

5-1-2012

The Country-Specific Nature of Apparel Elasticities and Impacts of the Multi-Fibre Arrangement

Lauren A. Martinez

Macalester College, laurenarleymartinez@gmail.com

Follow this and additional works at: http://digitalcommons.macalester.edu/economics_honors_projects



Part of the [Econometrics Commons](#), and the [International Economics Commons](#)

Recommended Citation

Martinez, Lauren A., "The Country-Specific Nature of Apparel Elasticities and Impacts of the Multi-Fibre Arrangement" (2012). *Honors Projects*. Paper 49.

http://digitalcommons.macalester.edu/economics_honors_projects/49

This Honors Project is brought to you for free and open access by the Economics Department at DigitalCommons@Macalester College. It has been accepted for inclusion in Honors Projects by an authorized administrator of DigitalCommons@Macalester College. For more information, please contact scholarpub@macalester.edu.

Macalester College
1600 Grand Avenue
Saint Paul, Minnesota 55105

The Country-Specific Nature of Apparel Elasticities and Impacts of the Multi-Fibre Arrangement

Lauren A. Martinez
Economics Honors
Advisor: Professor Raymond Robertson
Macalester College
laurenarleymartinez@gmail.com

Abstract:

Beginning with Krugman and Helpman's theory of demand for differentiated products, this paper estimates 104 direct price elasticities of demand for apparel in the United States. While the literature has established that apparel elasticities vary by category and across countries, I examine how price elasticities of demand for apparel vary by country, regions, product characteristics, and after the end of the Multi-Fibre Arrangement. Results suggest that the country has the greatest single explanatory power in predicting price elasticities, and additionally, the "race to the bottom" hypothesis in the apparel industry is supported through increasing elasticity of 3.4% from the mean value of overall price elasticity after the end of the MFA.

1. Introduction

Clothing is one of the first manufactured goods that developing countries export, and over the past 20 years the United States has almost quadrupled the dollars of clothing it imports (Martin, 2007). Additionally, in 2010, the United States imported 22.3% of global clothing imports, second only to the sum of the entire European Union (WTO, 2011). Apparel exports have increased dramatically since the end of the Multi-Fibre Arrangement (MFA), a quota system limiting the amount of textiles and clothing allowed into developed countries. The MFA selectively restricted the quantities of apparel or textiles if they threatened to cause damage to the importing country's industry. These quotas fully ended on 1 January 2005, but since 1995, through the Agreement on Textiles and Clothing, there has been a slow phase out of the percentage of textiles and garments subject to these quotas. While this period was intended to prepare textile and apparel manufacturers for the increase in global competition at the end of the 10-year period, it was rather abrupt in practice. The first three stages of phase-out reduced the quotas of the less traded products and products with under-utilized quotas, it was not until the fourth and final stage of full integration when the quotas were withdrawn on the products that often utilized the full quota amount. Even without the strategic reductions in quotas, only 51% of apparel and textiles had been cleared of restrictions before 2005 (Martin, 2007).

The end of the MFA caused anxiety particularly among developing countries: many believed that the end of these quotas would increase competition and induce a race to the bottom in wages and working conditions as producers responded to increased competition in an attempt to decrease costs. This increased competition results in two forms: lower prices and increased elasticities of demand.

The decrease in prices is well documented by Harrigan and Barrows (2009). They show that the simple prediction of trade theory happened precisely: in the Chinese clothing that were subject to quotas, prices fell 38% and quality¹ fell 11%. Overall, they find that while there was an increase in Chinese apparel imports after the MFA, many countries (particularly India, Pakistan, Bangladesh and Indonesia) were not hurt by this because they were also able to increase their sales to the United States; however, those countries with privileged access through the quotas (such as Mexico, Canada, Honduras, and El Salvador) saw their revenues drop. Additionally, recently developed countries like Hong Kong, Taiwan and Korea also saw revenues drop, most likely due to their inability to compete with competitors' lower labor costs (Harrigan and Barrows, 2009). Where Harrigan and Barrows leave off, my research begins: they have documented the falling price, and I evaluate the increasing price elasticities.

Accurate estimates of trade elasticities are critical for a wide range of topics, most notably including topics on welfare (Broda and Weinstein, 2006) and policy (Broda et al., 2008). Slaughter (2001) found that price elasticity of demand for labor has increased in the textile, apparel and footwear industries over time. On a whole, these papers illustrate the importance of demand elasticities beyond price.

Fully understanding variation in elasticities across apparel products is even more critical when a specific good's market elasticity differs by producer country (Imbs and Méjean, 2010). Estimates of direct price elasticities for apparel varieties are relevant for apparel production choices of low-income countries and the choices they make for trade specialization. The end of the MFA is significant for several reasons: the lack of quotas means a freer market and increased

¹ "Quality upgrading [is] a phenomenon first analyzed by Falvey (1979) and Rodriguez (1970)...[it] occurs when the quota causes the composition of imports to be tilted toward goods that would be relatively more expensive under free trade (Harrigan & Barrows 2009, 283)."

competition. Countries therefore seek a niche in apparel production. By producing the apparel products that face the (relatively) most inelastic demand, countries can become less subjected to competitive pressure and therefore may be more likely to experience wage growth. Additionally, the firms producing these apparel products can demand higher margins from their customers.

These significant implications have been revealed in many estimates of apparel elasticities at higher levels of aggregation (See Table 1 for a summary of several such studies showing country, aggregation level, and key estimates). The mean own-price apparel elasticity by previous estimates is -1.928, with a standard deviation of 1.093. This variation may be due to several factors such as estimation specification and method, year, country or aggregation as disaggregated apparel price elasticities are an untouched topic in the literature. The most disaggregated examination of apparel elasticities in the literature (Khaled and Lattimore, 2006) only estimates apparel variety in seven categories, and the most recent estimation (Lee and Karpova, 2010) only examines U.S. apparel import elasticities relative to domestic apparel elasticities. In contrast, I estimate direct price elasticities of 19 categories of apparel, 104 apparel products, from 221 producer countries. Elasticities will be evaluated by “country-product” referring to one of 104 products produced in one of the 221 producer countries. I determine reasons for differences across countries, and the impact on these elasticities in light of the end of the MFA.

These estimates show that there *is* heterogeneity in price elasticities across the same products produced in different countries, and additionally that the MFA benefitted countries with higher GDP per capita by reducing the elasticity of demand that these countries’ face. The end of the MFA would, ideally, have helped developing countries increase their overall value of exports

and remain a competitive force. All these answers provide insight into how a country should choose to specialize in apparel production, particularly in light of the end of the MFA, and

The rest of the paper is organized as follows: Section two summarizes the theory by Krugman and Helpman. Section three includes summary statistics, followed by data analysis of apparel (section four) and evaluation of the MFA (section five). The final section concludes.

2. Theory

Krugman and Helpman (1985) derive the demands for differentiated products (the perfect description of demand for apparel) using the constant elasticity of substitution subutility function. Krugman and Helpman present both love-of-variety (where a consumer gains utility from variety itself) and ideal variety (where a good's utility is dependent on how similar it is to the "ideal variety" of the consumer) models. I focus on love-of-variety, which more accurately captures clothing preferences; as an individual cannot have only coats, society requires him or her to have a variety of clothing: shirts, pants, etc. They begin with a standard two good utility function, in which the two goods are apparel and non-apparel:

$$U = U(X_{Apparel}, X_{Non-apparel}) \quad (2.1)$$

Apparel is a differentiated product and its utility is a function of its varieties²:

$$U_{Apparel} = U[u_1(\cdot), u_2(\cdot), \dots, u_i(\cdot)] \quad (2.2)$$

The function u_i represents the sub-utility derived from each differentiated product of apparel, i . These functions are assumed to be concave and upward sloping to align with the economic principles of diminishing marginal utility and more (variety) is better. The demand functions are derived assuming horizontal differentiation, which is consistent with the nature of apparel.

² Varieties is synonymous with products or country-products.

