



## Review Article

# Comparative Analysis of Apparel Import by Fiber Content: The Case of the United States and Japan

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### Abstract

The present study investigated the difference in U.S. and Japanese apparel import demand, driven by fiber content specific to each market and revealed overall characteristics of the corresponding import market. Based on demand theory (Deaton & Mullebaur, 1980), this research (1) calculated price and income elasticities to identify characteristics of U.S. and Japanese apparel import markets by fiber content, and (2) compared differences in the price and income elasticities of apparel imports based on fiber contents in both markets using analysis of variance (ANOVA). The research found that income elasticities of U.S. and Japanese apparel imports were statistically different for cotton and manmade fiber apparel products. Cotton and manmade fiber apparel products imported to the U.S. market were luxury products, whereas the same product categories to the Japanese market were considered necessity items. Apparel products made of wool in both U.S. and Japanese markets were considered luxury, but the perception toward wool import products in the U.S. and Japanese markets was not different from each other.

### Introduction

Understanding the characteristics of major import markets is indispensable for a large number of exporting countries. The U.S. and Japanese apparel import markets' significance in size has become of great importance in this context [1,2]. According to the World Trade Organization (WTO), as of 2010 the United States was the largest importer of apparel products, worth \$82 billion, and Japan was the third largest, importing \$27 billion worth of apparel trade next to Germany importing \$33 billion worth of apparel products [2]. More than 60% of the world's countries exported apparel products to both U.S. and Japanese markets during the same year, accounting for 94 out of 153 countries [3]. Domestically, the market shares of imported apparel products in the total U.S. and Japanese domestic apparel markets increased significantly: from 58% in 2001 to 77% in 2007, and 41% in 2001 to 59% in 2007, respectively [3-5].

Scholars historically believe that the demands of consumer products in the United States and Japan are determined by substantially different and even bipolar market characteristics due to opposite cultural dimensions [6,7]. Researchers as well as marketers

highly value the comparative analysis of the U.S. and Japanese markets because they believe that investigating and comparing the two different markets with extremely opposite cultures might be able to provide the explanation of market characteristics in other cultures and reveal commonality in world demand in a specific product category if market universals in the U.S. and Japanese markets are found [7].

Scholars believe fiber content is one of the most important factors determining demand of apparel products [8-11]. Workman reported that fiber content affects the purchase of apparel products through attributes such as comfort, cut and style [11]. Other scholars found that fiber content determines perceived quality and price of products and eventually, purchase [8-10]. Although researchers acknowledged the importance of fiber content in understanding domestic market demand, it has failed to quantify the relationship between fiber content and demand of apparel products especially in import markets [11,12]. Furthermore, no research has investigated how fiber content influences the demand for apparel imports in the United States and Japan [11].

The purpose of this research is to investigate the relationship between apparel import demand and fiber content and the difference in U.S. and Japanese apparel import demand, driven by fiber content specific to each market and reveal overall characteristics of the corresponding import market. Based on consumer demand theory [13], this research (1) calculated price and income elasticity's to investigate the relationship between apparel import demand and the price and income of apparel imports by fiber type in U.S. and Japanese apparel import markets by fiber content, and (2) compared differences in the price and income elasticities of apparel imports by fiber contents in both markets using ANOVA (analysis of variance) to identify similarities and differences in the two markets. This research is significant because it can provide empirical evidence for the relationship between the apparel import demand and fiber types for the first time. The investigation of apparel import demands, based on fiber types, can also comparatively identify overall characteristics of U.S. and Japanese import markets, and provide managerial insights for countries simultaneously exporting to both countries. Apparel exporters and importers to both markets can benefit from this research by understanding consumer's preference for particular fiber content when purchasing imported apparel products [14].

### Literature Review

#### Consumer demand theory: Elasticity of demand

Consumer demand theory assumes that demand of a product depends on the price of the product and income [15]. It is a base of any demand theory including import demand ( $Q$ ) which is determined by the price of products ( $P$ ) and income ( $Y$ ) of an importing country in Equation 1 [16].

$$Q = f(P, Y) \quad (1)$$

Where,

$Q$  = Quantity of imports demanded;

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$P$  = Price of imports; and

$Y$  = Income of an importing country.

Elasticity of import demand explains and quantitatively shows the relationship between price, income and import demand changes based on consumer demand theory [13]. Elasticity has been a useful tool in consumer demand research because it is easily interpreted, reveals how sensitive a product's demand is to price and income changes, and subsequently reveals the market positions of products and overall characteristics of the corresponding market [17]. Scholars also believe that the types of products can be categorized--based on the demand changes when there are price and income changes [15]. Subsequently, the theory has been widely used by economists in various areas of investigation [18,19].

