For example, a decrease in skill-intensity may cause firms to drop products. We define skill-intensity as the share of non-production workers in the total employees of an industry at the NIC 2004 3-digit level. Inclusion of skill intensity in column (1) as a possible channel doesn't alter our benchmark result: large firms continue to drop products as a result of import competition from China. We also find, somewhat surprisingly, weak evidence (at 10% level of significance) of higher skill-intensity to be associated with narrowing of product scope for large firms. It is possible that closure of plants (for reasons other than import competition) could force a firm to drop some of the products produced in those plants. In column (2), we use the number of factories at the industry level to see whether it affects the product-mix of the firms. Again, our finding with respect to large firms (i.e. those firms in the 4th Quartile of the size distribution) is robust to the inclusion of the number of factories as an additional variable. We consider two additional channels in columns (3) and (4), to further test the sensitivity of our results. In column (3), we use domestic production by industry to capture whether variations in domestic demand may also influence the number of products produced, while in column (4), following Bloom et al. (2013), we use management technology as a determinant of firm performance. By surveying a large number of firms in across all but couple of manufacturing industries in India (among other countries) throughout 2004, Bloom et al. (2010) construct a composite index for management quality for different manufacturing sectors. The index is a number between 1 and 5; with 5 representing the best quality. In both columns (3) and (4), our results with respect to the product drop by the largest firms remain primarily unchanged: creative destruction for large firms in response to import competition from China. We also find one additional result. Column (3) shows that higher levels of domestic production results in addition of products for all sizes of firms, with the level of significance increasing with firm size.

Despite controlling for crucial industry level factors whose omission may have biased our results, we omit other factors that can also potentially explain intra-industry heterogeneity. To account for these, we use several firm level channels which can also possibly influence our previous findings. For instance, a firm can suffer a drop in sales (for reasons unrelated to import competition) and this could force to drop some of its products. The results using these channels are shown in Columns (5) – (8) of **Table 9**. Like the industry level controls, the sequential inclusion of the four firm level controls also doesn't alter our previous finding: large firms drop products as the share of Chinese imports in total Indian imports increases in the domestic market. Additionally, like the domestic production variable measured at the industry level, increases in firm level sales (Column 5) also leads to an increase in the product scope for all but lowest quartile of firms of the size distribution. In contrast, export share of only the big firms positively and significantly influence their product variety: column (6).

Lastly, we use firm productivity measures and the degree of market power of firms (concentration index) relative to the industry in which they are located, to explore whether they can also significantly explain the product-mix of firms, in columns (7) and (8), respectively. We measure the former using the Levinshon-Petrin (2003)[25] methodology. Column (7) indicates that even when controlling for productivity of firms, big firms drop products in response to higher Chinese import competition. Column (8) computes Herfindahl- Hirschman index (HHI) to check whether higher market concentration can explain product mix of the manufacturing firms. For e.g., drop in market concentration power may induces a firm to drop some of their products. We don't find any such evidence. Our primary result continues to hold: firms belonging to the highest quartile of size distribution drop their products as a response to import competition from China.

5 Untangling the Puzzle: Core Competency, Product Composition and Product Exit

This section seeks to investigate the exact reason(s) behind our benchmark finding: product drop or 'creative destruction' in case of big Indian firms (belonging to 4th Quartile) as a result of Chinese import competition in the domestic market. Results appear in **Table 10**. Following Liu (2010), we start by analyzing the core competency of the firms to check out whether this is a case of refocusing to the core product(s), at the expense of the peripheral products, by the big firms as a result of import competition from China. We define the core product of a firm as the product which has the highest average sales share (in total sales) over time. This product takes a value 1, while the other products take a value of 0. We interact the core product dummy with our measure of import competition from China in order to measure the required effect. Column (1) distinguishes the core product–the product that generates the largest share of sales within a firm–from the rest of the products–peripheral products–the firm produces and interacts the import competition measure with the core product dummy. The coefficient of the interaction term between import competition measure and the core dummy is negative and statistically significant. The negative sign indicates that the firms drop their peripheral products in the face of rising import competition from China. That is, import competition leads firms to refocus on their core products by dropping their peripheral products. We take a step forward and do the same estimation, but by dividing the firms by size, in column (2). The coefficients on four different quartiles point out that the aggregate effect (firms dropping their peripheral products) comes solely from the effect of import competition on the big firms, which seems to be consistent with our earlier results. In other words, it is only the big firms, who refocus on their core products and drop their peripheral ones, as a result of import competition from China. Bernard et al. (2006, 2011) contend that import competition leads not only to dropping of marginally viable products but also to a shift in the distribution of firm output towards high-profitable products.

[25] For details, please see Levinshon and Petrin (2003)

Next, following Liu (2010), we use the change in the sales share in total sales as the dependent variable in order to capture the compositional change of a firm's output in response to import competition. Our dependent variable here is $\Delta Sales\ Share_{pit}$. This is the change in sales share of product p. The right-hand side variables remain the same. We report the results in Columns (3) and (4). Column (3) shows the existence of a positive and significant relationship between the interaction of the import competition measure and the core product dummy, and the change in sale share for the entire sample of firms. This finding indicates that increases in import competition from China result in growth in the share of sales for the firms' core products. Once we allow for heterogeneity based on firm size, our results in Column (4) clearly indicate that our finding in the previous Column (i.e. Column 3) are driven by the larger firms in the sample i.e. those in the 3rd and 4th Quartiles of the distribution. Overall, the results suggest considerable support for the core competency hypothesis i.e., higher levels of import competition from China in the domestic market causes multiproduct firms to drop their peripheral products and instead focus on the production of their core products. We now directly test this hypothesis.

Product Exit: To confirm our above benchmark findings, we follow Iacovone et al. (2013) and Liu (2010) to consider the effects of Chinese import competition on product exit of peripheral products. We use firm-product level data to define product exit. Consequently, our panel data analysis is now three-dimensional in contrast to the two-dimensional approach adopted in our earlier estimations. Product exit is defined as:

$$y_{ikt} = \begin{cases} 1 \\ 0 \end{cases}$$

where, y_{ikt} is a firm-product specific outcome of interest for firm i or firm-product ik at time t. It takes a value 1 in the year when the firm or firm-product is last observed in the sample. Like, Iacovone et al. (2013), we also drop the last year of the sample (2007) in the exit regressions, since for this year we can't distinguish between firms (products) that exit from those who do not. To undertake this analysis, we employ probit estimations[26].