Additionally, the utility derived from all of these varieties is dependent on the amount consumed of each variety, D_i , such that:

$$U_i (D_{i1}, D_{i2}, \dots) \equiv (\sum_{\omega} D_{i\omega}^{\beta_i})^{\frac{1}{\beta_i}}, \beta_i = \left(1 - \frac{1}{\sigma_i}\right), \sigma_i > 1 \quad (2.3)$$

Where ω is the variety of the apparel product and σ_i (the elasticity of substitution) must be greater than 1 in order for elasticity of demand to be greater than 1, which is necessary for monopolistic competition (and this is monopolistic competition as there is differentiation between goods and multiple producers)³. Krugman and Helpman believe σ_i will be much larger than 1 because the substitution is between pairs of varieties, or in this case, between varieties of apparel, e.g. a dress and a blouse. The larger σ_i is, the more substitutable the goods are, and it is not a far reaching assumption to assume a dress is more substitutable for a blouse than a dress is for a non-apparel variety (e.g. Kix cereal, a Toyota, etc.). I partially imposed this assumption in this estimation (that almost all of the varieties are equally substitutable for the other); however, variety is valued. For example, if an individual has \$20 to spend on clothing, and there are four varieties and all varieties are equally priced at \$5 (an unavailable variety can be understood to have an infinite price), then the individual would buy one of each variety. This also applies to the varieties across countries: if an individual has the option of four cotton t-shirts produced in four different countries, the individual will purchase one of each country origin. In this way, the utility of the individual is increased through variety, as in,

³ Krugman and Helpman explain, “The requirement for an elasticity of substitution larger than one is dictated by the need to have a demand elasticity that is larger than one in order to make sense of monopolistic competition (if the elasticity of demand with respect to price is smaller than one, marginal revenue is negative). However, since σ_i is the elasticity of substitution between pairs of varieties of the same product, we expect it to be large, and assuming that it is larger than one does not seem to be a severe restriction (Krugman and Helpman 1985, 117).”

$$u_i \left(\frac{E_i}{n_i p_i}, \frac{E_i}{n_i p_i}, \dots, \frac{E_i}{n_i p_i}, 0, 0, \dots \right) = n_i^{1/(\sigma_i - 1)} \frac{E_i}{p_i} \quad (2.4)$$

E_i = expenditure level
 n_i = varieties of apparel
 p_i = price of apparel

Utility maximization occurs in two stages. First $U_{Apparel}$ must be maximized subject to spending across varieties. Second, the overall utility must be maximized subject to an overall budget constraint. Both of these maximizations yield:

$$D_{i\omega} = \frac{P_{i\omega}^{-\sigma_i}}{\sum_{\omega' \in \Omega_i} P_{i\omega'}^{1-\sigma_i}} E_i, \omega \in \Omega_i \quad (2.5)$$

Where Ω_i is the full set of varieties, and $\omega \in \Omega_i$ is a specific variety within the entire set of varieties. However, to specify Krugman and Helpman's theory to the demand of apparel, we add to the demand of every variety (equation 2.5), a vector of factors, X^β , which represents the other components that impact an apparel product's demand that is informed from the literature and fashion theory. This demand equation then becomes:

$$D_{i\omega} = \frac{P_{i\omega}^{-\sigma_i} X^\beta}{\sum_{\omega' \in \Omega_i} P_{i\omega'}^{1-\sigma_i}} E_i, \omega \in \Omega_i \quad (2.6)$$

Where X^β is a vector of other variables that impact this specific apparel variety's demand. In market, however, a buyer takes the level of expenditure (E_i) as exogenous, and the price elasticity of demand it faces is then:

$$\sigma_i + \frac{P_{i\omega}^{1-\sigma_i} X^\beta}{\sum_{\omega' \in \Omega_i} P_{i\omega'}^{1-\sigma_i}} (1 - \sigma_i) \quad (2.7)$$

Krugman and Helpman explain that what has often been assumed is because the number of varieties is so large, the second term in the equation effectively becomes zero, and thus

σ_i becomes the price elasticity of demand faced by a producer (or for this case, country).⁴ Thus

I change the sub-utility previously defined in (2.4) to:

$$u_i(D) = \left\{ \int_{\omega \in \Omega_i} [D_i(\omega)]^{\beta_i} d\omega \right\}^{\frac{1}{\beta_i}} \quad (2.8)$$

where variety is a continuous variable of differentiated products. This yields the demand function:

$$D_i(\omega) = \frac{P_i(\omega)^{-\sigma_i} X^\beta}{\int_{\omega \in \Omega_i} [P_i(\omega')]^{1-\sigma_i} d\omega'} E_i, \quad \omega \in \Omega_i \quad (2.9)$$

Then a producer country within the industry of a given variety, i , faces the demand:

$$D_{i\omega} = k_i P_{i\omega}^{-\sigma_i}, \quad \omega \in \Omega_i$$

$$\text{where } k_i = \frac{E_i}{\sum_{\omega \in \Omega_i} P_{i\omega}^{1-\sigma_i}} \quad (2.10)$$

and k_i is the expenditure share on apparel. I estimate the price elasticity of demand, and to do so derive an initial estimation equation of:

$$\ln D_i = \ln k_i - \sigma_i P_i + \beta \ln X \quad (2.11)$$

I estimate σ_i , which would be negative as given in theory: $-\sigma_i = \hat{\beta}$, so $\hat{\beta} < 0$. Krugman and Helpman's (1985) framework provides a skeleton for the subsequent empirical work. The following literature offers the rich detail needed to apply this to apparel, and to fully develop the factors that make up X that must be determined.

Pindyck and Rubinfeld (2009) and Bijmolt et al. (2005), in a meta-analysis of price elasticity, list factors that influence the price elasticity of demand: durability, availability of

⁴ They explain, "For example, when all varieties are equally priced, the second term equals $(1 - \sigma_i)/n_i$, and goes to zero as n_i approaches infinity. The σ_i approximation is precise when the set of potential varieties is a continuum and the set of varieties Ω_i is of nonzero measure (Krugman and Helpman 1985, 117)."

substitutes, household disposable income, time frame, and level of aggregation, among many others. A variety of social factors also affect the demand for a specific variety of apparel. These social factors include prevailing styles or public tastes, how luxurious an item is perceived to be, its attractiveness compared to other products, and an item's ability to show status (Sproles, 1974; Robinson, 1961).

Seasonality significantly impacts apparel in a variety of ways. First, shoppers exhibit seasonal preferences (Kopp, Eng and Tigert (1989), Allenby, et al. (1996) and Wagner and Mohktari (2000)). Those shopping in "pre-season" (January-March and July-September) are more affluent and less price sensitive (Kopp, Eng and Tigert (1989)). Thus, it is expected that during the pre-seasons the demand and prices may be higher. Allenby et al. (1996) find that consumer expectations (which is a popular predictive variable of future economic conditions and durability of a good) also influence fashion sales. They find consumer confidence and expectations to be a much bigger predictor of sales during off-season (or "pre-season") whereas ability to purchase is a far greater predictor during season (April-June and October-December). Translating this to apparel demand, demand is expected to be higher during "in-season" than "pre-season." Country of origin also determines the quality of a garment perceived by consumers: Hines and Swinker (2006) find that extrinsic cues (country of origin, brand, cost) more than intrinsic cues (fabric, construction) impact a consumer's perception of clothing quality.