According to Gottheil [17], price and income elasticity is calculated as follows in Equation 2:

$$\text{Price elasticity} = \Delta Xi / \Delta Pi, \text{ and } \text{Income elasticity} = \Delta Xi / \Delta Ci \quad (2)$$

Where,

$\Delta Xi$  = Total value of product demand changed

$\Delta Pi$  = Change of product price

$\Delta Ci$  = Change of income

Price elasticity is measured by the percentage change of demand in total product value when there is a percentage change in price, and income elasticity is measured by the percentage change of demand in total product value when there is a percentage change in income [17].

Scholars believe that negative income elasticity indicates the product is a necessity, whereas positive income elasticity means the product is a luxury item [13]. Consumers purchase more luxury products that demonstrate social status and aesthetics as their incomes grow, but consume fewer "necessities" [20,21]. For example, a consumer with increasing income will choose a luxury brand sweater over one carrying a "necessity" brand label. The overall demand for a luxury brand sweater will increase and the demand for a necessity brand sweater will decrease as overall consumer's incomes increase [21].

On the other hand, price elasticity determines whether a product is of high or low quality [21]. Consumers have a large number of choices with different price points when purchasing apparel products [22]. Prices of similar products often differ according to quality: the higher the quality of a product, the higher the price [22]. For example, if the price of a sweater increases, consumers will likely buy fewer of them--instead purchasing a sweater of lower quality that functionally covers the body, like higher priced cotton sweaters but with inferior style and fiber content [21].

Researchers [23,24] investigated apparel import demand using price and income elasticities. Chadwick et al. investigated price and income elasticities for apparel imports from developing and developed countries between 1974 and 1988. They found that price elasticities for apparel imports from developing countries ranged from -0.61 to -0.8 and those for developed countries ranged from -2.35 to -2.57 [23]. Income elasticities for apparel imports from developing countries were found to be more than 1 for both groups of countries [23]. Lee and Karpova identified the market positions of products and overall market characteristics in the U.S. and

Japanese domestic apparel products markets, using price and income elasticities between 1995 and 2004 [24]. They found: (1) imported and domestically produced apparel products in both markets regarded by consumers as high quality, luxury items; (2) domestically produced Japanese products in Japan perceived as low quality necessities; (3) imported products in Japan regarded as high quality necessities; and (4) imported products in the United States thought to be low quality necessities [24]. The previous research, however, lacks to identify how apparel import demand is related to physical attributes of apparel products, such as fiber content [23,24].

### Relationship between fiber content and apparel demand

Several studies have investigated the relationship between fiber content and apparel demand and found that fiber content is strongly related to consumers' quality perceptions and consequent increased product demand [8-10]. Salerno-Kochan investigated variables that consumers use to evaluate quality of clothing: aesthetics, durability, utility properties, quality of finish, fiber content, fabric structure, convenience, physiological comfort, sensorial impression, hygienic properties, toxicity, ecological properties, maintenance, brand, certificate, price and fashion [8]. He found that fiber content is a very important feature for consumers over age 30 and female and also reporting that fiber content is highly related to customers' estimates of quality [10]. Fiore et al. found the fiber content of apparel products is strongly related to consumer's quality perception because it indicates how well the item will physically perform [8]. Heisey suggested that fiber content is positively related to perceived quality and price, even though country of origin and care instructions have not been shown to be statistically related to predictive quality and price of apparel among U.S. consumers [9].

Apparel fiber content also influences perceptions of intrinsic attributes determining comfort and satisfaction which leads to changes in product demand [25]. For example, Byrne et al. suggested that cotton is related to images such as physical and psychological comfort, and considered "youthful, honest, pure and dependable" [26] which leads to consumers' preference over apparel products made of man-made fiber [25]. Consumers consider wool apparel suitable for casual outdoor wear because of "its natural properties, durability, versatility and classic styling" [27]. Manmade fibers are believed by consumers as nothing more than "simple manmade fibers," carrying a negative connotation [28] making the consumer's perception for apparel products made of man-made fibers.

Although scholars acknowledge the importance of fiber content in apparel demand through shaping perceived quality in consumers' apparel purchasing decisions [6,8], the investigation of direct relationship between fiber content and apparel demand, especially import demand is limited. Especially, the investigation and comparison of price and income elasticities of apparel products by fiber content in the United States and Japan does not exist.

