Effects of Quantitative Restrictions on U.S. Textile and Apparel Imports over 1995-2010: An Analysis Using Gravity Models

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ABSTRACT

The purpose of this study is to examine the effects on U.S. textile and apparel imports of the quantitative restrictions imposed under the Agreement on Textiles and Clothing (ATC) (1995-2005), the post-ATC U.S. safeguard quotas on 21 categories of Chinese textile and apparel products (2006-2008), and no quantitative restrictions on U.S. textile and apparel imports (2009-2010).

Data were sourced from the Office of Textiles and Apparel (OTEXA) in the U.S. Department of Commerce, the GeoDist dataset from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), and the United Nations Commodity Trade (U.N. Comtrade) database.

In this research, three gravity equations were developed and estimated based on the existing gravity model. The first gravity equation was estimated to assess the effects of the independent variables commonly included in gravity models on the total value of U.S. textile and apparel imports from 187 exporting countries with a scaled dependent variable and from 177 without it. The result of the first gravity equation indicated that distance and the per capita GDPs of the exporting countries, exchange rates, and the total GDPs of the exporting countries are statistically significant and have the expected signs

in the model with the scaled dependent variable.

The second gravity equation was estimated to access the overall effect of the presence or absence of quotas and VERs on U.S. textile and apparel import quantity from the 187 exporting countries. The results from the second gravity model showed that the presence or absence of quotas or VERs is significant and has an unexpected positive sign because the United States tended to impose quotas and VERs on textile and apparel products that it imported in large amounts.

The third gravity equation was estimated to assess trade creation and trade diversion effect of the quota and VER levels of U.S. textile and apparel imports with separate equations by product types considering the endogeneity by applying instrumental variables. The result from the third gravity equation showed that the quota and VER level is significant for fabric, apparel, and made-up products with expected signs but the variable is not significant for yarn products. These findings suggest that U.S. textile and apparel imports from the exporting countries limited by quotas and VERs on U.S. textile and apparel imports increased more than rest of world (ROW) imports from those countries as the quota and VER levels on U.S textile and apparel imports increased. Therefore, trade creation occurred between the United States and the exporting countries as the total SME quota or VER levels on those imports increased during the ATC and safeguard period. However, these findings show the demand of yarn as intermediates does not increase much in the United States; therefore, the increase of the total yarn quota or VER level has less of an effect on the yarn imports than other product types.

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CHAPTER 1

INTRODUCTION

Problem Statement

Many operations in the textile and apparel industry are relatively labor intensive. Apparel assembly requires not only sewing machines, but also a large amount of labor. Sewing machines are cheap compared to many machines used in other industries, and apparel assembly does not require highly skilled labor; therefore, the apparel industry has low startup costs and low entry barriers. For these reasons, this industry serves as the first step in the industrialization process for many of the least-developed countries (Staritz, 2011). In addition, many apparel producers in low-income countries export their products, especially to developed countries, because they enjoy a competitive advantage over developed-country apparel producers as a result of their relatively low costs for labor and other factors of production and because export markets are often more profitable than the domestic markets of low-income countries.

The textile industry is more capital intensive than the apparel industry because yarn and fabric production requires less total labor and more machinery, along with more complex machinery, than does apparel assembly. This industry also requires more skilled labor than apparel assembly to operate and maintain the complex machines used in production. Although textile production is more capital intensive than apparel production, these industries are closely related because the textile industry provides yarns and fabrics used in apparel production. Therefore, many low-income countries start their industrialization with apparel production, often for export, and after earning enough from apparel production, they invest money to build textile production (Gereffi, 1999). An incentive for building textile production capacity in low-income countries is to provide domestic supplies of textile inputs for apparel production as a way to attract apparel buyers based in developed countries.

As the wage rates of developed countries have increased over time, these countries have experienced rising textile and apparel imports from low-income countries. The United States has been the world's largest importer of textiles and apparel for many years. U.S. textile and apparel imports rose in nominal U.S. dollars from $28 billion in 1989 to $105 billion in 2013 (U.S. Department of Commerce, *n.d.*). As U.S. textile and apparel imports increased over time and the productivity of U.S. textile and apparel manufacturing improved due to technological advances, the employment in such manufacturing declined from 1.7 million workers in 1989 to 377 thousand workers in 2013 (U.S. Department of Labor, *n.d*.).

