Trade Liberalization and Reallocation of Production
An Analysis of Indian Manufacturing

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Draft: August 2012

Abstract

In this paper, we look at the impact of the removal of the Multifibre Agreement quotas on reallocation of market-share and prices charged by Indian textile firms. We employ a difference-in-differences estimation technique on firm-level data from India to find that this reduction in trade barriers was associated with an increase in sales of quota-restricted products relative to non-quota restricted textile products. These effects are robust to controlling for unobservable firm-specific shocks affecting outcomes. Results also suggest that the MFA quota removal was associated with reallocation of market-share towards low-price products. Also, the price decrease associated with quota-removal was greater for low-price products, consistent with quality downgrading by firms in the presence of quotas. Results also indicate that these effects operate through the extensive margin, through product switching by firms. Our study highlights the role of distortions induced by trade barriers in developing countries in determining the allocation of production.

JEL codes: F10, F13, L11, O14, O24

Keywords: Quotas, Quality Upgrading, Firm Behavior, Market Distortions, Welfare

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1. Introduction

The Multifibre Arrangement (MFA) on Textile and Clothing (T&C) institutionalized quotas on cotton textiles and apparel products by countries like the United States and the United Kingdom against Asian textile exporters in 1974. The motivation behind the arrangement was for developed countries to seek a more systematic mechanism to deal with the continued growth of textile and clothing exports from large Asian countries. The MFA quotas were negotiated on four main MFA 'groups' of products spanning Yarn, Fabric, Made-Ups and Clothing. Protection from textile and apparel imports extended over a 20 year period, until 1994 and the singing of the Agreement on Textile and Clothing (ATC) under the Uruguay Round of negotiations under the World Trade Organization, after which the process of phasing down these import quotas began. The final phase down of the MFA/ATC (hereinafter MFA) quotas occurred in 2005, when all quotas under this arrangement were abolished.

For labor-abundant countries like India and China with a comparative advantage in labor-intensive products, the MFA quotas were binding on clothing and textile exports. India, for example, exhibited a quota fill rate of 87 percent, next to only China and Bangladesh, who both exhibit a quota fill rate of 88 percent (Brambilla, Khandelwal and Schott 2010).[1] Thus, the removal of MFA quotas allowed for improved access to developed markets for these large developing exporters.

The effect of the removal of MFA quotas on prices and export volumes, however, is not symmetrical across all products. Theoretically, a quota is analogous to a fixed cost added to the price of a good – the specific tariff equivalent of quotas established by Falvey (1979). The implication for import prices in the quota imposing country is twofold: (i) the prices of quota restricted products rise, but (ii) the increase in price is strongest for relatively low priced varieties. Quotas, therefore, shift home composition of quota constrained goods towards relatively high priced varieties, i.e. quotas lead to quality upgrading.

The effect of the ending of the MFA on trade volumes and trade prices is well established (Barrows and Harrigan 2009; Brambilla et al. 2009). Less studied is the impact on

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[1] Brambilla, Khandelwal and Schott (2007) look at the 'adjusted base quota', actual exports and quota fill rates (defined as exports divided base quota) for major developing exporters of textile and clothing from 1984 through 2004 under the MFA/ATC. They define the adjusted base quota as the quota originally negotiated quota level at the start of an agreement term, adjusted for "flexibilities" that allow countries to borrow unused base quotas across MFA groups and years.

firm behavior in the quota restricted country. Yet, as argued by Melitz (2003), trade policy shocks have heterogeneous effects on firms within industries. The aggregate trade response is a combination of within-firm responses and between-firm shifts in the composition of output.

In this paper, we investigate the effect of the removal of the MFA/ATC (hereinafter MFA) quotas on market-share and pricing behavior using firm-level data[2]. This focus is important for various reasons. First, we are interested in studying the impact of a reduction in trade barriers on firm behavior and the reallocation of production resulting from the absence of this market distortion, an exercise that, we believe, has important implications for ascertaining welfare gains. Second, we wish to test trade theory that predicts quality downgrading among firms as a result of the removal of the MFA quotas. The ending of the MFA is useful in this regard as it was an externally imposed reduction in trade barriers, and hence presents a suitable opportunity to control for some of the endogeneity in trade policy.

We focus on India for two reasons. First, we are able to exploit firm-level panel data on Indian textile firms that allows us to account for some of the firm-specific unobserved heterogeneity driving outcomes and also selection into products. Second, we evaluate the impact of the quota removal on the Indian textile industry, an industry accounting for a sizeable share of manufacturing in a large developing economy[3]. The firm-level data base that we use contains data on publicly listed firms that account for about 60 to 70 percent of the economic activity in the organized industrial sector in India. The database has information on sales and quantities of 1,918 products produced by each textile firm over the period 2002 through 2008.

The detailed product level information allows us to explore the differential impact of the MFA on quota restricted and non-restricted products within the firm. We are hence able to adopt a difference-in-differences estimation technique that looks at differential sales and unit-values (our measure of price) of products that were subject to quotas and those that were not, before and after 2005, to identify the effect of the removal of quotas on firm behavior. This empirical strategy allows us to control for demand and supply side unobservable shocks such as changing consumer preferences and changes in technology or the policy environment that might affect firm behavior.