Columns (5) and (6) consider the likelihood of product exit based on the firms' core product. We continue to define a core product as the product that has the highest sales ratio on average across all the products produced by a given firm. This variable takes a value of 1 in our estimating equations. As shown in column (6), the coefficient on the interaction of the import competition index with core product and 4th Quartile dummy is negative and significant, suggesting evidence of core products to be less likely dropped by the big Indian multiproduct firms in the presence of import competition from China. Thus, our results show consistent support to our previous finding (based on product scope) that Chinese import competition leads multiproduct firms to drop their peripheral products and retreating to their core ones. In other words, we find uniform evidence that rising import competition from China in the Indian domestic market is associated with an increasing share of core products and a decreasing share of peripheral products. This result is particularly strong in case of the big firms. Thus, the results

[26] The estimating equation contained the same set of controls used for our earlier estimations.

indicate that more centralized distribution of production is related to the rising import competition faced by the Indian firms. This is very consistent with the case of the U.S. firms (Liu, 2010).

6 Additional Heterogeneity – Product Categories, Industry Exposure to Competition and Firm Characteristics

6.1 Product and Industry Categories

In this section, we seek to explore additional heterogeneity in our benchmark findings in terms of different product categories according to end-used classification, industry exposure to competition, export orientation and ownership.

We start by dividing the entire manufacturing sector into different categories of goods utilizing the user-based classification of Nouroz (2001). To classify the manufacturing sector into different user-based categories, first, we match the NIC 2004 codes with the Input-Output (I-O) classifications; then arrange the matched NIC categories into user-based products at 2004 NIC 5-digit level. Finally, we categorize the entire manufacturing sector into two major sub-sectors: (1) Final goods, which comprises of consumer durable and non-durable goods; and (2) Intermediate goods, which contains capital, intermediate and basic goods. We denote these two different categories by binary dummies. We do so in order to examine the compositional effect of import competition from China i.e., how the effect varies across different types of industrial products. In other words, this decomposition of the manufacturing sector would tell us the type of good, which suffers the most in case of India as a result of the import competition from China. Results are shown in **Table 11**.

Columns (1) – (2) and (3) – (4) measures the effect of Chinese competition on the firms producing final and intermediate goods, respectively. The coefficients continue to show us that big firms drop both these type of products as a result to import competition, with the effect 1.5 times higher in case of intermediate goods. The result of 'creative destruction' in case of intermediate goods is also significant at the aggregate level. So, there is a higher probability of dropping intermediate goods by a firm, when faced with Chinese competition, rather than final goods. In case of final goods, we obtain an additional outcome: our coefficients also indicate that small firms increase their product scope in response to Chinese competition in the domestic market. Our findings, particularly with respect to intermediate goods, are largely consistent with Goldberg et al. (2010a; 2010b). They show that the significant growth in India's domestic production in the 1990s and first decade of the 21st Century, is largely due to greater access to cheaper and greater variety (as well as greater quality) of imported intermediate as a result of a reduction in output and input tariffs. We show additional evidence that unilateral liberalization policies adopted by one of the important trading partners of India also led to increase in the import of intermediate goods by the Indian manufacturing firms. Singh (2012) also argues that intermediate goods sector of India is negatively affected because of rising imports from China.

Next, we then divide industries according to exposure from Chinese import competition in Columns (5) – (8). We classify industries as high-exposure, where the mean share of imports from China is greater than the median of the entire manufacturing sector and low-exposure, otherwise. The coefficients point out that the big firms drop products irrespective of these two different categories. However, the probability of dropping products by a firm belonging to 'high-exposure' industries is higher by a factor four vis-à-vis 'low-exposure' industries. The results also show confirm the previous evidence of small firms increasing their product diversification by pointing out that these firms add products in the low-exposure industries only.

6.2 Firm Characteristics

Lastly, we utilize two important firm-level characteristics, namely export orientation and ownership to see how firms belonging to these different categories are affected. We present our results in **Table 12**. We start with the export orientation of a firm: exporters and non-exporters. Columns (1) – (4) report that the big firms, both exporters and non-exporters, drop products in the face of rising import competition from China. The non-exporters, however, are facing the heat of the import competition from China by factor of 1.7 as compared to exporters. Also, the import competition from China is inducing the small exporters to diversify their product portfolio. Therefore, putting the results together for small firms, it can be said that there is considerable evidence of exporters adding final goods in the low-exposure industries as import competition from China intensifies. Columns (5) – (10) divide firms into three categories according to their ownership – domestic private, domestic public and foreign. As the coefficients demonstrate, there is strong evidence that large domestic private firms drop their products in response to import competition from China. In case of domestic public firms, there is only some evidence of product drop by only the small-medium sized firms, with no effect on the product-mix of the foreign multinationals.

7 Robustness Checks

We perform a number of robustness checks to test whether our findings hold across different indices of import competition, time period and method of estimation. The results are reported in **Table 13**. Column (1) uses the measure employed by Iacovone et al. (2013) – change (first difference) in the share of imports from China. The results remain consistent with our findings: big firms reduce product scope or drop products. Next, we adopt the import competition index used in case of Belgian firms by Mion and Zhu (2013) in column (2). They use the following ratio:

$$IMPSHARE_{jt}^{China} = \frac{IM_{jt}^{China}}{IM_{jt} + DP_{jt}}$$

where $IMPSHARE_{jt}^{China}$ denotes the import share of China of the goods produced by industry j in year t. IM_{jt}^{China} and IM_{jt} represent (respectively) the value of imports from China and all

countries for industry j in year t. DP_{jt} is Indian domestic production of industry j in year t. This comes from the **Annual Survey of Industries** (ASI) dataset. As the coefficients demonstrate, we continue to find strong evidence in support of big firms (firms in the 4th Quartile) dropping products in response to Chinese import competition. Column (3) exploits a measure highlighted by Alvarez and Claro (2009) while estimating the effect of Chinese competition on developing countries, especially Chile. The import penetration ratio in this case is calculated in the following manner:

$$IMPSHARE_{jt}^{China} = \frac{IM_{jt}^{China}}{(IM_{jt} + DP_{jt} - X_{jt})}$$

X_{jt} represents India's exports of goods of industry j in year t. Our primary result continues to hold as in the two previous columns. Column (4) adapts the methodology of Liu and Rosell (2013) in case of India:

$$IMPSHARE_{jt}^{China} = \sum_{j} s_{ijt} \frac{IM_{jt}^{China}}{(IM_{jt} + DP_{jt} - X_{jt})}$$

s_{ijt} is the share of firm i's revenues earned in industry j in year t. IM_{jt}, DP_{jt}, and X_{jt} are the same as defined before. The coefficients continue to exhibit heterogeneity across the firm size distribution. In Column (5), we use import share from China at period $(t-1)$ as the import competition index purported by Liu (2010) and Iacavone et al. (2013). The results don't differ. Interestingly, the magnitude of the coefficients is almost identical to those shown in Column (1) which is based on the import competition measure adopted by Iacavone et al. (2013). In column (6), we use a WTO dummy, where it takes 1 if the year is greater than or equal to 2000. This is to reduce the possibility of reducing a firm's anticipation of China's accession to the WTO and therefore causing firms to change their behavior. As the results portray, controlling for the anticipation factor of a firm does little to change our benchmark findings: big firms reduce product scope as a threat to competition.

We use a different time period in columns (7) and (8): 1992-2011. Column (7) uses $AvgM01_j * WTO_t$ as the import competition index, whereas column (8) exploits one-period lag import share. As the coefficients demonstrate, using a different time period also does little to change the results. The main difference with results in the previous columns is that the smallest firms are shown not to add to their product-mix. Lastly, column (9) exploits a different estimation method. Since our dependent variable is discrete, therefore, using traditional OLS estimation may bias the results if it is not converted into a continuous variable using logs. Therefore, we use a Poisson regression without transforming our dependent variable using log. The estimates remain stable – we now find a greater proportion of firms (upper-half of the firm-size distribution) dropping products. In conclusion, our results from the various techniques undertaken to evaluate the heterogeneous effects of import competition from China on the manufacturing firms of India are robust across different measures of import competition; time period and estimation method.

8 Conclusion

Using detailed firm level data, which reports product level information for firms across all manufacturing sectors in India spanning over two decades, and exploiting the exogenous nature of China's entry into the WTO, we find no effect of Chinese competition, either from domestic or export market, on the product variety of the Indian manufacturing firms at the aggregate level. However, dividing the firms by size, we find consistent evidence of big firms dropping products. And, this effect comes solely from competition in the domestic market. Going deeper to find out the reason for such, our exercises on looking at the core-competency of firms reveal that these big multiproduct firms are refocusing on core products more by dropping peripheral products in response to Chinese threat. This is consistent with both the theoretical (Eckel and Neary, 2010) and empirical literature (Liu, 2010; Lopresti, 2016). These patterns are observed among both exporters and non-exporters, and domestic private firms. We also find that higher Chinese competition forces firms to drop both intermediate and final goods, with effect on intermediate goods larger. In addition, we find some, relatively small, evidence product scope expansion, adding final goods, in the low-exposure industries by small exporters. Finally, our results are consistent across a battery of robustness checks and IV analysis, where we control for endogeneity of the import competition index using a third country's share of imports from China, which is EU imports share from China as an instrument.

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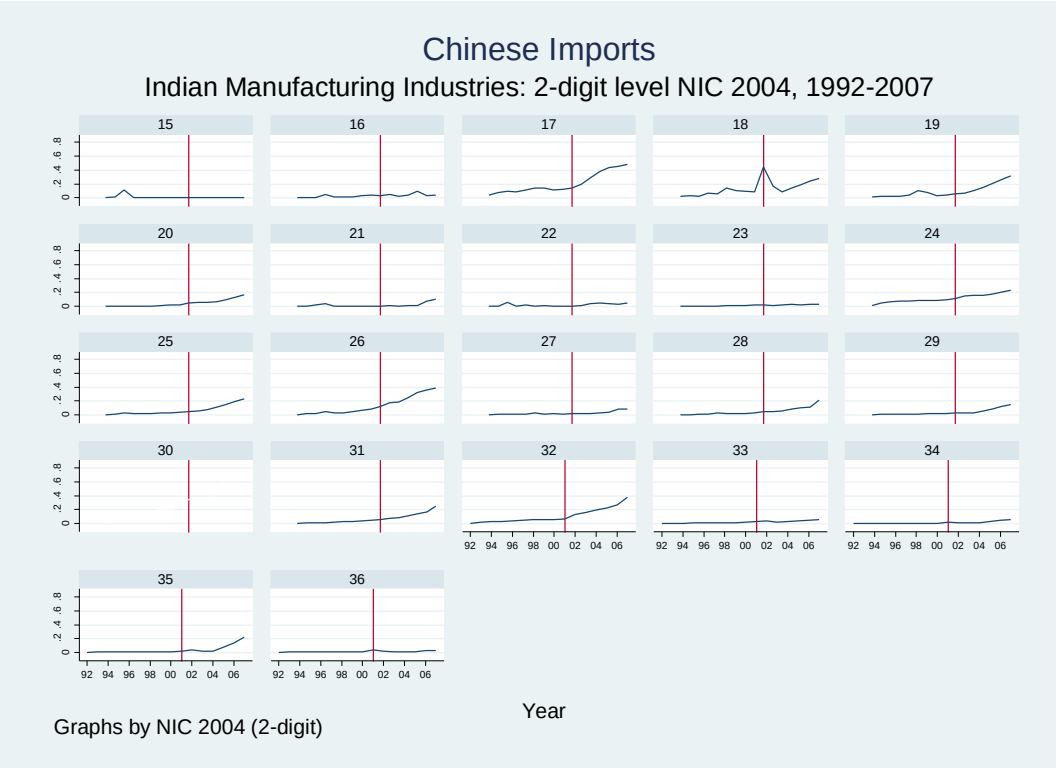
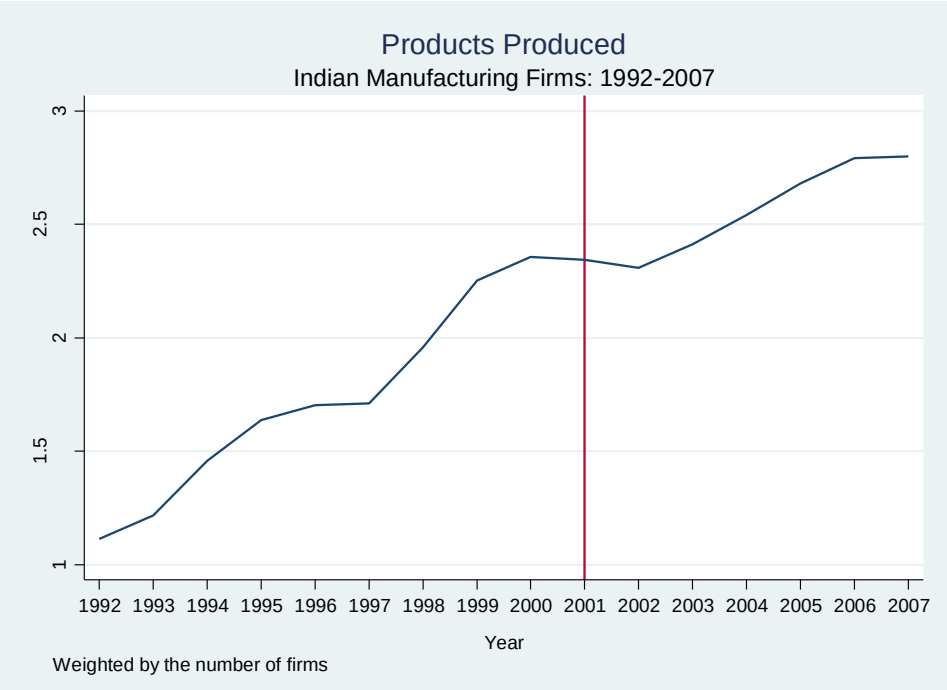
Notes: Figures represent the average share of Chinese imports in total imports across manufacturing industries in a given year.