Over the years, many U.S. textile and apparel manufacturers have merged with or acquired other companies to improve their competitiveness, and many have also made technological advancements to enhance productivity; however, U.S. textile and apparel producers have progressively lost domestic market share to imports (Kunz & Garner, 2007). A similar situation exists in other developed countries. During the last half of the 20^{th} century and the first decade of the 21^{st} century, the United States and other developed countries imposed import restraints, primarily in the form of tariffs and quantitative restrictions, to protect domestic textile and apparel producers and their labor force. A major set of quantitative restraints, mainly voluntary export restraints (VERs), was imposed through bilateral agreements between importing countries and exporting countries under the Multi-Fiber Arrangement (MFA). The MFA was in effect from 1974 through 1994. Under the MFA, developed countries, such as the United States, pressured low-income countries to make bilateral agreements that set VERs on the textile and apparel products that low-income countries could export to the developed countries in the bilateral agreements. Like a quota, a VER is a quantitative trade restriction; however, a quota is set unilaterally by an importing country, and a VER is set through a bilateral agreement between an exporting country and an importing country (Kreinin, 2002). Usually, the exporting country must accept the negotiated VER in order to avoid more restrictive quotas imposed by the importing country on products from the exporting country (Kreinin, 2002). In spite of the trade restraints imposed under the MFA, U.S. textile and apparel imports rose from $10 billion in 1974 to $43 billion in 1994 in nominal U.S. dollars while the MFA was in force (Hathcote, Rees, & Kind, 2004).

Major factors that account for the large increase in U.S. imports under the MFA include the following. U.S. buyers imported from exporting countries that were not subject to VERs or quotas, and they imported products not subject to VERs from VER-controlled exporting countries. For example, U.S. buyers imported baby clothes from the Philippines, underwear from Sri Lanka, and men's shirts from Mauritius that were not limited by VERs or quotas (Rivoli, 2009). Some U.S. buyers also imported fabrics and garments made of ramie/cotton blends to avoid import restrictions on 100% cotton products.

According to economic theory, quantitative restrictions on trade, such as quotas and VERs, reduce the welfare of consumers in importing countries and producers in exporting countries. These welfare losses exceed the welfare gains of producers in importing countries. Quotas and VERs constrain the purchase choices of consumers in importing countries and also increase domestic prices. Many analysts, leaders of low-income countries, and retailers and other importers in developed countries pressed for the elimination of the MFA for those reasons and for the reason that it violated the basic principles of the General Agreement on Tariffs and Trade (GATT) as well as the World Trade Organization (WTO), which absorbed the GATT, to encourage free trade.

The MFA was disbanded in 1995 and replaced that year by the Agreement on Textiles and Clothing (ATC), which had the purpose to phase out by January 1, 2005 all quantitative restrictions on textile and apparel trade that were imposed under the MFA and to bring under WTO rules the textile and apparel trade between WTO member countries (Shen, 2008). Despite these purposes, the ATC also allowed during its tenure any WTO member country to make bilateral agreements with exporting countries to set new VERs on the textile and apparel products it received from the exporting countries. China has long been a major source of the textile and apparel imports of the United States and other developed countries. In addition, its textile and apparel exports to such countries were heavily restricted under the MFA.

After 15 years of negotiations between China and GATT or WTO countries, China joined the WTO in 2001. China's accession to the WTO in 2001 allowed it to benefit from the elimination of MFA trade restrictions that had occurred by that time and occurred subsequently, as well as other advantages enjoyed by WTO members such as lower tariffs on the imports of any WTO member country from other WTO members than from non-WTO members (Shen, 2008). Despite these benefits for China, its WTO accession agreement allowed any other WTO member country to impose safeguard quotas on textile and apparel products the country imported from China if the country demonstrated to the WTO that such imported products disrupted or threatened to disrupt markets for those products in the importing country (Shen, 2008).