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[2] We note that what we measure here is the net effect from the MFA quota phase down, including the effect of the surge in Chinese (and other major developing exporter) textile and clothing exports.

[3] The textile industry in India accounted for 21 percent of manufacturing employment and 8 percent of manufacturing value added in 2005-06 (see report on 'Productivity and Competitiveness of Indian Manufacturing Sector: Textiles and Garments', 2010)

This study relates to the literature using micro data to look at the impact of trade liberalization on firm behavior (Pavcnik, 2002, Goldberg, Khandelwal, Pavcnik and Topalova, 2010), and in general, market distortions on firm behavior, focusing both on the intensive margin (Hsieh and Klenow, 2009, Dollar and Wei, 2007, Petrin and Sivadasan, 2010) and the extensive margin (Khandelwal, Schott and Wei, 2011). We also contribute to the literature on the evidence for quality upgrading brought about by an import quota (Feenstra, 2005).

Khandelwal, Schott and Wei, 2011 look specifically at productivity gains to China from the MFA quota phase-down and decompose it into gains from removal of the trade barrier and gains from the removal of export licensing under the MFA quotas, using trade data on exports by firm at the firm, product and destination level. They find that almost half of the overall productivity gain among Chinese exporters following quota removal was due to the elimination of the quota licensing institution. They also find evidence for price declines associated with quota removal in the extensive margin, driven by entry of low-priced exporters, consistent with quality downgrading. However, on probing further, they find that evidence for quality downgrading in the Chinese case is weak, not robust to the inclusion of country-product pair effects, and inconsistent with results on productivity effects of the quota removal derived from an alternate firm-level production database.

While our data, unlike theirs, does not allow us to distinguish between export and domestic sales, we are able to use sales and price data at the product level for each firm, thereby enabling us to use a difference-in-differences estimation strategy to analyze the impact of the MFA quota removal. Also, our firm-level data contain production data, including information on inputs at the firm level, which can then allow us to analyze reallocation effects across firms of differing productivity levels using a similar difference-in-differences strategy[4].

We find that this reduction in trade barriers was associated with an increase in sales of quota-restricted products relative to non-quota restricted textile products. The magnitude of these effects suggests that quota removal was associated with an increase in sales of about 20 percent. We find that these effects are robust to controlling for unobservable firm-specific shocks affecting outcomes. We, however, find that the evidence for a price effect of the MFA

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[4] We are currently endeavouring to look at such reallocation effects across firms of varying productivity levels.

quota removal is relatively weak. Our results also suggest that the MFA quota removal was associated with reallocation of market-share towards low-price products. Also, evidence suggests that the price decrease associated with quota-removal was greater for low-price products, consistent with quality downgrading by firms in the presence of quotas. Results also indicate that these effects primarily operate through the extensive margin, through product switching by firms.

2. Quotas and Quality Upgrading

The 'non-equivalence' of import quotas and tariffs is well established (Bhagwati, 1965; Krishna, 1989). Like tariffs, binding quotas raise the price of constrained goods relative to unconstrained goods. This holds in both competitive and imperfectly competitive markets. Unlike, tariffs, however, quotas give rise to additional distortions. The upgrading of quality in response to a quota is one such effect.

There are two avenues through which quality upgrading occurs: shifts in the composition of demand towards higher priced import varieties, or the addition of improved characteristics in each variety (Feenstra, 2004). Our focus is on the former effect.

As is well established, the price effect of a quota is equivalent to that of a specific tariff Falvey (1979). The implication for import prices in the quota imposing country is twofold: (i) the prices of quota restricted products rise, but (ii) the increase in price is strongest for relatively low priced varieties. Consumer's respond to relative price changes, and shift consumption towards the relatively high priced variety.

To see this formally, we use the framework provided in Feenstra (2004). Assuming CES demand and utility functions, consumers choose consumption c_i of product varieties with characteristics z_i and prices p_i, $i = 1, 2, \ldots, N$. Also, cost of producing variety z_i is given by $g(z_i)$ where costs do not depend on the level of output. Consider an exporting firm operating under a quota. This firm maximizes:

$$\max_{p_i, z_i} \sum_{i=1}^{N} [p_i - g(z_i)] c_i + \lambda [\bar{X} - \sum_{i=1}^{N} c_i] \tag{2.1}$$

where the second part of the equation represents the quota constraint.

Prices are determined for each i by:

$$p_i = \mu[g(z_i) + \lambda] \qquad\qquad\qquad (2.2)$$

where μ is the markup charged on all products sold by the firm and is assumed constant across all products. The effect of the quota is to introduce a dollar price increase of $\mu\lambda$ to the price. It hence acts as a 'specific' price increase across products. If two products are sold by the firm and $g(z_1) > g(z_2)$, then in the absence of the quota, $\mu g(z_1) > \mu g(z_2)$ and hence product 1 is the more expensive product. However, in the presence of the quota, the new price ratio becomes:

$$\frac{p_1'}{p_2'} = [g(z_1) + \lambda]/[g(z_2) + \lambda] < g(z_1)/g(z_2) = p_1/p_2 \qquad\qquad (2.3)$$

This indicates a relative price change in favor of the high-price variety, product 1. Quotas therefore lead to quality upgrading. The effect is analogous to the Alchian-Allen's Washington Apples effect where per unit transport costs raise the relative price of the low priced variety and hence induce the export of relatively higher priced and higher quality apples (see Hummels and Skiba, 2004).