Therefore, based on consumer demand theory [15] and the extant research, the following hypotheses are proposed:

H1: The price by apparel imports by fiber type is negatively related to the apparel import demand in the United States and Japan.

H2: Income is positively related to the apparel import demand by fiber type in the United States and Japan.

## Methods

This research has two level analysis of the relationship between apparel import demand in the United States and Japan using Houthakker et al. import demand models [29] to calculate price and income elasticities and ANOVA (analysis of variance) to compare the results of price and income elasticities of apparel imports by fiber type in the United States and Japan. First, this research utilized Houthakker et al. import demand model [29] to identify price and income elasticities of apparel imports by fiber content in the United States and Japan using secondary data. The use of secondary data plays an important role for empirical economic research [30] because it is efficient, time saving and less costly compared to collecting primary data at a national level [31]. Price and income elasticities using import demand models have been used by scholars to identify overall product characteristics of the corresponding market in international trade [32,33]. The data was collected based on the categories as disaggregate as possible but the final data was aggregated to the levels of blouse, coats and jackets, dress, outer-garment, skirt, suits and trouser to match trade data before 1978 which was collected using less aggregated classification system.

Among various import demand models, the Houthakker et al. [29] import demand model was used in this study because it remains a benchmark for estimation of import demand models across countries [34]. Houthakker et al. proposed that the following import demand model (Equation 3) [29]:

$$\text{Log } M_{it} = A_{0i} + A_{1i} \log Y_{it} + A_{2i} \log (PM_{it} / WPI_{it}) + \mu_{it} \quad (3)$$

$t$ : either the United States or Japan

$M_{it}$ : the  $t$  country's imports of merchandise during year  $i$

$Y_{it}$ : An index of the  $t$  country's GNP (Gross National Product) in year  $i$

$PM_{it}$ : a price of imports into the  $t$  country in year  $i$

$WPI_{it}$ : The  $t$  country's wholesale price index in year  $i$

$\mu_{it}$ : The error term

The natural logarithm coefficients as an index of the country's GNP (Gross National Product) ( $A_{1i}$ ) were interpreted as income elasticities, and the coefficients of the price index natural logarithm ( $A_{2i}$ ) were referred to as price elasticities [29].

For simplification of the data collection procedure, wholesale price index ( $WPI_{it}$ ) was replaced by clothing expenditure ( $CE_{it}$ ) as a price index ( $P^*$ ) of apparel products in both U.S. and Japanese markets [29] (Equation 4 and Equation 5).

$$\text{Log } M_{it} = A_{0i} + A_{1i} \log Y_{it} + A_{2i} \log (P^*) + \mu_{it} \quad (4)$$

$$P^* = PM_{it} / CE_{it} \quad (5)$$

$P^*$ : price index

$CE_{it}$ :  $t$  country's clothing expenditure

$PM_{it} / CE_{it}$ : import price index compared to a  $t$  country's clothing expenditure

The second analysis using an ANOVA (analysis of variance) test identified whether the result of price and income elasticities was significantly different for U.S. and Japanese apparel product imports based on fiber content. Import models were estimated using multiple

regression analysis and least square approximation and an ANOVA (analysis of variance) was conducted by SAS [35,36].

The dependent variable was the natural logarithm of the total import value from the United States and Japan ( $M_{it}$ ). The independent variables included the natural logarithm of the U.S. and Japanese gross national income per capita ( $Y_{it}$ ), and the natural logarithm of the price index ( $P$ ) calculated by the price of imports divided by a country's clothing expenditure ( $PM_{it} / CE_{it}$ ). The natural logarithm coefficients of the U.S. GNI per capita ( $A_{1i}$ ) were interpreted as income elasticities, and the coefficients of the price index natural logarithm ( $A_{2i}$ ) were referred to as price elasticities. The results of the U.S. and Japanese income and price elasticities were reported according to fiber content.

Import value and volume of cotton, wool and man-made<sup>1</sup> girls' and women's apparel products (blouse, coats and jackets, dress, outer-garment, skirt, suits and trouser) between 1974 to 2004 were obtained from major apparel product exporters to the United States and Japan in 1995, 2000 and 2004 namely, China, Hong Kong, Italy and South Korea. This research utilized product categories for girls' and women's apparel products because of its importance in the total household apparel expenditure during the same time and to decrease data collection complexity [37]. The expenditure on girls' and women's apparel products accounts for 40%, of the total apparel expenditure for household during the same period [37]. The value of apparel product imports from China, Hong Kong, Italy and South Korea to the United States were attained from both [37-39]. Apparel imports made of cotton, wool and man-made fibers were chosen because almost 99% of the total apparel imports in the United States in 2010 were made from each of the fibers [40].