In the first few months after China joined the WTO in 2001, U.S. imports of some textile and apparel products from China rose sharply. Even larger growth occurred in U.S. imports from China in some textile and apparel product categories during the first two months, January and February, after January 1, 2005 when all quantitative trade restrictions established under the MFA or the ATC were eliminated. This led the United States to impose safeguard quotas on its imports of 21 categories of textiles and apparel from China. These quotas were in effect from January 1, 2006 through December 31, 2008 (Shen, 2008). The EU and some other countries took similar actions.

This research focuses on how U.S. textile and apparel imports were affected by the trade restraints under the ATC and the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China. A number of other trade policies, such as tariffs, are believed to have significantly affected U.S. textile and apparel imports in recent decades. The other trade policies also include various preferential trade agreements (PTAs) between the United States and other countries. An example of these PTAs is the North American Free Trade Agreement of the United States, Canada, and Mexico. In most cases, PTAs increase trade between member countries by reducing barriers to their trade with each other. In addition, Grant and Boys (2011) found for the period 1980-2004 that WTO membership of an importing country and an exporting country increased trade between these countries by 161% in agricultural products and 72% in non-agricultural products. Although tariffs and PTAs are of interest for their effects on U.S. textile and apparel imports, examination of these effects is beyond the scope of the present research.

Purpose of this Research

The overall purpose of this research is to examine the effect on U.S. textile and apparel imports of the quantitative restrictions imposed under the Agreement on Textiles and Clothing (ATC), the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China, and the lack of quantitative restrictions on U.S. textile and apparel imports after the safeguard quotas expired. The period of analysis is 1995-2010.

Research Objectives

The specific objectives of this research are to

1. characterize the Multi-Fiber Arrangement (MFA) and the quantitative restrictions on U.S. textile and apparel imports that were imposed under the MFA;
2. characterize the Agreement on Textiles and Clothing (ATC), the WTO mechanism for the 10-year phase out of the MFA trade restrictions;
3. characterize the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China;
4. use graphs and tables to examine data on U.S. textile and apparel imports from all countries that supplied the imports during the 1995-2010 period;
5. develop and estimate the first gravity equation to examine the effect of several the basic independent variables commonly included in gravity models on the total value of U.S. textile and apparel imports over 1995-2010;

6. develop and estimate the second gravity equation to examine the effect on the total annual SME quantity of U.S. textile and apparel imports over 1995-2010 of the presence or absence of quotas and VERs on these imports while controlling for the same independent variables as in the first gravity equation in Research Objective 5; and
7. develop and estimate the third gravity equation to examine the effect on trade creation and trade diversion of the quota or VER levels on U.S. textile and apparel imports over 1995-2008 while controlling for the same independent variables as in the first gravity equation in Research Objective 5.

Justification

Quotas and VERs are nontariff trade barriers that may influence not only producers but also consumers and the overall welfare of importing and exporting countries. These trade barriers raise prices in an importing country and limit the quantity of products that may enter the country. For these reasons, these trade barriers reduce consumer welfare in the importing country and producer welfare in exporting countries, but increase producer surplus in the importing country. For example, increased product prices in the importing country result in decreased real income for consumers in the importing country, and import limits protect domestic textile and apparel manufacturers and workers from world competition. Economic analyses have shown that the total effect of trade barriers is usually negative (Kreinin, 2002). Quotas and VERs imposed on textile and apparel trade under the MFA were phased out under the ATC.

Along with the general effects of quotas and VERs noted above, the imposition or removal of these trade restraints may cause trade creation or trade diversion. Trade creation and trade diversion are often discussed as effects of regional trade agreements or other forms of PTAs, which typically include discriminatory trade policies that reduce barriers to trade among member countries while retaining barriers to trade with non-member countries. As described by Eicher, Mutti, and Turnovsky (2009), trade creation is a beneficial effect of a PTA on the member countries in that reduced trade barriers (e.g., tariffs) lead to lowering the prices paid by domestic consumers and importing companies. The reduced prices are partially due to the displacement of inefficient domestic producers by efficient producers in another PTA member country. On the other hand, trade diversion is "the undesirable or efficiency-reducing effect" of a PTA (Eicher et al., 2009, p. 252). Trade diversion occurs when low-cost imports by a PTA member country from a non-member country are displaced by high-cost products from a member country. Despite the frequent application of the trade creation and trade diversion concepts to PTAs, such effects may have occurred under the trade policies considered in the present study.