Our expectation is therefore that the removal of the MFA quotas raises exports of quota restricted products (relative to non-restricted products), but that the impact is strongest in low price varieties. Similarly, we expect the unit values of quota restricted products to fall, with relatively strong declines in low unit-value products.

3. Empirical Specification

3.1 Impact of quota removal on sales and unit-values

We employ a difference- in-difference strategy to examine the impact of the removal of the MFA quotas in 2005 at the firm level. Hence, we focus on the differential sales and unit values of quota restricted products (or bound products) produced by firms relative to unrestricted (or unbound products) before and after the MFA quota was lifted in 2005. Our basic specification is hence

$$LnY_{ijt} = \alpha_1 + \beta_1 Bound_i + \beta_2 Post_t + \beta_3 Bound_i * Post_t + u_{1,ijt} \qquad (3.1.1)$$

where Y_{ijt} refers to the outcome variable, log of sales or log of the unit-value (or price) of product i, firm j at time t, $Bound_i$ is a dummy variable that equals 1 if the product is quota-restricted and zero if not, $Post_t$ is a dummy variable that equals 1 if the year is greater than or equal to 2006 (our firm level data records run from March of the previous year through April of the current year) and u is the idiosyncratic error term[5]. The coefficient β_3 captures the differential effect on the outcome variable in quota-restricted products after the quota was removed. In other words, it is the difference-in-differences estimates of the effect of the quota on the outcome. We expect $\beta_3 > 0$ where sales is the outcome variable and $\beta_3 < 0$ where the unit-value (price) is the outcome variable. This captures the increase in market-shares and a fall in prices of quota-restricted products with quota removal.

Next, we refine our specification by controlling for unobserved firm-specific shocks in firm outcomes. For instance, one concern is that particular firm types select into production of quota-restricted products and that the factors determining such selection are unobserved. This would then lead to inconsistent estimates of the effect of the quota removal. Since we have firm level data, we can control for such factors such as long as they are time-invariant, using firm fixed effects. We hence estimate

$$LnY_{ijt} = \alpha_2 + \delta_{1ij} + \delta_{2t} + \delta_3 Bound_i * Post_t + u_{2,ijt} \qquad (3.1.2)$$

The difference-indifference coefficient δ_3 once again captures the effect of the quota removal. This specification now includes a firm by product fixed effect. This includes a firm-specific effect and product fixed effect. Finally, we estimate an unrestricted specification, where we only exploit within-firm, cross product variation between quota bound and unbound products to identify the effect of the MFA quota removal. We hence estimate:

$$LnY_{ijt} = \alpha_3 + \gamma_{1i} + \gamma_{2jt} + \gamma_3 Bound_i * Post_t + u_{3,ijt} \qquad (3.1.3)$$

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[5] We do not estimate 3.1.1 for unit-value as the dependent variable since quantities are not comparable across products. Hence, we only estimate specifications that include product fixed effects.

3.2 Quota removal and Quality downgrading

Next, we look for evidence consistent with quality downgrading subsequent to quota removal. To do this, we estimate the basic specification:

$$LnY_{ijt} = \alpha_4 + \theta_1 Bound_i + \theta_2 Post_t + \theta_3 Bound_i * Post_t + \theta_4 Bound_i * Post_t * \overline{P_{ij}} + u_{4,ijt} \tag{3.2.1}$$

where $\overline{P_{ij}}$ is the average price of product i produced by firm j before the quota removal. Hence, this specification is restricted to firm by product combinations that exist for at least one year before the MFA quota was lifted in 2005. Again, we estimate 3.2.1 for both sales and price as the outcome variable. In the sales estimation, we interpret a negative coefficient on θ_4 to be indicative of evidence for quality downgrading with quota removal. Hence, a negative θ_4 would imply that the increase in the market share of quota-restricted products with quota removal was greater for low-priced products. In the price estimation, we interpret a positive coefficient on θ_4 to be consistent with quality downgrading. In other words, we expect relatively larger declines in the price of low-priced products.

We also estimate (3.2.1) with firm by product fixed effects and firm by time and product fixed effects. Here, we note that while a negative θ_4 is consistent with quality downgrading by firms post quota removal, it is possible that if price is a proxy for firm productivity. Then what we capture by estimating 3.2.1 is the effect of the MFA quota removal on reallocation of market-share towards low-productivity firms. Tying the evidence more closely to quality downgrading would hence require a careful study of reallocation across firms of heterogeneous productivity levels. This is an ongoing effort with this paper.

Finally, to tease out the intensive margin effect from the extensive margin effect, we estimate all our specifications by restricting our sample to firm by product combinations that existed for two years before quota removal (in 2004 and 2005) and for two years after quota removal (in 2006 and 2007). Looking at a balanced panel like this allows us to isolate the intensive margin effects. We also estimate our key specifications with the outcome variable as a dummy variable which takes the value of 1 if a firm by product pair records positive sales in a given year and zero otherwise. This helps us capture the effects of the quota removal on the

likelihood of a product being produced by a firm, in other words, the external margin of adjustment.