Wagner and Mokhtari (2000) agree with previous findings and define this as "seasonality," the tendency of demand for a good (or service) to vary in a predictable pattern over the year. Moehrle (1994) establishes that apparel is a classic seasonal good across the year and follows the pattern of expenditures being lowest in the first quarter, increasing throughout

the year and peaking in the final quarter (which is most likely explained by holiday shopping). Given all of these theoretical and research pieces, the guiding equation for this paper follows. Subscripts *itc* represent the product (*i*) the time period (*t*) and the country from which it was produced (*c*). The data are a panel set (further detailed in the next section), and have variation for each country by product and each product over time.

$$\begin{aligned} \ln Quantity_{itc} = & \alpha_0 - \beta_1 \ln Price_{itc} + \beta_2 Luxury_{itc} + \beta_3 FashionSeasonality_{itc} \\ & + \beta_4 WeatherSeasonality_{itc} + \beta_5 Trends_{itc} + \beta_6 Status_{itc} + \beta_7 RelativeAttractiveness_{itc} \\ & + \beta_8 Country_{itc} + \varepsilon_{itc} \end{aligned} \quad (2.12)$$

Unique to this equation, α_0 represents the expenditure on apparel. The stochastic error term captures all other factors that may impact a change in quantity. While many of these variables are not measurable, using individual products and running regressions independently by product will help account for this lack of measurable data, and thus the estimation equation is:

$$\ln Quantity_{itc} = \alpha_0 - \beta_1 \ln Price_{itc} + \beta_2 FashionSeason_{itc} + \beta_3 WeatherSeason_{itc} + e_{itc} \quad (2.13)$$

3. Summary Statistics

As suggested by theory, data would ideally include a measure of the apparel product's degree of luxury, availability of substitutes, season, price, and quantity. Only the last three variables are in the data set as given. The availability of substitutes is captured by the data by including all forms of apparel and thereby allowing buyers to switch to any other variety that is available. Finally, although "degree of luxury" cannot be measured exactly, it can be measured through fabric (this was used by Harrigan and Barrows (2009) in examining if a country "upgraded" its apparel).

I use a dataset from the Office of Textiles and Apparel (OTEXA), which includes apparel imports into the United States from January of 1989 through March of 2011. There are 104

different products of apparel, which can be further distinguished by: 19 apparel categories (skirts, pants, etc.), five fabrics (cotton, wool, silk, man-made fiber abbreviated by MMF and a combined category of silk blends and non-cotton vegetable fibers⁵) and four intended consumers (male, female, baby and unspecified). The majority of these apparel products are in different fabrics and for different intended consumers; for example, there are male cotton coats and male wool coats and the same categories for females. There are far more products, however, when bringing in the variety that exporting country (consisting of 221 countries) provides. The data make up a completely balanced panel: though not all countries export all apparel products each month, each of these zeros is relevant⁶.

A product is categorized under one of these types of fabrics if more than 50% of the fibers used in the apparel product are that fiber. According to U.S. apparel label laws (under the Textile Fiber Products Identification Act of the Federal Trade Commission) all apparel products need to be labeled with all fibers present unless there is less than 5% of it in the item. This implies buyers will see more of the fabric make-up of the apparel product than these data show. Additionally the clothing labels need to indicate where the apparel item was processed or manufactured. This may cause some confusion in the data: even if a product was manufactured in the United States, exported, and then returned in its same condition, it would appear as an imported good but labeled as produced in the United States.

⁵ Non-cotton vegetable fibers include hemp fibers, flax fibers, nesoi fibers and other vegetable fibers.

⁶ 68.9% of the overall observations are a relevant zero value. This is due to countries that do not produce certain goods or did not produce them for any period of time (not producing one country-product for one month would produce one relevant zero, not producing one country-product at all would result in 267 relevant zeros for that country-product). However, this provides no estimation issues as estimates are run by country-products and not run if there is no such country-product or there are not enough distinct values.

Each of the 104 apparel varieties will be referred to as products. Categories refer to products with the same title (as given by OTEXA) but made of different fabrics and intended for different consumers (e.g. male silk suits is a different product than female wool suits, but they are in the same category). The only exception is apparel category “Other”, which also includes cotton play suits and sun suits as there were no similar titles in any other fabric.

OTEXA receive the data mostly through the U.S. Customs’ Automated Commercial System. Some of the data are also received from import entry summary forms, warehouse exit forms, and Foreign Trade Zone documents (as are legally required to be sent to the U.S. Customs and Border Protection⁷). The month variable is recorded as the month that the imports are released to the buyer and I have later seasonally adjusted prices for the base year 1982-1984 using the monthly consumer price index from the Bureau of Labor Statistics.

I also transformed the quantity measures to square meter equivalents (SMEs) from each product’s individual quantity measure (e.g. baby clothes are measured in kilograms, pants are measured in dozens of pairs, etc.) based on the transformation ratio for each measure from the OTEXA site. The value variable from which price is calculated is defined as the price actually paid by the buyer, excluding costs of shipping and any changes in prices based on relationships between exporter and importer. Prices are per SME.

Figure 2 shows the prices and quantities over time of total apparel imports to the United States. Additionally, the cyclical nature of the price graph roughly follows the expansions and recessions the United States has experienced since the 1990s: in general, when unemployment has been low, prices have been high (see Figure 3).

⁷ For more information see <http://otexa.ita.doc.gov/msrpoint.htm>.

Figure 4 shows the mean of quantities and prices of goods across categories of products: suits are the most expensive good and fewer are purchased while underwear is relatively cheap and has the highest quantity. On average, the prices of cotton and man-made fiber apparel are much cheaper than those of wool, silk, and silk-vegetable blend; dresses are a prime example where the prices of cotton and man-made fiber dresses are not only much lower than wool, silk-vegetable blend and silk, but they also vary less over time (Figure 5). Figure 6 shows men's cotton down coats, a good whose demand and price is dramatically dictated by weather season. Figure 7 shows its quantities and prices also change drastically by fashion season. Figure 8 shows changing prices and quantities of apparel by intended consumer and finally, Figure 9 shows these quantities and prices differ by an exporting country's GDP per capita⁸: prices increase consistently with GDP per capita quintile and the second lowest quintile produces the greatest amount of apparel.

4. Analysis: Price Elasticity

Before I ran the main regression, I estimated price elasticity by product (not country-product). This allows me to compare my estimates with other estimates on a more aggregated level. I used overall "world" values from the data set. This equation is shown below.

$$\ln Quantity_{it} = \alpha_0 - \beta_1 \ln Price_{it} + \beta_2 FashionSeason_{it} + \beta_3 WeatherSeason_{it} + e_{it} \quad (4.1^9)$$

I present these results in Figure 10 with a kernel density estimation plot¹⁰ showing all the price elasticities of demand estimated from the 104 coefficients (one for each product). As this figure shows, the average price elasticity is -1.482 with a standard deviation of 1.186. Cutting off the

⁸ GDP per capita amounts were used from the CIA World Factbook (<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html>) and varied in when they were most recently updated from 1993-2010.

⁹ This is the same equation as 2.13, but does not designate by country and therefore does not have subscript "c".

¹⁰ An Epanechnikov kernel function was used.

5% tails of the estimates (taking only the middle 90%) the elasticity mean increases to -1.551 and a standard deviation of 0.692. Of all price elasticities measured, 98.08% are significant. This main specification gave 47.12% of the regressions with heteroskedasticity and 2.88% with serial correlation, but showed no multicollinearity or non-stationarity. Re-running the regression with Newey-West Standard Errors made no change in the percentage significant, and heteroskedastic adjusted standard errors only decreased the percentage significant to 97.12%.

While often the constant does not have theoretical meaning, in this case it expresses the expenditure on overall apparel (measured in SMEs), and throughout all of the 104 regressions the constant has a mean of \$17.05 and a standard deviation of \$3.12. These findings show that there are indeed differences in elasticities by just product type.

Equation 2.13 is the initial estimation equation for country-product. I estimate elasticities for each country-product but included only those that had more than 20 observations (this correlates to being imported for more than 20 months between 1989 and 2011, 33.1% of the country-products price elasticities are estimated). To first examine these elasticities, all countries were divided into GDP per capita quintiles. The elasticity results are presented in Figure 11 with box plots of all price elasticities of the products produced within these quintiles. Table 12 elaborates these better by looking at their means and standard deviations. This shows that the top quintile faces the lowest elasticity and the lowest standard deviation- placing it in an ideal position for overall apparel competition, which may partially explain why they have the highest prices. It appears, however, that there is little explanation for these differences in the characteristics of the apparel: Tables 13 and 14 show mean price elasticities by fabric and intended consumer, respectively, and Tables 15 and 16 break down the percentage of exports that fall into those classifications by quintile. The most elastic quintile (the first) produces the most

cotton as a percentage of total apparel exports (42.93%), which is the most elastic fabric, but the least elastic quintile does not export the greatest amount of the least elastic fabric (fifth quintile produces 7.98% silk, second to the fourth quintile which produces 8.32%). Additionally, this is not nearly as large of a portion of exports as cotton is of the first quintile. Some of the failures to strongly explain the differences in elasticities may come from how close *all* results are: almost all the measurements are fairly inelastic and the standard deviations are relatively large at an average of 0.671. However, this is the most significant explanation that can be found when looking at all traits of apparel (fabric, intended consumer and category).