One reason that trade creation and diversion may have resulted from the trade policies considered in this study is that the VERs on U.S. textile and apparel imports that were in force under the ATC were discriminatory in that they were imposed through bilateral agreements between the United States and individual exporting countries and were therefore country-specific (Cline, 1990). These agreements were mainly with low-income exporting countries that were major suppliers of U.S. textile and apparel imports, but not with all countries that did or could potentially supply such imports. Trade diversion occurred to the extent that low-cost, VER-controlled U.S. textile and apparel imports were displaced by high-cost products from domestic or foreign sources. Trade creation occurred to the extent that exporting countries sold their low-cost VER-controlled products to importing countries with no VERs on the products and the low-cost products displaced high-cost products in the importing countries. Similar effects may have occurred under the safeguard quotas on 21 categories of U.S. textile and apparel imports from China; however, an element of this case is that the only quota-controlled U.S. textile and apparel imports during the safeguard period were those 21 categories from China, on which U.S. companies had petitioned the U.S. government to impose quotas (Sjoberg & Moore, 2004). Because only products from China were under quotas during the safeguard period, U.S. importing companies could and did import like products from other countries, such as Bangladesh and Vietnam, to fill their product needs (Casabona, Liu, & Anderson, 2008; Clark, 2006; Field, 2008; Fischer, 2005), a practice that may have diluted trade creation and trade diversion effects of the quotas.

Increasing or removing quotas and VERs under the ATC and raising the levels of and ultimately eliminating the safeguard quotas could also involve trade creation and trade diversion. To the extent that low-wage exporting countries favored export sales to the United States over other import markets, the increased levels or removal of quotas and VERs on U,S. textile and apparel imports may have led to trade creation for the United States, but trade diversion for other importing countries. However, certain practices of U.S. retailers may have diluted these effects. In the post-ATC market, large U.S. retailers were freed from having to source their textile and apparel products abroad according to whether particular exporting countries were subject to quotas and VERs or had unfilled quotas and VERs on the desired products. Being freed from these constraints, many of the retailers have reduced the numbers of countries where they source their products and have instituted rather stringent criteria involving product quality, lead time, input-sourcing capability on suppliers' accounts, political and exchange-rate stability, and other factors to select the countries and suppliers from which they source products (Staritz, 2011).

Low-income countries often rely on textile and apparel exports, especially apparel exports, to promote their economic development because these countries can provide large amounts of low-wage labor for apparel production and thus can offer much-needed jobs in their countries through such production, along with attractive sites for supplying apparel to buyers in high-wage countries, and because apparel production does not require high fixed costs. Textiles and apparel accounted for 17% of the total exports of Vietnam in 2011. The apparel share of the total exports of Myanmar soared from 2.5% in 1990 to 39.5% in 2000 (Kudo & Goto, 2012). Even though the United States, the largest source of demand for the apparel exports of Myanmar, imposed an embargo on its imports from Myanmar in 2003, the apparel exports of Myanmar were back on track by 2011 after gaining market share in Asian countries such as Japan and South Korea (Kudo & Goto, 2012). These are only examples of the importance of textile and apparel exports to low-income countries. Fernandez-Stark, Frederick, and Gereffi, (2011) reported that low-income countries currently account for about 75% of world apparel exports.