4.   Data

We use firm-level data from the Prowess database of the Center for Monitoring the Indian Economy (CMIE). Firms are required by the 1956 Companies Act to disclose product-level information on capacities, production and sales in their annual reports that CMIE compiles into the Prowess database. The firm level data are captured from annual income statements and balance sheets of about 9500 publicly listed companies, of which roughly 5000 are in the manufacturing sector. The companies in the database together comprise 60 to 70 percent of the economic activity in the organized industrial sector.

The Prowess database is the primary Indian database that allows for detailed, annual, information on firms' product mix and variables such as sales, production and capacity. Using this database, we are able to exploit firm-specific production information and product level sales and quantities sold for each firm, to explore inter and intra firm dynamics resulting from the MFA quota removal.   We use data for the period 2002 through 2008 and focus on textile and clothing manufacturing firms. Export data is available through the Prowess database, however, CMIE does not compile export data at the product level. We hence focus on the data on sales and unit – values as a measure of price, which we construct using information on product quantities sold. In our final sample, we have 922 textile and clothing firms in our sample and 1,918 unique products, out of which about 22 percent are quota restricted (see discussion below).

The ideal way to pursue our difference-in-differences estimation strategy would be to classify each of our unique products into quota constrained and unconstrained and look at differential patterns in outcomes across these two product groups before and after 2005. This would be possible if Prowess products could be linked to HS ten digit codes which could then be linked to quota information from US Customs and Border Protection. Unfortunately, the nature of our data does not allow us to classify products in such a clean manner. We detect significant measurement error in the Prowess classification of products, especially in certain key Textile and Clothing groups like Garments and Cotton Fabrics and Cloth. While Garments are further classified in Prowess into 14 products, most firms are documented as producing 3 to 4 of these products. These 3 to 4 products that account for almost all firm output are called generic

and overarching product names like 'Readymade Garments' or 'Textile Garments'. Similarly, though Fabrics and Cloth is further broken down into 28 products, most firms are documented as producing about 4 of these products. Appendix A provides distributions of products reported by firms in Garments and Cotton Fabrics and Cloth. It is evident that products are bunched at between 3 and 4 products within these Textile and Clothing groups.

Given this feature of the data, we adopt a method of broadly classifying Textile and Clothing groups as quota restricted or unrestricted. The U.S Office of Textile and Apparel (OTEXA) monitored trading partners' compliance with the MFA and ATC quotas. OTEXA make use of U.S. partners Expired Performance Reports and records quota fill rates for each MFA quota category in Textiles and Clothing for years 1984 through 2004. Information is also available on the HS (Harmonized System of product classification) 10 digit product codes in each MFA quota category. Brambilla, Khandelwal and Schott (2010) list average fill rates for products in 10 of the largest OTEXA MFA categories for China, India and Bangladesh (Table 8). India's quota fill rates exceed 70 percent in the categories of Cotton Sheeting Fabric, Cotton Printcloth Fabric, Non-knit Shirts, Cotton Trousers, and Trousers of Man-made Fibres.

Hence, in our data, we assign these products as quota restricted and assign all other products as unrestricted products. Next, we are still left with product categories like 'Readymade Garments' and 'Apparel' that we are unable to clearly classify as quota restricted or unrestricted products. While some apparel products like cotton trousers had a fill rate of 98 percent, garments like Underwear and Knit Shirts were subject to zero quotas. For the purposes of the current study, we classify generic Garment and Apparel products and generic Cotton Fabrics as quota constrained, while we leave other groups, mainly including Cotton Yarns as quota unconstrained. In summary, our difference-in-differences strategy treats Garment and Apparel products and Cotton Fabrics as quota restricted and all other Textile products as unrestricted under the MFA quota regime[6].

Figures 1, 2 and 3 use US trade data to look at trends in Indian exports of Textiles and Clothing before and after 2005. Figure 1 that plots India's share in US textile and clothing imports reveals a jump in the year 2005 when the final MFA quotas were removed. Figure 2 looks at the composition of Indian textile and clothing exports to the US. It plots the percentage

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[6] We are currently exploring a strategy of using Indian trade data to arrive at weighted quota fill rates for broad product groups in Textile and Clothing, which we believe will refine our current method of classification.

of Indian textile and clothing exports in various product categories over 2004 through 2007. The figure reveals a jump in exports of apparel products, which were subject to heavy quotas, and silk clothing. Focusing on Figure 3 that plots India's share of total US imports in the key textile and clothing categories, we find a jump in the year 2005 corresponding with the MFA quota removal. In summary, the figures support the binding nature of MFA quotas on Indian textile and clothing exports to the US. Table 1 provides mean sales values of textile and clothing firms from Prowess for quota restricted and quota unrestricted products.

5.   Results

5.1 The Impact of the Quota Removal on Sales and Unit-Values

Table 2(a) presents results for specifications 3.1.1, 3.1.2 and 3.1.3 with log of sales as the explanatory variable. The coefficient on the difference-in-differences estimation coefficient from column one, the basic specification, is positive as expected, though not statistically significant. In column 2, we add firm by product and year fixed effects. The coefficient of interest is now positive and statistically significant. Column 3 adds firm by time and product fixed effects and only uses within firm and across product variation to identify the impact of the quota removal. Again, the coefficient is positive and significant at the 10 percent level. Results indicate that the removal of MFA quotas increased market share of quota restricted products by about 20 percent.