Table 17 breaks down elasticities by continent, the lowest being an elasticity of -0.871% for North America, and the most elastic is Africa at -1.093% (for this specification). Though standard deviations are still high, this is more variation than was seen examining quintiles. This also explains increases in consumption of clothing from Asia as seen by Harrigan and Barrows (2009), as their elasticity is the second lowest at -0.976 (which is only -0.000128 more elastic than Europe). These results imply that importers value a country characteristic itself in terms of elasticity as these results break down the elasticities further from the mean. If this is the case, there is little a country can do in terms of clothing production to improve competition; however, certain countries may have larger bargaining power with certain types of goods.

5. Analysis: Price Elasticities After the End of MFA

The second specification I run includes an interaction term to evaluate changes in price elasticity before and after the end of the MFA:

$$\ln Quantity_{itc} = \alpha_0 - \beta_1 \ln Price_{itc} * MFA + \beta_2 FashionSeason_{itc} + \beta_3 WeatherSeason_{itc} + e_{itc} \quad (5.1)$$

There were three countries that were not included in this set of country-products as they either only exported to the United States before the MFA (Burma and Czechoslovakia) or after

(Serbia); and therefore had no variation in the MFA variable. On a whole, the end of the MFA made goods more elastic by 3.42%, or -0.032 percentage points¹¹. Table 18 shows the impacts of the end of the MFA on elasticities by quintile, and, following the previous analysis, the subsequent tables evaluate its effects by fabric and intended consumer (Tables 19 and 20, respectively). As theory predicts, the end of the MFA increased elasticity of almost all products. The end of the MFA increased the elasticity most in the second GDP quintile (-0.187 percentage points), followed by the first quintile. It also reduced the elasticity of “higher-end” fabrics (silk, silk-veg blend and wool), and increased the elasticity most on MMF. When looking at intended consumer, the end of the MFA increased elasticity most for baby clothing, though it reduced the elasticity for women’s clothing. Most compelling, however, is examining this total elasticity by quintile from this specification: as GDP per capita quintile decreases, average price elasticities increase.

As before, some of the most interesting results come from breaking the impact of the MFA into continents (Table 21). Asia is also the most elastic continent when looking at price elasticity overall (-1.02%) compared with Europe, which is the least elastic at -0.785%. Some of the explanation for Europe’s low elasticity (and decrease in elasticity with the end of the MFA) comes back again to fabric: almost 43% of their exports are from the higher-end fabrics, all of which are the inelastic fabrics. However, they do not produce the most silk, which is the most inelastic good (Asia produces the most as a percentage of their apparel exports and it is the most elastic continent).

All of this analysis hints that it may be a country characteristic that is the best explanatory unit of price elasticity for apparel varieties. Variations within continents can be extreme:

¹¹ 31.4% of the MFA component of elasticities are significant, and 73.7% of the non-MFA components of elasticity were significant. Again, the 5% tails on either end were cut off.

standard deviations can also be large as 6.089 for Ethiopia, who faces an elasticity of -1.605%, and a minimum of 0.073 for Gambia who faces an overall elasticity of -0.950%, all within Africa. While the GDP per capita quintiles and continent evaluations provide some insight, it seems that country characteristics may have an explanation: for example, Ethiopia is much larger, produces many more goods and has a labor force of over 37 million, compared to Gambia who produces fewer goods and a labor force of less than 800,000¹².

6. Conclusion

Apparel is the leading export good of developing countries and the elasticities they face in the U.S. market (which is becoming a larger and larger purchaser) are incredibly important to their export decisions. In this new market with increased competition, countries should specialize in the apparel products that can demand the highest prices: in the country-products that are most inelastic. These results show that there is little explanatory power in the characteristics of a garment alone to the price elasticities it will face- but GDP per capita quintile evaluations reveal that the poorest countries faced the greatest increase in competition with the end of the MFA. On a whole, the end of the MFA increased elasticities of countries affected by its end (which excludes Burma, Czechoslovakia, and Serbia) by 0.032 percentage points.

Using the OTEXA monthly apparel import data from January 1989-March 2011, I estimate the country specific direct elasticities for 104 apparel varieties from 221 countries to answer *how* these elasticities differ (GDP per capita, fabric, intended consumer, etc.), and discuss their implications for development. Subsequent analysis should further examine and break down countries into regions that are less easily quantifiable (political climate, labor force

¹² Labor force numbers were used from the CIA World Factbook (<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2095rank.html>) and were 2007 estimates.

characteristics, etc.) to determine what these country characteristics might be that impact price elasticity. Also, I do not allow for substitutability for products across countries or fabric, and I believe doing so may provide further insight the changing competitive landscape.

There are some caveats this study faces, the most critical of which is the data's ability to accurately describe the garments. As explained in Section 3, there are differences in how an individual will see these garments and how the data show them. Each garment is only identified by one fabric, though individuals will see more of the makeup, for example if a blouse is 55% rayon and 45% silk, this may be valued much differently than a 100% rayon blouse- but the data only shows this as a MMF blouse. Additionally, if a good is constructed in the United States and is exported but re-imported completely intact, then it will show up as an imported good but will not be labeled as such. The final problem with the data is that it has been adjusted to show prices presumably paid by the buyer, and no deals that may be struck between exporter and buyer are shown - which would greatly impact how I calculate their elasticities. And though a small caveat, since these estimations are pioneering there is little to measure against for reasonability. Despite these small problems, the analysis is robust both in providing insights to these many questions and in magnitude.

Works Cited

- Allenby, Greg M., Lichung Jen, and Robert P. Leone. 1996. Economic trends and being trendy: The influence of consumer confidence on retail fashion sales. *Journal of Business & Economic Statistics* 14 (1) (Jan.): 103-111.
- Broda, Christian and David E. Weinstein. 2006. Globalization and The Gains from Variety. *Quarterly Journal of Economics* (May): 541-585.
- Broda, Christian, Nuno Limão and David Weinstein. 2006. Optimal Tariffs: The Evidence. *NBER Working Papers* (Feb.): 1-35.
- Cheng, Sheng-shry and Hsuana Chuang College. 2000. U.S. Clothing Expenditures: A Closer Look. *Consumer Interest Annual* 46 (2000): 72-76.
- Fan, Jessie X. Jinook Lee & Sherman Hanna. 1998. Are Apparel Trade Restrictions Regressive? *The Journal of Consumer Affairs* 32 (2) (1998): 252-274.
- Harrigan, James and Geoffrey Barrows. (2009). Testing the Theory of Trade Policy: Evidence from the Abrupt End of the Multifiber Arrangement. *The Review of Economics and Statistics* May 91 (2): 282-294.
- Hines, Jean D. and Mary E. Swinker. (2006). Understanding consumers' perception of clothing quality: a multidimensional approach. *International Journal of Consumer Studies* 30 (2) March: 218-223.
- Imbs, Jean and Isabelle Mejean. 2010. Trade Elasticities. September 2010: 1-37.
- Khaled, Mohammed, and Ralph Lattimore. 2006. The changing demand for apparel in new zealand and import protection. *Journal of Asian Economics* 17 (3) (June 2006): 494-508.
- Kopp, Robert T., Robert J. Eng, and Douglas J. Tigert. 1989. A competitive structure and segmentation analysis of the Chicago fashion market. *Journal of Retailing* 65 (4) (Winter): pp. 496-515.
- Krugman, Paul R. and Elhanan Helpman. 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy*. The MIT Press: Cambridge, Mass.
- Lee, Juyong and Elena E. Karpova. 2011. The US and Japanese apparel demand conditions: implications for industry competitiveness. *Journal of Fashion Marketing and Management* 15 (1) (2011): 76-90.
- Martin, M. F. (2007). *CRS Report for Congress: U.S. Clothing and Textile Trade with China and the World: Trends Since the End of Quotas*. Congressional Research Service.