The quotas and VERs imposed on textile and apparel trade under the MFA were phased out by January 1, 2005 under the ATC, and the safeguard quotas on 21 categories of U.S. textile and apparel imports from China were eliminated January 1, 2009. Trade liberalization in textiles and apparel may have large effects on consumers and producers in both developed and low-income countries. Given these large effects, good decisions by government policymakers in both types of countries rely on knowledge of the effects of imposing or reducing trade barriers. Buyers and suppliers of traded products in importing and exporting countries also need to understand the effects of trade policy changes in order to cope with resulting market changes. Buyers and suppliers of textiles and apparel in importing and exporting countries, such as those in North and South America, the EU, and Asia, have experienced great changes in their textile and apparel markets since the elimination of MFA quotas and VERs in 2005 (Shen, 2008). In addition to the elimination of the quantitative trade restrictions, factors like tariff rates, exchange rates, wage rates, and the relative political stability of countries may influence trade in textiles and apparel. Textile and apparel buyers and suppliers must consider these diverse effects when developing, respectively, their supply chains and their export markets. To make sound sourcing decisions, for example, buyers who source textile and apparel products in other countries need to understand the determinants of international trade in these products.

Now is a good time to compare U.S. textile and apparel imports before and after trade liberalization and to analyze the impact of the liberalization through the removal of all MFA quotas and VERs on January 1, 2005 and the post-ATC safeguard quotas on U.S. textile and apparel imports from China on January 1, 2009. The MFA was eliminated and replaced by the Agreement on Textiles and Clothing (ATC) in 1995. MFA quotas and VERs were phased out under the ATC over the 10 years from January 1, 1995 through January 1, 2005, and safeguard quotas were imposed on 21 categories of U.S.

textile and apparel imports from China from January 1, 2006 through December 31, 2008. Therefore, the data for this study cover the period from 1995 through 2010 to examine U.S. textile and apparel imports over that period. Researchers (e.g., Baier & Bergstrand, 2007; Carrere, 2006; Chi & Kilduff, 2010; Datta & Kouliavtsev, 2009; Liping, 2010) have analyzed the effects of trade liberalization in various industries, including the textile and apparel industry. Those cited studies focused on the effects of regional trade agreements (RTAs) rather than the effects of MFA quantitative restrictions on textile and apparel trade. In addition, many studies (Baier & Bergstrand, 2007; Carrere, 2006; Eichengreen, Rhee, & Tong, 2007) on the effects of trade policies have included analysis of trade between country pairs; however, only a few studies (Chi & Kilduff, 2010; Datta & Kouliavtsev, 2009; U.S. International Commission, 2011) have addressed the trade of one country with its trade partners. The United States is the largest textile and apparel importer in the world. It is important to examine the effects of trade liberalization on U.S. textile and apparel imports because the liberalization may influence the economies of both the United States and the many countries that supply these imports or may supply them in the future. It is therefore important to also examine the influence of the trade liberalization on the ROW imports of textiles and apparel in order to assess potential trade creation and diversion effects of the trade liberalization.

A further point is that researchers have sometimes used dummy variables to account for the presence or absence of quotas or VERs (Grossrieder, 2007). Some weaknesses of this approach are that it does not account for variation in quota or VER magnitudes among product categories or among the countries subject to quotas or VERs or among the fill rates of the quotas and VERs. A fill rate is the imported quantity of a product category divided by the quota or VER amount for that product category. Data from the Office of Textiles and Apparel in the U.S. Department of Commerce show considerable variation in the quota or VER amounts (levels) of U.S. textile and apparel imports and in the fill rates for product categories and product sources. Some U.S. product imports from some countries in some years had fill rates under the MFA of more than 90%, indicating binding quotas or VERs for those products when applying the definition of a binding quota used by Bouët, Decreux, Fontagné, Jean, and Laborde (2008). The fill rates of many U.S. import products from some countries in some years were much less than 90% however. Fill rates alone do not represent the magnitudes of the imported volumes of textile and apparel product categories. The allowed quota or VER quantities and the U.S. import amounts were large for some categories, but small for others. This issue is considered later in this dissertation.