Table 2(b) presents results for specifications 3.1.2 and 3.1.3 with log of the unit-value as the explanatory variable. Our hypothesis is that the difference-in-differences estimation coefficient is negative since it indicates a fall in the price of previously quota constrained products. Again, column 1 includes firm by product and year fixed effects while column 2 only exploits within firm variation by including firm by time and product fixed effects. Results show that the coefficient is indeed negative, as hypothesized, though it is not precisely estimated.

Next, we isolate the intensive and extensive margin effects of quota reform. First, we restrict our sample to only those firm-product combinations that exist two years prior to and two years after the year the quota was removed. Hence, we only consider those firm-product combinations that exist from 2004 through 2007. We then estimate equations 3.1.1 through 3.1.2 on this new sample. Tables 3(a) and (b) present results for the log of sales and the log of

the unit-value as dependent variables respectively. From Table 3(a), we find that the coefficient of interest is still positive and significant in column 1, but attenuated, at 16 percent, and imprecisely estimated in column 2. From Table 3(b) we still find no evidence for the impact of the quota removal on unit-values.

Next, we look at the external margin in Table 4. Here, we consider our sample from 2002 through 2008. We construct a balanced panel of all firm-product combinations in the data. Our dependent variable is now a dummy variable that takes the value of one of a firm-product combination reports positive sales and zero if it reports zero sales. Hence, we estimate specifications 3.1.1 through 3.1.3 in a linear probability framework. We find that across all three specifications, the difference-in-differences estimate is positive and statistically significant. This result indicates that the quota removal was associated with greater likelihood of a quota-constrained product being produced, providing evidence for a quota removal effect via the extensive margin.

Overall, these results indicate that the MFA quota removal was associated with greater market-share for quota-constrained products, and that this effect operated both through the intensive and extensive margin. However, we are unable to find an effect of the MFA quota removal on prices.

5.2 Quota Removal and Quality Downgrading

We now focus on looking for evidence consistent with quality downgrading associated with the MFA quota removal. Tables 5(a) presents results for specification 3.2.1 with log of sales as the dependent variable. Again, column 1 presents the basic estimation, while columns 2 and 3 add firm by product and year and firm by time and product fixed effects respectively. First, the difference-in-differences coefficient is still positive and significant across all columns and relatively stable at around 20 percent. Keying in on the triple interaction term, we find that it is negative and significant, as hypothesized, in columns 1 and 2. This is consistent with our quality downgrading hypothesis. It suggests that the increase in the market share of quota restricted products was greater for low-priced products.

Moving on to the log of the unit-value as the dependent variable, Table 5(b) presents results for estimation equation 3.2.1. Columns 1 and 2 present results for the baseline

specification including firm by product and year fixed effects in column 1 and firm by time and product fixed effects in column 2. Focusing on the difference-in-difference coefficient, though it is still negative, it is imprecisely estimated. The triple interaction term on the other hand, is negative and statistically significant in column 1. This is inconsistent with our quality downgrading hypothesis, since it would indicate that price declines were strongest for the high-priced varieties.

However, this result flips in sign when we move to column 2, which only exploits within firm and across product variation to identify the differential effect of the quota removal on quota constrained versus unconstrained products. Here, the coefficient on the triple interaction term is positive, as hypothesized, and statistically significant at the 10 percent level. This is consistent with the quality downgrading hypothesis where price declines in quota removals are greater for low-priced products. The qualitative difference in the results could stem from the fact that results in column 1 do not account for unobserved, time-varying, firm specific shocks in pricing behavior or selection into products that column 2 accounts for.

We then proceed to tease out the importance of the intensive and extensive margin adjustments in quality downgrading. In Tables 6(a) and 6(b), we again restrict our sample to those firm-product combinations that exist two years prior to and two years after the MFA quota removal, and look at a balanced panel. From Tables 6(a) and 6(b) we find that this effect does not seem to operate through the intensive margin. The triple interaction effects from Table 6(a) are all statistically insignificant and also of the wrong sign. From Table 6(b), while column 1 looks similar to column 1 of Table 6(a), the positive and statistically significant coefficient on the triple interaction term in column 2 now disappears. In summary, the results seem to suggest that the quality downgrading effect operates primarily through the extensive and not the intensive margin. This is reinforced by our results in Table 7.

Table 7 estimates equation 3.2.1 in the baseline (column 1), with firm by product and year fixed effects (column 2)[7]. Again, the dependent variable is a dummy variable that equals 1 if a product produced by a firm records positive sales. We consider a balanced panel for the years 2002-2008 that includes all firm-product combinations. Focusing on the triple interaction term, we find that the coefficient is negative and statistically significant, indicating that the MFA quota

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[7] We omit column 3 with the firm by time and product fixed effects, in both Table 6(a) and Table 7, since it did not yield significant results in our estimation on the full sample (Table 5(a)).

removal was associated with a higher probability of quota-constrained products being produced, and that this effect was stronger for low-priced products, even via the extensive margin.   In conclusion, results suggest that in the extensive margin, evidence is consistent with the quality downgrading story.