Figure 1: Share of Imports from China by Indian Manufacturing Sector, 1992-2007



Notes: Figures represent the average share of Chinese imports in total imports across each manufacturing industry (at 2-digit, NIC 2004) in a given year.

Figure 2: India's Manufacturing Imports from China by Industry (NIC 2004 2-digit), 1992-2007



Notes: Figures represent the average number of product varieties produced by a representative Indian manufacturing firm in a given year.

Figure 3: Number of Products Produced by an average Manufacturing Firm in India,1992-2007

	Technological Similarity with China (Top Ten)
India	0.928
Turkey	0.907
Indonesia	0.904
Hungary	0.897
Brazil	0.896
Philippines	0.889
Mexico	0.879
Egypt, Arab Rep.	0.873
Vietnam	0.868
Korea, Rep.	0.862

Notes: The table reports the top ten countries in terms of technological similarity with China.
Source: Julian di Giovanni et al. (2014).

Table 1: Technological Similarity with China

	Trade with China		Imports from other countries			
	Imports from China	Exports to China	ASEAN excluding China	US	EU27	Imports from the World
1992	140.8	157.8	1151.3	2325.5	7558.8	24452.4
2001	1827.5	922.5	4355.5	3226.7	10345.7	50671.1
2007	24575.8	9492	21031	14206.4	32394.7	218645.3
Growth (1992-2007)	17353.6%	5913.4%	1726.6%	510.9%	328.6%	794.2%

Notes: Values in USD Million. The table reports trade values of India with respect to different destinations.

Table 2: Trade with China and Others

	Mean	Median	Std. Dev	Min	Max
Product Scope	4.45	3	4.35	1	84
Chinese Competition	8.39	3.17	11.45	0	93.25
Skill Intensity	0.26	0.25	0.07	0.05	0.71
Factories	3994.10	3352	3105.05	15	14486
Domestic Production	345609.1	204438.2	381651.7	0	3662028
Management Technology	2	2.43	1.07	0	3.17
Sales	1840.41	268.8	21579.36	0	2000000
Export Share	0.48	0.003	51.51	0	11982.5
Productivity	0.21	0	1.14	0	309.85
Herfindahl Index	0.03	0.01	0.06	0	1
Technology Adoption/GVA	0.02	0	6.34	0	2163
Gross Value-Added (GVA)	383.84	0	8383.51	0	1200000
Assets	1786.19	240.1	14497.15	0	1200000
Age	17.12	13	18.81	5	128

Notes: Annual data at the firm-level, covering the period 1992-2007. Monetary values are in real INR (Indian Rupees) Millions. 'Product Scope' is the number of products manufactured by each firm in a single year. 'Chinese Competition' is the percentage share of Chinese imports in total imports by an industry. 'Skill Intensity' is the ratio of non-production workers to total employees at 3-digit level of National Industrial Classification (NIC) 2004. 'Factories' is the number of factories at 3-digit level of NIC 2004. 'Domestic Production' is the total output produced by an industry at 3-digit level of NIC 2004. 'Management Technology' is the management quality score obtained from Bloom and Van Reenen (2010) at 2-digit level of NIC 2004. 'Sales' is the total sales (domestic + exports) by a firm. 'Export Share' is the share of exports of a firm in its total sales. 'Productivity' is a measure of firm productivity computed following the Levinsohn and Petrin (2003) methodology. 'Herfindahl Index' (also known as Hirschman-Herfindahl Index, or HHI) is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. It is measured as $H = \sum_{i=1}^{N} s_i^2$, where s_i is the market share of firm i in the market, and N is the number of firms. 'Technology Adoption/GVA' is the total amount of technological adoption share of gross value-added (GVA) of a firm. Technology Adoption = R&D expenditure + Royalty payments for technical knowhow. 'Assets' is the total assets of a firm. 'Age' is the age of a firm.