Dissertation Structure

To achieve the overall purpose and objectives of this research, this dissertation proceeds along the following steps. Chapter 2 provides background on the U.S. textile and apparel industry; the GATT and WTO; the VERs imposed on Japan's cotton textile and apparel exports to the United States in 1957 to be in effect for five years; the Short Term Arrangement (STA) and Long Term Arrangement (LTA); the MFA and the quantitative restrictions on textile and apparel trade imposed under it; the Agreement on Textiles and Clothing (ATC); and the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China. The VERs imposed on Japan's cotton textile and apparel exports to the United States in the 1950s and into the 1960s and the STA and the LTA were pre-MFA trade policies with two major effects on the MFA: (a) they influenced world trade in textiles and apparel in ways that prompted the negotiation and implementation of the MFA; and (b) their trade-restriction frameworks served as models for those in the MFA. Chapter 2 also contains a review of relevant research literature. Such research includes investigations of the effects of the MFA trade restrictions. Most of the reviewed research pre-dated the phase out of the MFA quotas and VERs beginning in 1995 and was therefore designed to project the effects of eliminating those quotas and VERs. Another research stream discussed in Chapter 2 is the formulation of gravity models, the types of variables incorporated in such models, and studies in which the models have been employed.

Chapter 3 describes the theoretical framework and the empirical models in this research. The empirical models in this research have the form of the gravity model. The theoretical basis for the gravity model is explained along with the specifications of the three gravity equations used with panel data to estimate the random effects of quantitative restrictions and other independent variables on U.S. textile and apparel imports over 1995-2010 and to assess the potential effects on trade creation and trade diversion of the restrictions over 1995-2008. Hypotheses on the relationships between the dependent and independent variables are presented, along with the rationale for each hypothesis. Chapter 3 also describes the data and the data sources used in the research.

Chapter 4 presents the results from estimating three gravity equations. The first equation has the form of the basic gravity equation; it contains a set of independent variables commonly included in gravity models without considering the quantitative restrictions on U.S. textile and apparel imports. The second gravity equation accounts for the presence or absence of quantitative restrictions on U.S. textile and apparel imports controlling for the independent variables included in the first gravity equation. Lastly, again while controlling for the independent variables included in the first gravity equation, the third gravity equation accounts for the magnitudes of the quota and VER levels of U.S. imports of yarn, fabric, apparel, and made-up products, rather than textiles and apparel in aggregate. The dependent variable in this equation also differs from those in the first two equations in two main ways: Rather than being specified as total U.S. textile and apparel imports, (a) it is specified separately as imports of four product types (yarn, fabric, apparel, and made-up products); and (b) it is specified as the ratio of the total value of U.S. imports of the relevant product type to that of ROW imports of that product type.

Chapter 5 contains the research conclusions, indicates implications of this research for trade policymakers and managers of companies in the textile and apparel industry, and describes limitations of the study and suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

The literature review in this chapter provides background on the U.S. textile and apparel industry, especially characteristics of the industry that underlie U.S. trade patterns textiles and apparel. In addition, the literature review has the purpose of providing information to (a) the Multi-fiber Arrangement (MFA) and the quantitative trade restrictions that were imposed under the MFA. (b) the Agreement on Textile and Clothing (ATC); and (c) the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China. The fourth research objective addressed in this chapter is to use graphs and tables to examine data on U.S. textile and apparel imports from all countries that supplied the imports during the 1995-2010 period. Finally, this chapter contains a review of the literature on gravity models and their use to analyze international trade in textiles and apparel.

The U.S. Textile and Apparel Industry

Advancements in science and technology, such as those involving mechanization and computerization, have changed most manufacturing industries including textile and apparel manufacturing. For example, robotization in spinning, weaving, dyeing, and finishing has helped improve productivity in textile production (Kunz & Garner, 2011). Improvements in productivity have allowed U.S. textile manufacturers to produce large volumes of standard types of yarns and fabrics with many fewer workers than in the past. This strategy, however, cannot satisfy the yarn and fabric needs of many current consumers who want to follow fashion trends and demand a variety of fashion-forward apparel products composed of yarns and fabrics with short fashion life cycles. If garments do not sell in one season, they cannot be sold at full price the next season, which has led U.S. apparel companies to shorten production lead times and offer various styles in small volumes per style and per fabric type to reduce risk (Keiser & Garner, 2010). The need to offer varied apparel products has also led U.S. apparel companies to increasingly purchase fabrics for their apparel products from foreign suppliers more willing to provide short fabric runs than are many U.S. textile producers.