Japanese import value and volume data were taken from [41,42]. The U.S. import data are customs value [40] and the Japanese import data are f.o.b. value [43]. The unit price of each product category was calculated using total import amount divided by total import volume in the same product category collected from [37,38,41]. Gross National Incomes (GNI) and total population estimates were obtained from the [43] to calculate GNI per capita. Clothing expenditure for women's apparel products in the United States was collected from [44-47] and [48]; Japanese clothing expenditure was collected from [49]. All of the data collected are assumed to be normally distributed based on a central limit theorem [35].

## Results and Discussions

### Results of price and income elasticities

The results of price and income elasticities show the means of income elasticities for U.S. cotton at 1.98, wool at 1.38, and manmade fiber at 2.36--all higher than the Japanese counterparts of 0.18 for cotton, 1.38 for wool and 0.26, respectively (Figure 1). The mean of price elasticities for wool imports to the United States was 1.17--higher than the Japanese counterparts of 0.36. The mean of price elasticities for Japanese imports of cotton was 1.77, and for manmade fiber, 0.45--higher than the U.S. counterparts of -0.12 and 0.06, respectively. The results of price elasticities show that the prices of imported apparel products by any fiber type except for cotton apparel imports in the United States were positively related to apparel

<sup>1</sup>Man-made girls' and women's apparel products include both girls' and women's apparel products made of artificial fibers (e.g., nylon) and synthetic fibers (e.g., rayon) [40]. The trade data of both fiber types was combined for the level of aggregation of a research subject.

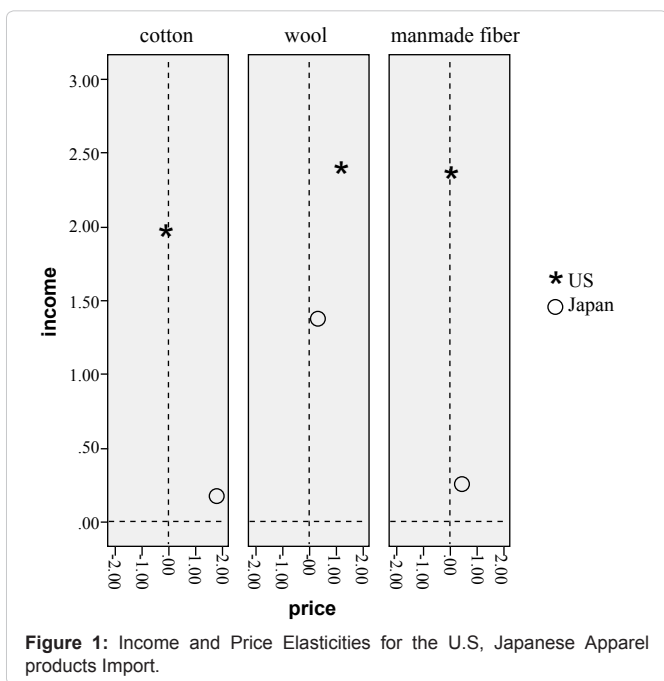


Figure 1: Income and Price Elasticities for the U.S. Japanese Apparel products Import.

Table 1: Results of Hypothesis Testing.

	The United States			Japan		
	Cotton	Wool	Man-made fibers	Cotton	Wool	Manmade fibers
H1 (price)	Support (-0.12)*	Do not support (1.17)	Do not support (0.06)	Do not support (1.77)	Do not support (0.36)	Do not support (0.45)
H2 (income)	Support (0.98)	Support (2.39)	Support (2.36)	Support (0.18)	Support (1.38)	Support (0.26)

\*Numbers in parenthesis represent the mean of calculated elasticities.

import demand in the United States and Japan. These results cannot support the first hypothesis that the price by (Table 1) apparel imports by fiber type is negatively related to the apparel import demand in the United States and Japan. However, the results of income elasticities showed that incomes of the United States and Japan were positively related to the demand of imported apparel products by any fiber type making supporting the second hypothesis of this research.

Overall, the t-tests for ANOVA (analysis of variance) showed that income elasticities of products made of cotton (T(54)=2.76, p<0.01)

and man-made fibers (T(56)=-2.84, p<0.01) for the United States and Japan are statistically different from each other (Table 2). However, income elasticities of products made of wool (T(46)=1.18, p<0.25) for the United States and Japan are not statistically different from each other. All of price elasticities for cotton, manmade fiber and wool apparel products are not statistically different for the U.S. and Japanese markets. The ANOVA (analysis of variance) results showed that the means of price elasticities of imported apparel products for the United States and Japan are not statistically different for cotton apparel products (T(53)=-1.34, p=0.19), wool apparel products (T(46)=0.9, p=0.33) and man-made apparel products (T(54)=1.19, p=0.24).