Table 3: Summary Statistics

Industry Code	Industry Name	Product Variety	
NIC 2004 2-digit		1992-2001	2002-2007
		(1)	(2)
15	Foods Products and Beverages	5.33	5.33
16	Tobacco Products	6.97	6.42
17	Textiles	3.78	4.09
18	Wearing Apparel	3.89	3.52
19	Leather	5.29	4.51
20	Wood and Wood Products	6.06	5.76
21	Paper and Paper Products	3.87	3.79
22	Recorded Media	3.94	2.82
23	Coke, Refined Petroleum, Nuclear Fuel	6.10	5.94
24	Chemical and Chemical Products	6.49	6.05
25	Rubber and Plastics	4.32	4.42
26	Non-metallic Mineral Products	4.36	4.25
27	Basic Metals	4.80	4.87
28	Fabricated Metal Products	4.13	4.55
29	Machinery and Equipment	5.79	5.27
30	Office, Accounting & Computing Machinery	6.70	7.03
31	Electrical Machinery and Apparatus	7.09	6.97
32	Communication Equipment	7.51	6.83
33	Medical, Precision and Optical Instruments	6.15	6.00
34	Motor vehicles, Trailers and Semi-Trailers	6.50	7.44
35	Other transport equipment	5.23	5.20
36	Furniture; Manufacturing n.e.c.	4.41	3.52
	Average	5.36	5.09

Notes: The numbers represent average across multiproduct firms belonging to each industrial category according to National Industrial Classification (NIC) 2004 2-digit level. 'Product Variety' is the number of products produced by an average multiproduct firm in each of these industrial categories.

Table 4: Average Product Variety of Indian Manufacturing Industries (NIC 2004 2-digit) – Before and After 2001

Industry Code NIC 2004 2-digit	Industry Name	Share of Imports From China (%)		
		1992-1997	1998-2001	2002-2007
		(1)	(2)	(3)
15	Foods Products and Beverages	2.21	0.25	0.28
16	Tobacco Products	1.24	2.91	4.41
17	Textiles	8.98	13.92	40.76
18	Wearing Apparel	5.71	18.03	18.52
19	Leather	3.71	5.46	20.10
20	Wood and Wood Products	0.32	3.37	10.32
21	Paper and Paper Products	1.15	0.43	3.87
22	Recorded Media	1.36	0.60	4.09
23	Coke, Refined Petroleum, Nuclear Fuel	0.62	1.46	2.48
24	Chemical and Chemical Products	5.93	10.39	18.41
25	Rubber and Plastics	1.72	3.92	15.42
26	Non-metallic Mineral Products	2.45	9.94	29.92
27	Basic Metals	1.28	1.62	5.01
28	Fabricated Metal Products	1.14	3.35	11.24
29	Machinery and Equipment	1.05	2.41	9.13
30	Office, Accounting & Computing Machinery	5.21	26.79	56.33
31	Electrical Machinery and Apparatus	1.63	4.82	15.02
32	Communication Equipment	2.82	7.49	24.46
33	Medical, Precision and Optical Instruments	0.57	2.02	3.87
34	Motor vehicles, Trailers and Semi-Trailers	0.05	0.76	3.13
35	Other transport equipment	0.74	1.62	8.89
36	Furniture; Manufacturing n.e.c.	0.95	1.69	1.55

Notes: The numbers represent average across all firms belonging to each industrial category according to National Industrial Classification (NIC) 2004 2-digit level. 'Share of Imports from China' is the share of Chinese imports in total imports. 'Product Variety' is the number of products produced by an average manufacturing firm in each of these industrial categories.

Table 5: Average Chinese Import Competition across Indian Manufacturing Industries (NIC 2004 2-digit)

	Share of Imports from China (%)			Product Variety	
	1997	2001	2007	1992-2001	2002-2007
	(1)	(2)	(3)	(4)	(5)
Intermediate Goods	2.59	6.31	18.15	4.60	4.12
Final Goods	3.71	6.96	17.54	4.26	4.15

Notes: The numbers represent average across all firms belonging to each industrial category according to National Industrial Classification (NIC) 2004 2-digit level. 'Share of Imports from China' is the percentage share of Chinese imports in total imports. 'Product Variety' is the number of products produced by an average manufacturing firm in each of these product categories.

Table 6: Chinese Import Competition and Product Variety (Product Categories – Intermediate and Final Goods)

	Log (Product Scope + 1)							
	Aggregate (1992-2007)				Size Heterogeneity (1992-2007)			
		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)	Input tariffs		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)	Input tariffs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MC^{IN}_{Chinese}$	–0.002	–0.002	0.001	–0.002				
	(0.002)	(0.002)	(0.002)	(0.002)				
$InputTariff_{t-1}$				0.010				–0.009
				(0.018)				(0.018)
$MC^{IN}_{Chinese}$*1st Quartile					0.002	0.002	0.005*	0.002
					(0.003)	(0.003)	(0.003)	(0.003)
$MC^{IN}_{Chinese}$*2nd Quartile					0.003	0.003	0.006**	0.003
					(0.002)	(0.002)	(0.003)	(0.002)
$MC^{IN}_{Chinese}$*3rd Quartile					–0.003	–0.004	–0.001	–0.003
					(0.002)	(0.003)	(0.003)	(0.003)
$MC^{IN}_{Chinese}$*4th Quartile					–0.010***	–0.010***	–0.007**	–0.010***
					(0.003)	(0.003)	(0.003)	(0.003)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Sq.	0.20	0.20	0.21	0.20	0.21	0.21	0.21	0.21
N	48882	48882	48882	48882	48882	48882	48882	48882
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	No	Yes	No	Yes	No	Yes	No	Yes
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	No	Yes	No

Notes: The dependent variable in columns (1) - (8) is the natural logarithm of number of products manufactured by a firm in each year plus 1. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. '$InputTariff_{t-1}$' is tariffs of intermediate inputs at the 4-digit NIC 2004. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the individual terms of the interaction. *, **, *** denotes 10%, 5% and 1% level of significance.