6.   Conclusion

This study looks at the impact of a reduction in trade barriers, particularly the MFA textile and clothing quotas, on reallocation of market shares across products in Indian manufacturing firms. It finds that the MFA quota removal was associated with an increase in market share of quota constrained products relative to unconstrained products, though evidence of a price response is weak. Results seem to indicate that the extensive margin is relatively more important in the adjustment to trade reform.   The study also finds evidence consistent with quality downgrading by textile firms in response to the quota removal.

The study throws some light on adjustment mechanisms of manufacturing firms in developing economies to a reduction in trade barriers, and also highlights the role of market distortions in reallocating resources across products of differing characteristics, like quality. We believe that this can have potential implications for welfare. As a next step, we plan to focus on reallocation across firms of heterogeneous productivity levels resulting from the MFA quota removal. We believe that this will enable us to further consolidate evidence for the quality downgrading hypothesis, while also informing us on the dynamics of resource allocation with trade reform in a world of heterogeneous firms.

Figure 1: Share of Indian Textiles and Clothing in Total US Imports
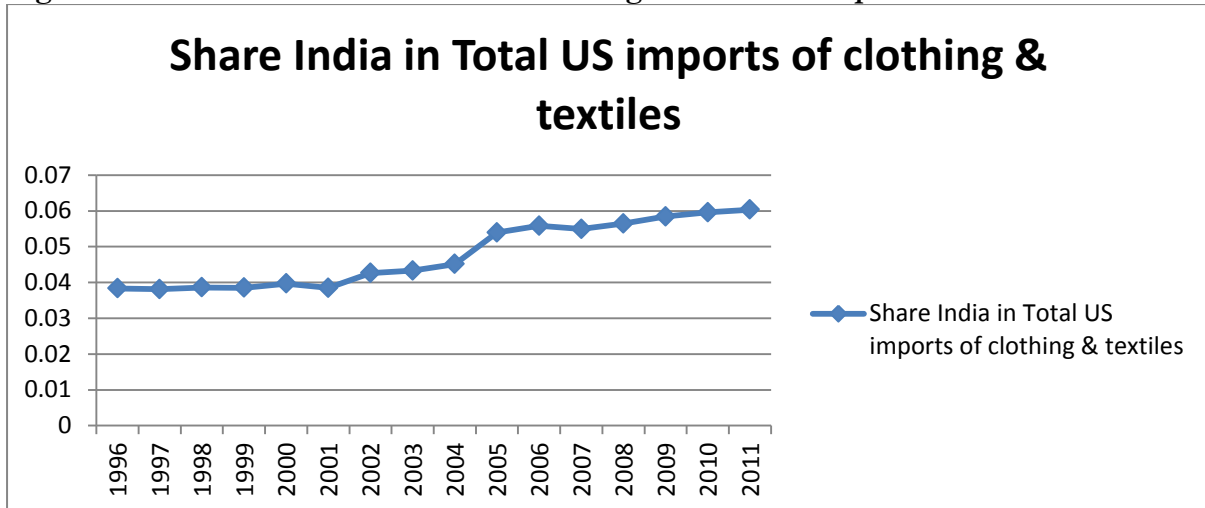
Sources: Tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission.

Figure 2: Share of select textile and clothing products in total US textile and clothing imports from India
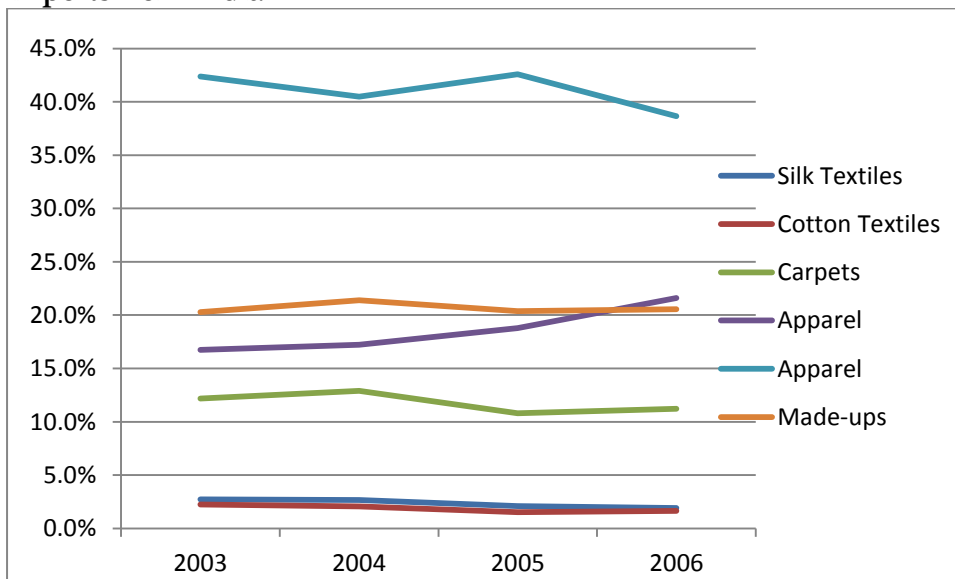
Sources: Tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission.