Among the results of income elasticities statistically different for the U.S. and Japanese markets, the income elasticity of apparel products made of manmade fiber in the U.S. market is the highest (2.36), following apparel products made of cotton in the U.S. market (1.98). The lowest income elasticity is apparel products made of cotton in the Japanese market (0.18), following apparel products made of manmade fiber in the same market (0.26)

It can be concluded that U.S. consumers increased the purchase of cotton and manmade fiber apparel imports far more than Japanese consumers when there was a same rate-income increase in both countries. This shows that U.S. consumers consider cotton and manmade fiber apparel imports far more luxurious than do Japanese consumers. Even though there was no statistical difference between U.S. and Japanese income elasticities for wool apparel products, both of the markets consider wool luxury products because of income elasticities more than 1. The results of price elasticities for cotton, wool and manmade fiber apparel imports in the U.S. and Japanese markets showed that almost all of the product categories, categorized by fiber type to the U.S. and Japanese markets, were low quality products except for Japanese cotton apparel import (1.77) and U.S. wool apparel import (1.17). However, the ANOVA (analysis of variance) results showed that none of the fiber type pairs in price elasticities statistically different.

### Conclusions

This research investigated income and price elasticities of apparel products import-by-fiber contents between 1974 and 2004 in the United States and Japan. The research found that income elasticities of U.S. and Japanese apparel imports were statistically different for cotton and manmade fiber apparel products. Cotton and manmade fiber apparel products imported to the U.S. market were luxury products, whereas the same product categories to the Japanese

Table 2: Income and Price Elasticities of Apparel import to the United States and Japan.

	Level	Income							Price						
		Elasticities				Analysis of variance			Elasticities				Analysis of variance		
		Mean	Std error	Lower 95%	Upper 95%	df	T	p	Mean	Std error	Lower 95%	Upper 95%	df	T	p
Cotton	U.S.	1.98	0.46	1.06	2.9	54	2.76	<0.01*	-0.12	0.98	-2.09	1.86	53	-1.34	0.19
	Japan	0.18	0.46	-0.74	1.11				1.77	1	-0.24	3.78			
Wool	U.S.	2.39	0.61	1.17	3.61	46	1.18	0.25	1.17	0.64	-0.12	2.47	46	0.9	0.33
	Japan	1.38	0.61	0.16	2.6				0.36	0.64	-0.94	1.65			
Manmade fiber	U.S.	2.36	0.45	1.46	3.27	54	3.3	<0.01*	0.06	0.23	-0.4	0.52	54	1.19	0.24
	Japan	0.26	0.45	-0.64	1.16				0.45	0.23	-0.01	0.91			

\* Statistically significant at p<0.01

market were considered necessity items. Apparel products made of wool in both U.S. and Japanese markets were considered luxury, but the perception toward wool import products in the U.S. and Japanese markets was not different from each other. Price elasticities of apparel product import categories by fiber types, however, were not statistically different for each fiber type pair between the U.S. and Japanese markets. Almost all of the product categories categorized by fiber type to the U.S. and Japanese markets were low quality products, except for Japanese cotton apparel import (1.77) and U.S. wool apparel import (1.17).

This research shows that U.S. and Japanese consumers have different perceptions of cotton and manmade fiber apparel products. This is consistent with the previous research by scholars that the demands of consumer products in the United States and Japan Scholars are substantially different because of unlike cultural characteristics [7]. U.S. consumers purchase cotton and man-made apparel products far more than Japanese consumers when there is a same rate of income increase. Perhaps as income increases, U.S. consumers tend to increase the purchase of apparel products made of cotton and manmade fiber faster than the Japanese counterpart [50]. Japanese consumers, however, think that imported apparel products made of cotton and manmade fiber are necessities, and purchase fewer items as their income increases. Conversely, as Japanese income decreases, there will a greater opportunity to export apparel products made of cotton and manmade fibers for foreign exporters.

This research is the first research to investigate apparel import demand by fiber content in the United States and Japan. It provides managerial insights for apparel business owners in various countries who export to the U.S. and Japanese markets. Scholars can also benefit from empirical investigation of this research to understand the demand of consumer products in two extremely different cultures. The future research can extend the results, price and income elasticities of imported apparel products by fiber content in the United States and Japan to investigate and explain cross cultural background of the demand of apparel products based on fiber type.

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