Table 7: Effect of Chinese Import Competition (Domestic Market) on Product Variety of Indian Firms: Benchmark Results

	Log (Product Scope + 1)					
	Aggregate (1992-2007)			Size Heterogeneity (1992-2007)		
		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)
	(1)	(2)	(3)	(4)	(5)	(6)
$MC_{Chinese}^{IN}$	–0.002**	–0.002**	–0.004**			
	(0.001)	(0.001)	(0.002)			
$MC_{Chinese}^{IN}$*1st Quartile				–0.004**	–0.004**	–0.006**
				(0.002)	(0.002)	(0.003)
$MC_{Chinese}^{IN}$*2nd Quartile				–0.002	–0.002	–0.003
				(0.001)	(0.001)	(0.002)
$MC_{Chinese}^{IN}$*3rd Quartile				–0.001	–0.001	–0.003
				(0.001)	(0.001)	(0.002)
$MC_{Chinese}^{IN}$*4th Quartile				–0.003***	–0.003***	–0.005**
				(0.001)	(0.001)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.10	0.10	0.11	0.10	0.10	0.11
N	42170	42170	42170	42170	42170	42170
F-stat (exogeneity of the instrument)	28.54	28.36	26.36	28.39	28.21	26.23
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	No	Yes	No	No	Yes	No
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	Yes

Notes: The dependent variable in columns (1) - (6) is the natural logarithm of number of products manufactured by a firm in each year plus 1. '$MC_{Chinese}^{IN}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgMo1' and 'WTO'. 'AvgMo1' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. 'Share of Chinese Imports' is the 'share of Chinese imports in total imports of EU' at NIC 2004 4-digit level. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned),'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance. First-stage results are not reported due to lack of space and are available on request.

Table 8: Effect of Chinese Import Competition (Domestic Market) on Product Variety of Indian Firms: IV

	Log (Product Scope + 1)							
	Additional Channels (1992-2007)							
	Industry Channels				Firm Channels			
	Skill Share	Factories	Domestic Production	Management Technology	Sales	Export Share	Productivity	Herfindahl Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MC^{IN}_{Chinese}$*1[s]Quartile	0.002	0.002	0.003	0.001	0.002	0.002	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$MC^{IN}_{Chinese}$*2[nd]Quartile	0.003	0.003	–0.004**	0.002	0.005*	0.004	0.002	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
$MC^{IN}_{Chinese}$*3[rd]Quartile	–0.004	–0.004	–0.003	–0.004	–0.002	–0.004	–0.004	–0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$MC^{IN}_{Chinese}$*4[th]Quartile	–0.011***	–0.010***	–0.011***	–0.011***	–0.010***	–0.012***	–0.009***	–0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Channel*1[st]Quartile	0.274	0.007	0.039*	–0.514	0.005	0.095	0.014	0.039**
	(0.282)	(0.032)	(0.021)	(1.471)	(0.006)	(0.065)	(0.017)	(0.017)
Channel*2[nd]Quartile	0.130	0.024	0.043**	–0.935	0.019***	0.108**	0.010	–0.009
	(0.265)	(0.032)	(0.021)	(1.479)	(0.005)	(0.055)	(0.017)	(0.017)
Channel*3[rd]Quartile	–0.330	0.028	0.044**	–1.199	0.022***	0.043	–0.001	0.007
	(0.260)	(0.031)	(0.024)	(1.473)	(0.006)	(0.039)	(0.019)	(0.018)
Channel*4[th]Quartile	–0.474*	0.046	0.077***	–1.561	0.064***	0.004	–0.044*	–0.038*
	(0.283)	(0.031)	(0.022)	(1.490)	(0.006)	(0.057)	(0.026)	(0.021)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.21	0.21	0.21	0.20	0.22	0.22	0.21	0.21
N	48882	48882	48882	47593	48882	44711	48882	48867
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable in columns (1) – (8) is the natural logarithm of number of products manufactured by a firm in each year plus 1. . '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. Each 'Channel' refers to the firm or industry characteristics specified at the top of each column. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table 9: Effect of Chinese Import Competition (Domestic Market) on Product Variety of Indian Firms: Additional Controls (Industry-Firm)

	Core Competency		Product Composition		Product Exit	
	Log (Product Scope + 1)		ΔSales Share			
	1992-2007		1992-2007		1992-2007	
	(1)	(2)	(3)	(4)	(5)	(6)
$MC^{IN}_{Chinese}$*Core	–0.005*		0.002**		–0.005	
	(0.003)		(0.001)		(0.004)	
$MC^{IN}_{Chinese}$*1st Quartile*Core		–0.001		0.002		–0.006
		(0.004)		(0.001)		(0.006)
$MC^{IN}_{Chinese}$*2nd Quartile*Core		–0.005		–0.0004		–0.002
		(0.005)		(0.001)		(0.008)
$MC^{IN}_{Chinese}$*3rd Quartile*Core		–0.003		0.004**		–0.005
		(0.005)		(0.002)		(0.009)
$MC^{IN}_{Chinese}$*4th Quartile*Core		–0.011**		0.007***		–0.019**
		(0.006)		(0.002)		(0.009)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.44	0.45	0.70	0.71	0.03	0.03
N	286926	286926	235943	235943	262820	262820
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable in columns (1) and (2) is the natural logarithm of number of products manufactured by a firm in each year plus 1. Columns (3) and (4) use the change in the sales share of a firm per product. Columns (5) and (6) use 'Product Exit' as the dependent variable. It takes a value 1 or 0. We use Probit regressions to estimate. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. 'Core' is defined as the core product of a firm. It takes a value 1 for that product, which has the highest sales ratio on average across all the products produced by that firm. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table 10: Effect of Chinese Import Competition (Domestic Market) on Product Variety of Indian Firms: Untangling the Puzzle – Core Competency, Product Composition and Product Exit