Figure 3: Share of Indian exports in total US imports of select Textile and Clothing products
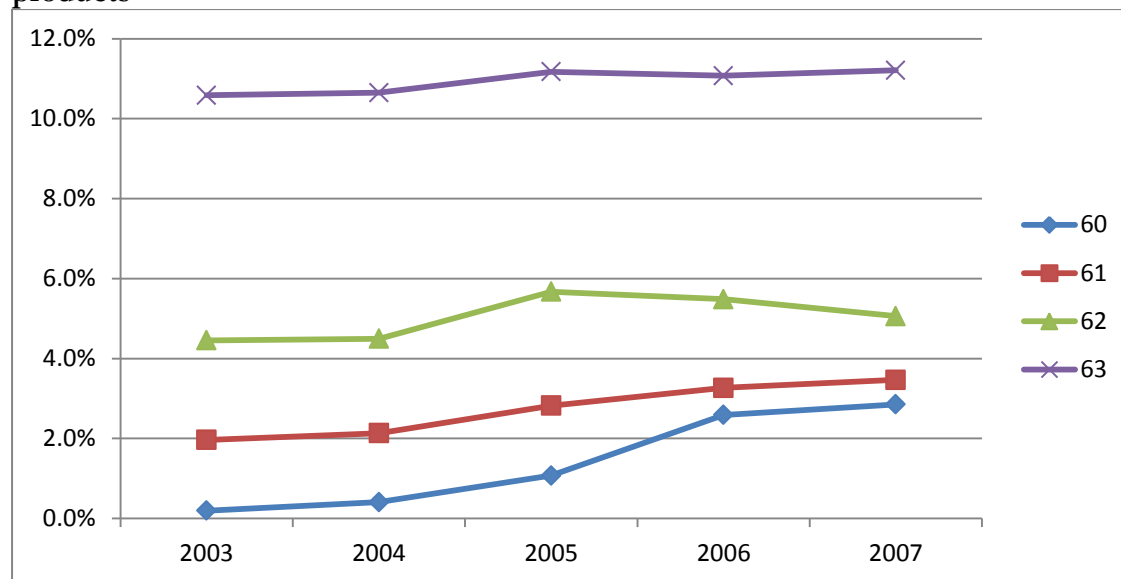
Notes 1) HS 60: Knitted Fabrics, 61 and 62: Apparels, 63: Made-ups.
Sources: Tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission.

Table 1: Mean Sales values for Quota Restricted and Unrestricted Products

	Quota Restricted	Unrestricted
2002	312.6678	238.2209
2003	316.1283	256.3343
2004	341.7403	249.1801
2005	368.876	253.457
2006	380.4318	331.4235
2007	469.8353	407.5805
2008	546.1995	505.7249

Source: CMIE Prowess database and authors' calculations. Figures in rupee millions.

Table 2(a): Quota Removal and Market Share Effects

	Ln(1+Sales)	Ln(1+Sales)	Ln(1+Sales)
Post MFA dummy	0.241***	0.164***	
	(0.055)	(0.050)	
Bound dummy	-0.344***		-2.901
	(0.080)		(2.367)
Post x Bound	0.087	0.196**	0.223*
	(0.120)	(0.092)	(0.119)
Product Fixed Effects	No	No	Yes
Year Fixed Effects	No	Yes	No
Firm by Product Fixed Effects	No	Yes	No
Firm by Time Fixed Effects	No	No	Yes
Observations	7,964	7,964	7,964
R-sq	0.007	0.022	0.893

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics.

Table 2(b): Quota Removal and Price Effects

	Ln(Unit Value)	Ln(Unit Value)
Post MFA dummy	0.106***	
	(0.028)	
Bound dummy		1.548
		(1.169)
Post x Bound	-0.050	-0.014
	(0.037)	(0.059)
Product Fixed Effects	No	Yes
Year Fixed Effects	Yes	No
Firm by Product Fixed Effects	Yes	No
Firm by Time Fixed Effects	No	Yes
Observations	7,964	7,964
R-sq	0.006	0.945

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics.

Table 3(a): Quota Removal and Market Share Effects – Balanced Panel

	Ln(1+Sales)	Ln(1+Sales)	Ln(1+Sales)
Post MFA dummy	0.065	0.088**	
	(0.086)	(0.037)	
Bound dummy	-0.321**		1.432
	(0.132)		(1.331)
Post x Bound	0.198	0.198**	0.157
	(0.190)	(0.091)	(0.142)
Product Fixed Effects	No	No	Yes
Year Fixed Effects	No	Yes	No
Firm by Product Fixed Effects	No	Yes	No
Firm by Time Fixed Effects	No	No	Yes
Observations	2,808	2,808	2,808
R-sq	0.003	0.018	0.939

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Sample is restricted to those firm product combinations that exist two years prior to and two years after quota removal.

Table 3(b): Quota Removal and Price Effects – Balanced Panel

	Ln(Unit Value)	Ln(Unit Value)
Post MFA dummy	0.033	
	(0.024)	
Bound dummy		0.573
		(0.675)
Post x Bound	-0.030	0.001
	(0.044)	(0.072)
Product Fixed Effects	No	Yes
Year Fixed Effects	Yes	No
Firm by Product Fixed Effects	Yes	No
Firm by Time Fixed Effects	No	Yes
Observations	2,808	2,808
R-sq	0.008	0.966

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Sample is restricted to those firm product combinations that exist two years prior to and two years after quota removal.