-
- Michelini, Claudio. 1999. New Zealand Household Consumption Patterns 1983-1992: An Application of the Almost-Ideal-Demand-System. *New Zealand Economic Papers* 33 (2) (1999): 15-26.
- Moehrle, Thomas G. 1994. Seasonal adjustment of quarterly consumer expenditure series. *Monthly Labor Review* (Dec.) (1994): 38-46.
- Mokhtari, Manouchehr. 1992. An Alternative Model of U.S. Clothing Expenditures: Application of Cointegration Techniques. *The Journal of Consumer Affairs* 26 (2) (Winter 1992): 305-323.
- Robinson, Dwight E. 1961. The Economics of Fashion Demand. *The Quarterly Journal of Economics* 76 (3) (Aug.): pp. 376-398.
- Slaughter, Matthew J. 2001. International Trade and Labor-Demand Elasticities. *Journal of International Economics* 54 (2001): pp. 27-56.
- Sproles, George B. 1974. Fashion Theory: A Conceptual Framework. *Advances in Consumer Research* 1 (1) pp. 463-472.
- U.S. Department of Commerce: International Trade Administration. Office of Textiles and Apparel database. Available at <http://otexa.ita.doc.gov/scripts/tqmon2.exe>.
- Wagner, Janet, and Manouchehr Mokhtari. 2000. The moderating effect of seasonality on household apparel expenditure. *Journal of Consumer Affairs* 34 (2) (Winter 2000): 314-29.
- World Trade Organization's International Trade Statistics. 2011.

Tables & Figures

Table 1:

Apparel Elasticity Summary Studies

Authors	Country	Year	Model	Aggregation	Estimate
Khaled & Lattimore	New Zealand	2006	Rotterdam apparel demand system	Country-level	-2.06
				Men's clothing	-3.875
				Women's clothing	-3.029
				Children's clothing	-2.73
				Other	-2.95
				Men's footwear	-1.706
				Women's footwear	-3.016
				Children's footwear	-3.155
Michelini	New Zealand	1992	Almost Ideal Demand System	Country-level	-2.095
Cheng & College	U.S.	2000	Engle and Granger's (1987) "simple to general" model	Country-level	-0.38
Lee & Karpova	U.S.	2010	Almost Ideal Demand System	Domestic	-0.48
				Imported	-0.3
Mokharti	U.S.	1992	Error Correction Mechanism model	Country-level	-1
Fan, Lee & Hanna	U.S.	1998	Almost Ideal Demand System	Bottom Per-Capita Income Quartile	-1.03
				Second Quartile	-1.75
				Third Quartile	-1.07
				Highest Quartile	-2.15
Mean					-1.928
Standard Deviation					1.093

Figure 2:

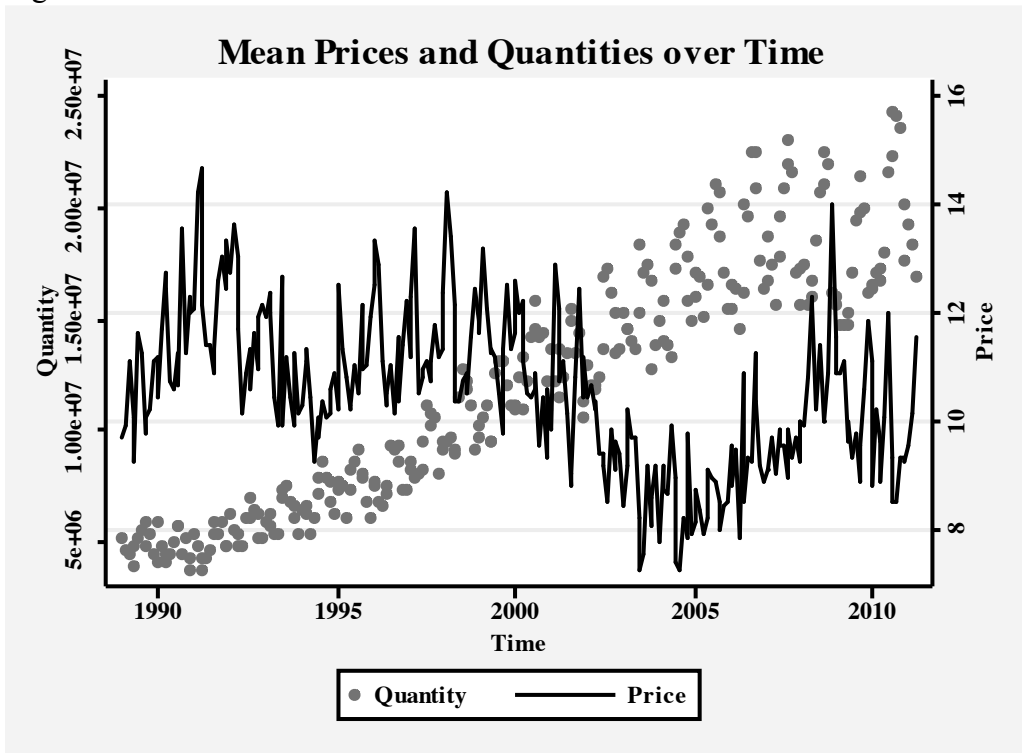


Figure 3:

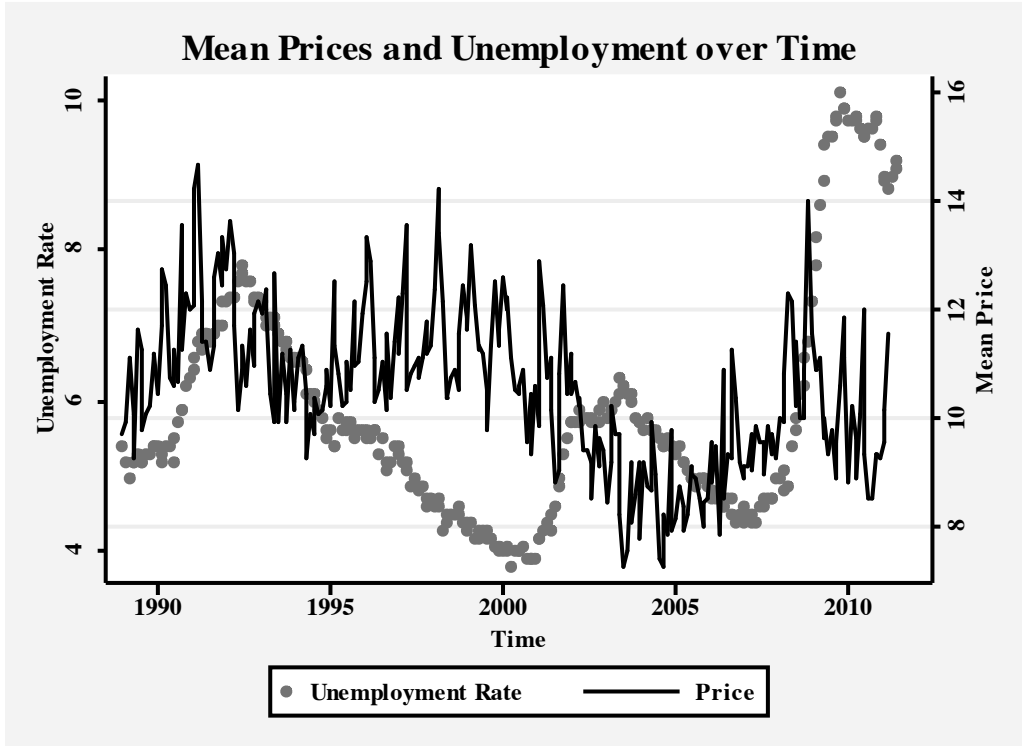


Figure 4:

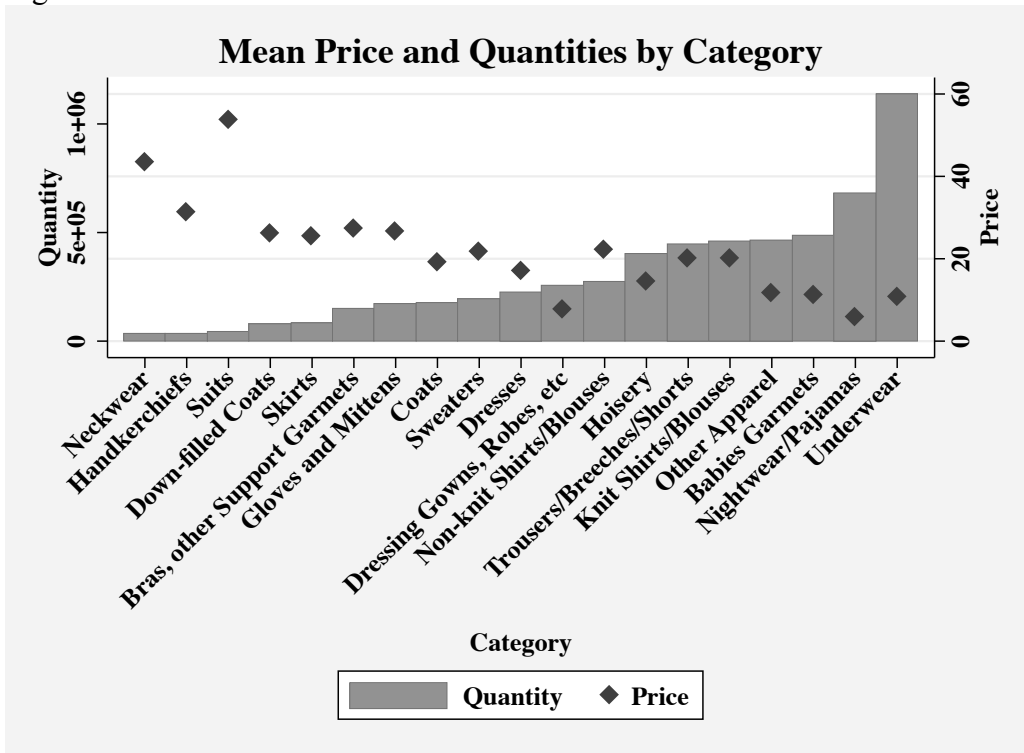


Figure 5:

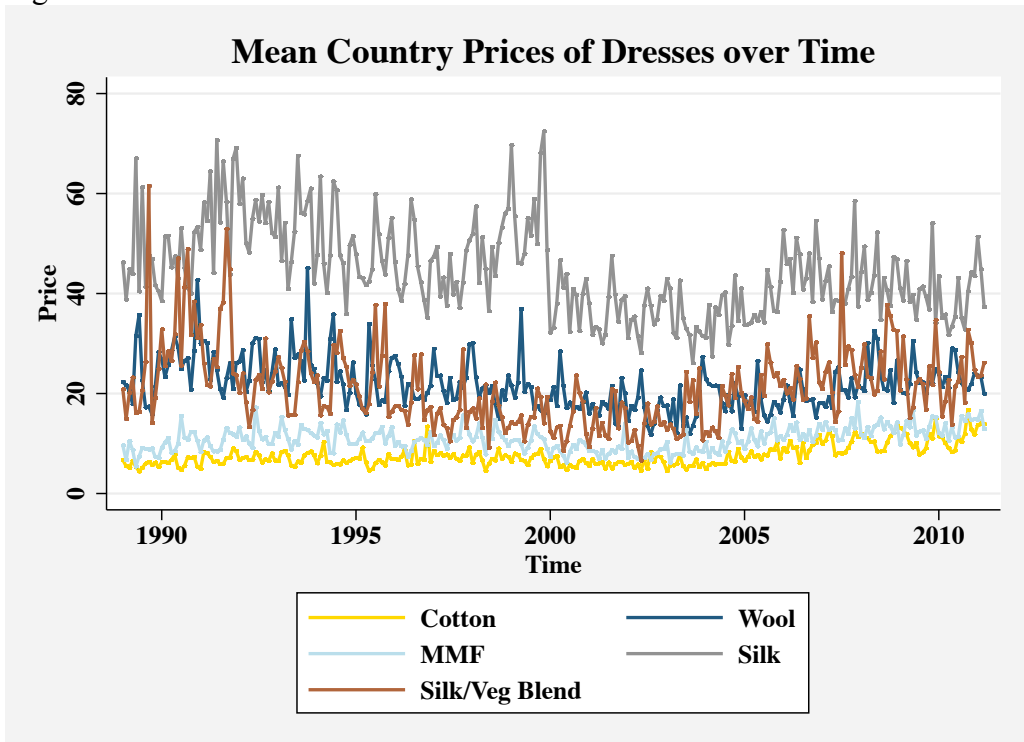


Figure 6:

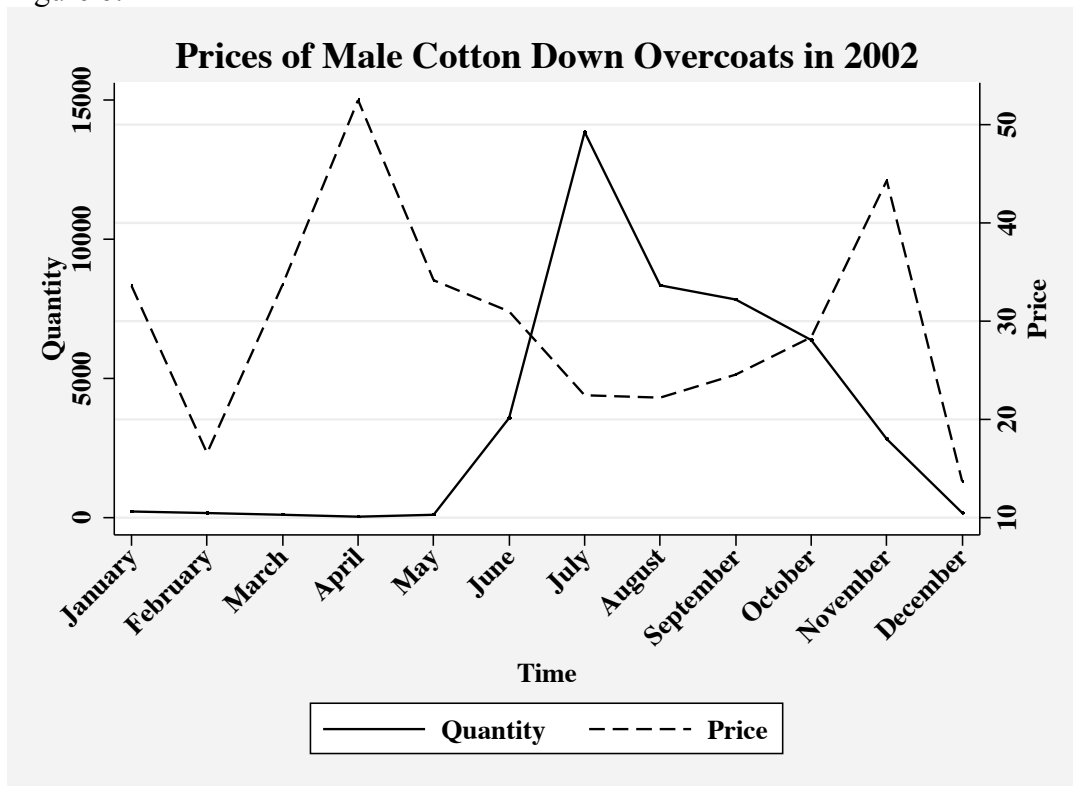


Figure 7:



Figure 8:

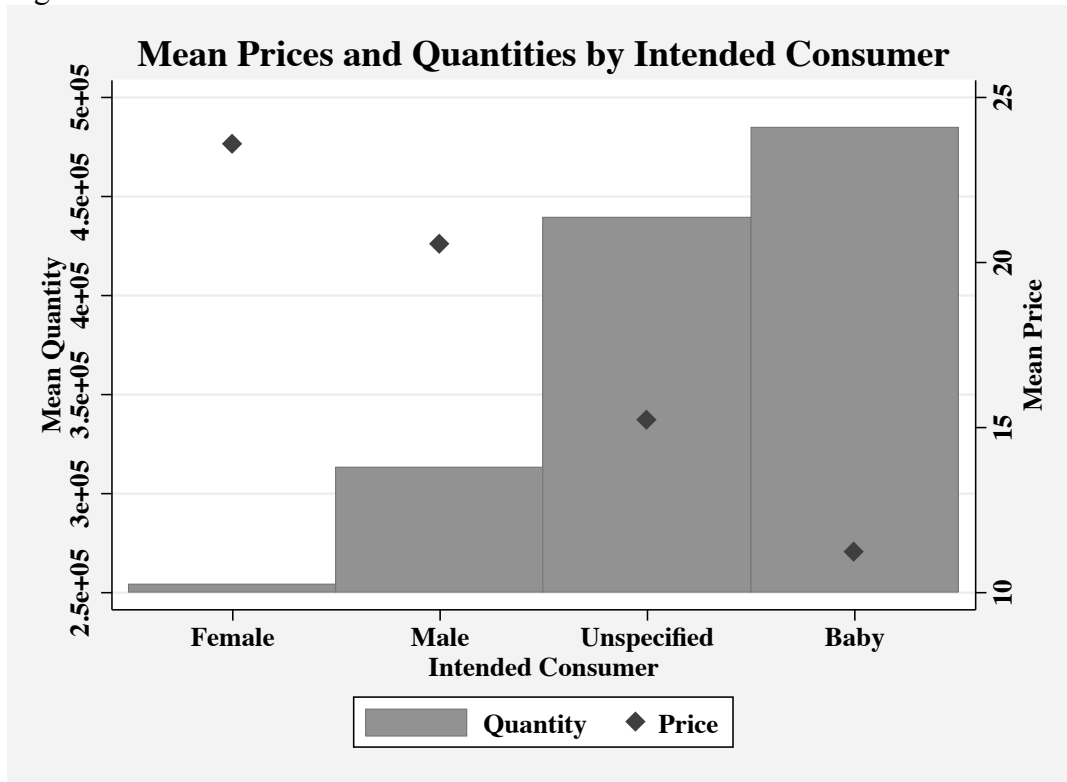


Figure 9:

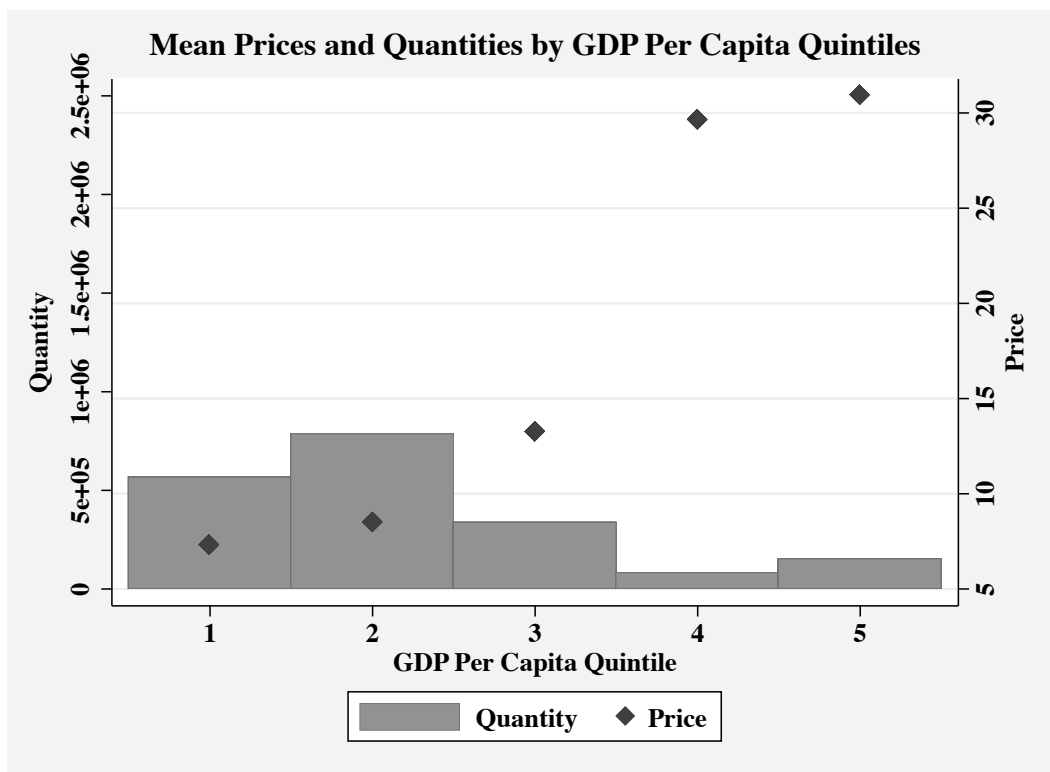


Figure 10:

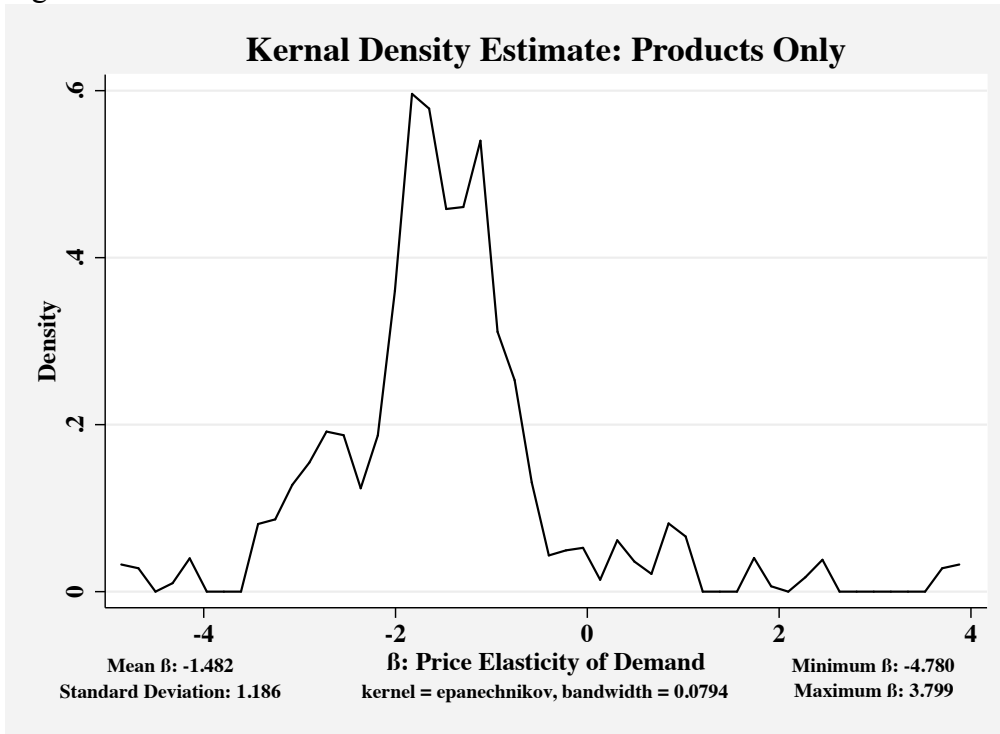


Figure 11:

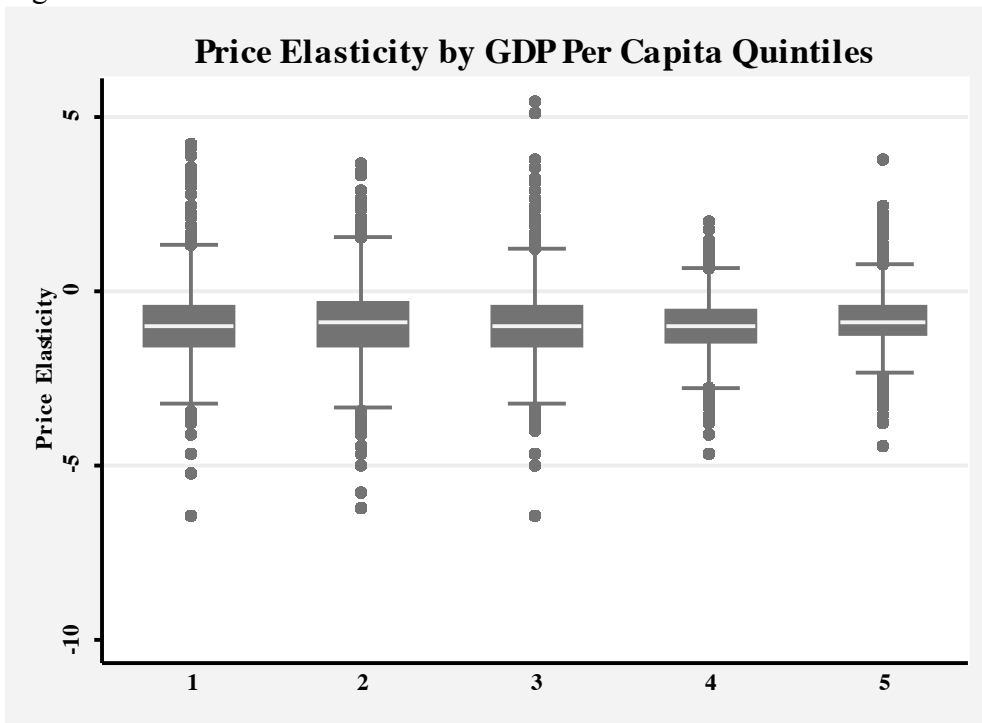


Table 12:

Price Elasticity Estimates by GDP Quintiles

GDP Quintile	Mean	Std. Dev.
1	-1.040	0.703
2	-0.923	0.712
3	-1.108	0.712
4	-1.035	0.610
5	-0.900	0.608

Note: Results for all specific country products includes; 5% values on either end cut off; observations >20

Table 13:

Price Elasticity Estimates by Fabric

Fabric	Mean	Std. Dev.
Cotton	-1.063	0.692
MMF	-1.014	0.666
Silk	-0.718	0.622
Silk/Vegetable Blend	-0.970	0.578
Wool	-0.942	0.645

Note: Results for all specific country products includes; 5% values on either end cut off; observations >20

Table 14:

Price Elasticity Estimates by Intended Consumer

Intended Consumer	Mean	Std. Dev.
Baby	-1.097	0.617
Unspecified	-1.060	0.598
Male	-0.943	0.697
Female	-0.958	0.693

Note: Results for all specific country products includes; 5% values on either end cut off; observations >20

Table 15:

Percent of Fabrics that are Produced by Each Quintile						
GDP Quintile	Cotton	MMF	Silk	Silk/Vegetable Blend	Wool	"High-end Fabrics" Total
1	42.93%	32.73%	3.03%	9.12%	12.2%	24.35%
2	34.31%	31.61%	5.68%	11.7%	16.7%	34.08%
3	33.75%	31.74%	3.91%	12.18%	18.42%	34.51%
4	29.91%	28.58%	8.32%	14.23%	18.96%	41.51%
5	34.27%	27.16%	7.98%	12.34%	18.25%	38.57%

Note: Observations >20; "high-end" fabrics include silk, silk/veg blend and wool

Table 16:

Percent of Each Intended Consumer that are Produced by Each Quintile				
GDP Quintile	Baby	Unspecified	Male	Female
1	2.76%	30.07%	26.05%	41.12%
2	3%	33.35%	26.03%	37.63%
3	2.66%	32.29%	24.61%	40.45%
4	2.97%	31.66%	25.02%	40.35%
5	3.34%	35.25%	23.39%	38.01%

Note: Observations >20

Table 17:

Price Elasticity Estimates by Continents		
Continent	Mean	Std. Dev.
Africa	-1.093	0.683
Asia	-0.975	0.703
Europe	-0.976	0.591
North America	-0.871	0.727
Oceania	-1.035	0.609
South America	-1.030	0.607

Note: Results for all specific country products includes; 5% values on either end cut off; observations >20

Table 18:

Impacts of the MFA on Price Elasticity by Quintile				
GDP Quintile	Post MFA on ΔQ	MFA Component of Elasticity	Non-MFA Component of Elasticity	Total Elasticity
1	0.104 (1.928)	-0.136 (0.946)	-0.890 (0.745)	-1.027 (1.691)
2	-0.014 (1.955)	-0.187 (0.913)	-0.828 (0.745)	-1.016 (1.659)
3	-0.542 (2.083)	-0.003 (0.893)	-0.987 (0.697)	-0.990 (1.590)
4	-0.769 (2.056)	0.108 (0.767)	-1.001 (0.658)	-0.894 (1.425)
5	-0.834 (1.925)	-0.031 (0.754)	-0.809 (0.623)	-0.840 (1.377)

Note: Values in parentheses are standard deviations of the means; results for all specific country products; 5% values on either end cut off; observations >20

Table 19:

Impacts of the MFA on Price Elasticity by Fabric				
Fabric	Post MFA on ΔQ	MFA Component of Elasticity	Non-MFA Component of Elasticity	Total Elasticity
Cotton	-0.531 (2.064)	-0.068 (0.889)	-0.975 (0.721)	-1.043 (1.610)
MMF	-0.343 (1.929)	-0.079 (0.872)	-0.928 (0.700)	-1.007 (1.572)
Silk	-0.311 (2.074)	0.061 (0.721)	-0.719 (0.649)	-0.658 (1.371)
Silk Veg Blend	-0.636 (1.939)	0.036 (0.793)	-0.873 (0.625)	-0.837 (1.418)
Wool	-0.610 (2.157)	0.029 (0.808)	-0.858 (0.676)	-0.829 (1.484)

Note: Values in parentheses are standard deviations of the means; results for all specific country products; 5% values on either end cut off; observations >20

Table 20:

Impacts of the MFA on Price Elasticity by Intended Consumer				
Intended Consumer	Post MFA on ΔQ	MFA Component of Elasticity	Non-MFA Component of Elasticity	Total Elasticity
Baby	-0.262 (1.776)	-0.166 (0.785)	-0.954 (0.665)	-1.120 (1.450)
Unspecified	-0.379 (1.836)	-0.056 (0.795)	-0.991 (0.633)	-1.046 (1.428)
Male	-0.449 (2.175)	-0.068 (0.908)	-0.854 (0.735)	-0.921 (1.643)
Female	-0.617 (2.103)	0.018 (0.856)	-0.873 (0.711)	-0.855 (1.568)

Note: Values in parentheses are standard deviations of the means; results for all specific country products; 5% values on either end cut off; observations >20

Table 21:

Impacts of the MFA on Price Elasticity by Continent				
Continent	Post MFA on ΔQ	MFA Component of Elasticity	Non-MFA Component of Elasticity	Total Elasticity
Africa	-0.326 (1.979)	0.107 (0.912)	-1.105 (0.674)	-0.997 (1.586)
Asia	-0.141 (2.081)	-0.176 (0.920)	-0.844 (0.734)	-1.020 (1.654)
Europe	-0.710 (1.965)	0.131 (0.693)	-0.916 (0.618)	-0.785 (1.311)
North America	-0.445 (1.941)	-0.166 (0.917)	-0.812 (0.761)	-0.979 (1.677)
Oceania	-1.261 (1.904)	0.120 (0.659)	-0.968 (0.689)	-0.848 (1.348)
South America	-0.457 (2.026)	-0.023 (0.847)	-0.973 (0.667)	-0.995 (1.514)

Note: Values in parentheses are standard deviations of the means; results for all specific country products; 5% values on either end cut off; observations >20