	Log (Product Scope + 1)							
	Product Categories				Exposure Categories			
	Final Goods		Intermediate Goods		High-Exposure Industries		Low-Exposure Industries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MC^{IN}_{Chinese}$	–0.0001		–0.006**		–0.001		0.002	
	(0.002)		(0.003)		(0.003)		(0.011)	
$MC^{IN}_{Chinese}$*1st Quartile		0.006**		–0.003		0.003		0.009
		(0.003)		(0.004)		(0.004)		(0.015)
$MC^{IN}_{Chinese}$*2nd Quartile		0.004		0.001		0.004		0.026*
		(0.003)		(0.004)		(0.004)		(0.015)
$MC^{IN}_{Chinese}$*3rd Quartile		–0.004		–0.003		–0.002		0.006
		(0.003)		(0.004)		(0.004)		(0.016)
$MC^{IN}_{Chinese}$*4th Quartile		–0.008**		–0.012***		–0.033**		–0.008**
		(0.004)		(0.005)		(0.004)		(0.016)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.20	0.21	0.21	0.21	0.17	0.18	0.23	0.23
N	21341	21341	24181	24181	19471	19471	29411	29411
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable in columns (1) - (8) is the natural logarithm of number of products manufactured by a firm in each year plus 1. 'Final Goods' refer to consumer durable and non-durable goods, whereas, 'Intermediate Inputs' is a combination of intermediates, basic and capital goods. 'High-Exposure' industries are defined as when the average import share of any industry is greater than the median import share of all the industries put together and vice-versa for 'Low-Exposure' industries'. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table 11: Effect of Chinese Competition (Domestic Market) on Product Variety of Indian Firms: Product Categories and Industry Exposure to Competition

	Log (Product Scope + 1)									
	Firm Characteristics (1992-2007)									
	Export Orientation				Ownership					
	Exporters		Non-Exporters		Domestic Private		Domestic Public		Foreign	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$MC_{Chinese}^{IN}$	–0.004		–0.004*		–0.003		–0.016*		0.004	
	(0.002)		(0.002)		(0.002)		(0.009)		(0.007)	
$MC_{Chinese}^{IN}$*1st Quartile		0.002		–0.003		0.002		–0.006		–0.009
		(0.005)		(0.003)		(0.003)		(0.017)		(0.018)
$MC_{Chinese}^{IN}$*2nd Quartile		0.007**		–0.001		0.002		–0.029*		–0.010
		(0.004)		(0.003)		(0.002)		(0.017)		(0.018)
$MC_{Chinese}^{IN}$*3rd Quartile		–0.004		–0.005		–0.005*		–0.014		0.002
		(0.003)		(0.004)		(0.003)		(0.010)		(0.010)
$MC_{Chinese}^{IN}$*4th Quartile		–0.010***		–0.017***		–0.012***		–0.009		–0.001
		(0.003)		(0.006)		(0.003)		(0.010)		(0.010)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.21	0.21	0.20	0.20	0.20	0.21	0.48	0.51	0.27	0.29
N	23881	23881	25001	25001	44510	44510	1849	1849	2523	2523
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the natural logarithm of number of products manufactured by a firm in each year plus 1. '$MC_{Chinese}^{IN}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table 12: Effect of Chinese Competition (Domestic Market) on Product Variety of Indian Firms: Firm Characteristics – Export Orientation and Ownership

	Log (Product Scope + 1)								Product Scope
	Robustness Checks (1992-2007)						Robustness Checks (1992-2011)		Robustness Checks (1992-2007)
	Iacovone et al. (2013)	Mion & Zhu (2013)	Alvarez & Claro (2013)	Liu & Rosell (2013)	$ImpSh_{t-1}$	WTO = 1 if year ≥ 2000	AvgM01* WTO	$ImpSh_{t-1}$	Poisson AvgM01*WTO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$MC^{IN}_{Chinese}$*1st Quartile	0.005***	0.272***	0.308***	3.008**	0.003***	0.003	0.004	0.004***	0.002
	(0.001)	(0.066)	(0.071)	(1.330)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)
$MC^{IN}_{Chinese}$*2nd Quartile	0.002*	0.040	0.059	–0.920	0.001	0.005	0.004	0.001	0.001
	(0.001)	(0.073)	(0.073)	(1.984)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)
$MC^{IN}_{Chinese}$*3rd Quartile	–0.0001	–0.106	–0.067	–1.951	–0.001	–0.004	–0.002	–0.001	–0.004**
	(0.001)	(0.070)	(0.070)	(1.233)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)
$MC^{IN}_{Chinese}$*4th Quartile	–0.004***	–0.317***	–0.281***	–5.391**	–0.004***	–0.012***	–0.015***	–0.003***	–0.007***
	(0.001)	(0.069)	(0.064)	(2.350)	(0.001)	(0.004)	(0.004)	(0.001)	(0.002)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.21	0.21	0.24	0.21	0.21	0.21	0.20	0.20	n/a
N	41970	48882	48882	48880	41970	48882	59178	50842	48455
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable in columns (1) - (8) is the natural logarithm of number of products manufactured by a firm in each year plus 1. Column (9) uses number of products manufactured, therefore, using Poisson regression. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in the domestic market of India. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. Columns (1) - (6) and (9) use 1992-2007 as the time period, whereas, Columns (7) and (8) use 1992-2011 as the same. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned), 'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table 13: Effect of Chinese Competition (Domestic Market) on Product Variety of Indian Firms: Robustness Checks

Appendix

A Data

We use an annual-based panel of Indian manufacturing firms that covers up around 9000+ firms, across 105 industries, over the period of 1992-2007. Data is used from the PROWESS database of the Centre for Monitoring Indian Economy (CMIE). All monetary-based variables measured in Millions of Indian Rupees (INR), deflated by 2005 industry-specific Wholesale Price Index (WPI). We use 2004 National Industrial Classification (NIC). We use the import penetration data from the UN-COMTRADE. We match the HS 6-digit trade data with the industrial codes using Debroy and Santhanam (1993).