Table 4: Quota Removal and Market Share Effects – Extensive Margin

	Dummy = 1 if Sales >0	Dummy = 1 if Sales >0	Dummy = 1 if Sales >0
Post MFA dummy	-0.018*	-0.042**	
	(0.010)	(0.018)	
Bound dummy	-0.083***		-0.135
	(0.014)		(0.364)
Post x Bound	0.076***	0.076***	0.083***
	(0.021)	(0.027)	(0.020)
Product Fixed Effects	No	No	Yes
Year Fixed Effects	No	Yes	No
Firm by Product Fixed Effects	No	Yes	No
Firm by Time Fixed Effects	No	No	Yes
Observations	13,426	13,426	13,426
R-sq	0.003	0.006	0.768

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after.
3) Bound equals one if the product belongs to garments or cotton fabrics.

Table 5(a): Quality Downgrading and Quota Removal: Effect on Market Shares

	Ln(1+Sales)	Ln(1+Sales)	Ln(1+Sales)
Post MFA dummy	0.380***	0.118**	0.000
	(0.057)	(0.051)	(1.653)
Bound dummy	-0.344***		
	(0.080)		
Post x Bound	0.232*	0.215**	0.269*
	(0.127)	(0.092)	(0.146)
Post x Bound x Average Price	-0.062***	-0.051***	0.216
	(0.002)	(0.002)	(0.560)
Product Fixed Effects	No	No	Yes
Year Fixed Effects	No	Yes	No
Firm by Product Fixed Effects	No	Yes	No
Firm by Time Fixed Effects	No	No	Yes
Observations	7,381	7,381	7,381
R-sq	0.013	0.021	0.904

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Average price refers to the average price of the firm-product in the years prior to the MFA quota removal.

Table 5(b): Quality Downgrading and Quota Removal – Effect on Prices

	Ln(Unit Value)	Ln(Unit Value)
Post MFA dummy	0.105***	
	(0.027)	
Bound dummy	0.012	0.176
	(0.079)	(0.845)
Post x Bound	-0.040	-0.087
	(0.037)	(0.074)
Post x Bound x Average Price	-0.024***	0.475*
	(0.001)	(0.286)
Product Fixed Effects	No	Yes
Year Fixed Effects	Yes	No
Firm by Product Fixed Effects	Yes	No
Firm by Time Fixed Effects	No	Yes
Observations	7,381	7,381
R-sq	0.008	0.945

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Average price refers to the average price of the firm-product in the years prior to the MFA quota removal.

Table 6(a): Quality Downgrading and Quota Removal: Effect on Market Shares, Balanced Panel

	Ln(1+Sales)	Ln(1+Sales)
Post MFA dummy	0.065	0.088**
	(0.086)	(0.037)
Bound dummy	-0.321**	
	(0.132)	
Post x Bound	0.047	0.062
	(0.216)	(0.113)
Post x Bound x Average Price	0.923	0.831
	(0.630)	(0.653)
Product Fixed Effects	No	No
Year Fixed Effects	No	Yes
Firm by Product Fixed Effects	No	Yes
Firm by Time Fixed Effects	No	No
Observations	2,808	2,808
R-sq	0.004	0.022

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Average price refers to the average price of the firm-product in the years prior to the MFA quota removal. 5) Sample is restricted to those firm product combinations that exist two years prior to and two years after quota removal.

Table 6(b): Quality Downgrading and Quota Removal – Effect on Prices, Balanced Panel

	Ln(Unit Value)	Ln(Unit Value)
Post MFA dummy	0.033	
	(0.024)	
Bound dummy		0.570
		(0.676)
Post x Bound	0.098	-0.007
	(0.060)	(0.089)
Post x Bound x Average Price	-0.782**	0.052
	(0.394)	(0.324)
Product Fixed Effects	No	Yes
Year Fixed Effects	Yes	No
Firm by Product Fixed Effects	Yes	No
Firm by Time Fixed Effects	No	Yes
Observations	2,808	2,808
R-sq	0.013	0.966

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Average price refers to the average price of the firm-product in the years prior to the MFA quota removal. 5) Sample is restricted to those firm product combinations that exist two years prior to and two years after quota removal.

Table 7: Quality Downgrading and Quota Removal: Effect on Market Shares, Extensive Margin

	Dummy = 1 if Sales >0	Dummy = 1 if Sales >0
Post MFA dummy	-0.126***	-0.201***
	(0.010)	(0.017)
Bound dummy	-0.035**	
	(0.014)	
Post x Bound	0.028	0.029
	(0.023)	(0.026)
Post x Bound x Average Price	-0.006***	-0.007***
	(0.002)	(0.001)
Product Fixed Effects	No	No
Year Fixed Effects	No	Yes
Firm by Product Fixed Effects	No	Yes
Firm by Time Fixed Effects	No	No
Observations	11,347	11,347
R-sq	0.017	0.037

Note: 1) Robust standard errors in parentheses. 2) Post MFA dummy equals one if year is 2006 or after. 3) Bound equals one if the product belongs to garments or cotton fabrics. 4) Average price refers to the average price of the firm-product in the years prior to the MFA quota removal.

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Appendix A: Distribution of Product by Year Observations within 'Garments' and 'Cotton Fabrics' MFA Quota Groups

Source: Prowess Database, CMIE, 2002 through 2008