Variable definitions:

1. **Product Scope**: The number of products produced by a firm, which represents the product variety of a firm.
2. **Chinese Competition (domestic market)**: Share of Chinese imports in total imports of India.
3. **Chinese Competition (export market)**: Share of Chinese imports in total imports of US.
4. **Instrument for Chinese Competition (domestic market)**: Share of Chinese imports in total imports of EU.
5. **Instrument for Chinese Competition (export market)**: Share of Chinese imports in total world imports minus US, EU and India.
6. **Skill intensity**: Ratio of non-production workers to total employees at the 3-digit level of 2004 NIC. This is obtained from two different sources - the years 1992-2000 has been generously shared by Dr. Sangeeta Ghosh; and for 2001-2007 from the various publications of ASI.
7. **Factories**: The number of factories at the 3-digit level of 2004 NIC.
8. **Domestic Production**: The value of output at the 3-digit level of 2004 NIC.
9. **Management technology**: Management Quality score for the year 2004 at 2-digit NIC, obtained from Bloom et al. (2010); the score is between 1 and 5, with 5 denoting the highest quality.
10. **Sales**: Total sales of a firm.
11. **Export Share**: (Total Exports/Total Sales) of a firm.
12. **Productivity**: Firm TFP computed using the Levinsohn and Petrin (2003) methodology.
13. **Herfindahl Index**: The Herfindahl index (also known as Herfindahl--Hirschman Index, or HHI) is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. It is measured as $H = \sum_{i=1}^{N} s_i^2$, where s_i is the market share of firm i in the market, and N is the number of firms.
14. **Intermediate goods**: The goods which are classified according to the I-O table as inputs by end-use. It combines intermediates, capital and basic goods.
15. **Final goods**: The goods which are classified according to the I-O table as final products by end-use. It combines consumer durable and consumer non-durable goods.
16. **TechAdop/GVA**: Share of R&D expenditure and Royalty Payments for Technical Knowhow in Gross Value-Added.
17. **GVA**: Gross Value-Added = Total Sales - Total Raw Material Expenditure.
18. **Assets**: Total assets of a firm.
19. **Ownership**: It indicates whether a firm is domestic-owned or foreign-owned.
20. **Age**: Age of a firm in years.

B Tables

	Multi-Product Firms	Single-Product Firms
	(1)	(2)
Sales	2108.26	730.62
Capital Intensity	1335.49	561.71
Assets	1999.03	780.22
Wages	46.06	34.01
TFP	0.30	0.23
Share of Output	91%	9%
Share of Firms	74%	26%

Notes: Numbers represent values for an average manufacturing firm in India in a year. Values are in INR Million.

Table B.1: Mutliproduct and Single-product Firms

	Log (Product Scope + 1)					
	Aggregate (1992-2007)			Size Heterogeneity (1992-2007)		
		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)
	(1)	(2)	(3)	(4)	(5)	(6)
$MC^{IN}_{Chinese}$	–0.001	–0.001	0.001			
	(0.002)	(0.002)	(0.003)			
$MC^{IN}_{Chinese}$*1st Quartile				0.001	0.001	0.004
				(0.003)	(0.003)	(0.003)
$MC^{IN}_{Chinese}$*2nd Quartile				0.002	0.002	0.005
				(0.002)	(0.002)	(0.003)
$MC^{IN}_{Chinese}$*3rd Quartile				–0.001	–0.001	0.001
				(0.003)	(0.002)	(0.003)
$MC^{IN}_{Chinese}$*4th Quartile				–0.004*	–0.004*	–0.002
				(0.002)	(0.002)	(0.003)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.27	0.27	0.28	0.27	0.27	0.28
N	55675	55675	55675	55675	55675	55675
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	No	Yes	No	No	Yes	No
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	Yes

Notes: The dependent variable in columns (1) - (6) is the natural logarithm of number of products manufactured by a firm in each year plus 1. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in one of the main export markets of India, US. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China by US at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned),'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *,**,*** denotes 10%, 5% and 1% level of significance.

Table B.2: Effect of Chinese Import Competition (Export Market) on the Product Variety: Benchmark Results (Chinese share of imports of US)

	Log (Product Scope + 1)					
	Aggregate (1992-2007)			Size Heterogeneity (1992-2007)		
		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)		Time Trend* Industry FE (4-digit)	Year FE* Industry FE (2-digit)
	(1)	(2)	(3)	(4)	(5)	(6)
$MC^{IN}_{Chinese}$	0.002	0.002	–0.017			
	(0.005)	(0.005)	(0.039)			
$MC^{IN}_{Chinese}$*1st Quartile				–0.004	–0.003	–0.005
				(0.007)	(0.007)	(0.020)
$MC^{IN}_{Chinese}$*2nd Quartile				0.001	0.001	–0.007
				(0.017)	(0.018)	(0.029)
$MC^{IN}_{Chinese}$*3rd Quartile				0.002	0.002	–0.003
				(0.013)	(0.014)	(0.027)
$MC^{IN}_{Chinese}$*4th Quartile				0.001	0.0004	0.007
				(0.023)	(0.024)	(0.029)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-Square	0.09	0.09	0.09	0.09	0.09	0.08
N	40332	40332	40332	46226	46226	46226
F-stat (exogeneity of the instrument)	28.81	28.63	25.90	27.82	27.61	25.21
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE*Time Trend	No	Yes	No	No	Yes	No
Industry FE (2-digit)*Year FE	No	No	Yes	No	No	Yes

Notes: The dependent variable in columns (1) - (6) is the natural logarithm of number of products manufactured by a firm in each year plus 1. '$MC^{IN}_{Chinese}$' is defined as an index of import competition from China in one of the main export markets of India, US. It is an interaction of two terms – 'AvgM01' and 'WTO'. 'AvgM01' is the average of imports from China by US at NIC 2004 4-digit level for the years on or before 2001 (1992-2001) and 'WTO' is a year dummy, which takes a value 1 if the year is greater than or equal to 2002. We use 'Chinese Share of Total World Imports minus US, EU and India' as the instrument for the share of 'Chinese Imports by US'. Quartiles are defined according to the total assets of a firm. A firm belongs to 1st quartile if the total asset of that firm is below 25th percentile of the total assets of that industry to which the firm belongs and so on. Firm controls include age of a firm, age squared, ownership dummy (either domestic or foreign owned),'TechAdop/GVA' and size of a firm. 'TechAdop' measures the level of technology adoption, defined as the sum of R&D expenditure and royalty payments for technical knowhow. We use assets as the size indicator. Numbers in the parenthesis are robust clustered standard errors at the industry level. Intercepts are not reported. All the regressions contain the pairwise and individual terms of the interactions. *, **, *** denotes 10%, 5% and 1% level of significance.

Table B.3: Effect of Chinese Import Competition (Export Market) on the Product Variety: IV (Chinese Share of World Imports minus US, EU and India)