Although technological changes have been introduced in several areas of apparel design, product development, and production, such as computer-aided design, pattern grading, marker making, and pressing, the progress in automating apparel assembly has been much slower than that in textile production. Engineers have tried to automate apparel assembly using robotic technology, as in assembling automobiles, but commercialization of this technology has failed because the use of robots is so far more amenable to producing large amounts per garment style than the small quantities per style and the varied and rapidly changing styles required today. Apparel assembly has therefore remained labor intensive. Consequently, apparel companies in the United States and other developed countries have sought apparel assembly and fabric production in low-income countries to reduce costs, sustain or increase profits, and survive in the highly competitive apparel market.

Furthermore, advancements in communication technology, such as the capability to transmit digitized information via the Internet, and developments in logistics technology, such as radio frequency identification (RFID) for tracking inventory, have enabled global sourcing of apparel inputs and apparel production (Bottani, Ferretti, Montanari, & Rizzi, 2009). Third-party logistics providers, such as Caterpillar Logistics, FedEX, Menlo Worldwide, Penske Logistics, Ryder, and UPS, have helped to boost the buildup of global supply chains, which has allowed U.S. apparel companies to concentrate on their core competences and avoid large investments in in-house logistics operations (U.S. International Trade Commission, 2011). Thus, U.S. apparel companies, such as retailers, manufacturers, and brand marketers, in developed countries have been able to access cheap labor in low-income countries to reduce the costs of manufacturing their products.

U.S. firms began to move the production of their apparel products to foreign countries in the 1950s. They shifted the production first to Japan in the early 1950s, then to Hong Kong in the late 1950s, then to South Korea and Taiwan in the 1960s and 1970s, and then to other Asian countries such as China in the 1980s (Bonacich & Waller, 1994a). Apparel production for U.S. firms has also been shifted to Mexico and countries in the Caribbean, Central America, Africa, and elsewhere. The successive shifts of apparel production were caused by various factors such as trade restrictions or the lack thereof, favorable or unfavorable exchange rates, the relative proximity of supplier countries to the United States, and the relative production costs in the United States and in low-income apparel supplier countries (e.g., see Evans & Harrigan, 2005; Gereffi, 2002).

An important factor that contributed to the relocation of apparel production is that apparel companies in first Hong Kong and then also South Korea and Taiwan developed what are known as triangular manufacturing networks. In such a network, the firm that manages the network (e.g., a firm in Hong Kong) takes orders from buyer firms in developed countries, such as the United States, for the production of apparel goods and then has the ordered garments produced in other countries, such as China, from which the finished goods are shipped directly to the buyer firms. The firm that manages a triangular manufacturing network may own and operate the apparel factories in other countries where it has apparel produced or may hire contractors in the other countries to produce the apparel. The triangular manufacturing networks evolved as Hong Kong, South Korea, and Taiwan experienced rising apparel production costs in conjunction with their rapid economic development in the last half of the 20th century, as well as tightened restraints on their apparel exports to the United States and other developed countries under the MFA, inducing the shift of apparel production to countries with both lower production costs and less or no restriction on their apparel exports (Staritz, 2011).

Apparel manufacturers were the first U.S. importers of apparel, starting in the 1950s. They were joined by retailers in the 1970s as competition in the U.S. apparel retail market intensified and retailers sought to improve their competitiveness by offering exclusive products at low prices through bypassing U.S. manufacturers and importing low-cost apparel themselves (Bonacich & Waller, 1994b). As a result, U.S. retailers' relationship with apparel manufacturers increasingly altered from being solely customers of the manufacturers to competing with them (Gereffi, 2002). Imports accounted for only 12% of the apparel products sold in the U.S. retail market in 1975; the percentage doubled by 1984. Retailers had become the leading U.S. apparel importers by 1994 (Bonacich & Waller, 1994b).

The rapid growth in the import penetration of the U.S. apparel retail market and the dominance of retailers as U.S. apparel importers since 1994 are largely due to many retailers' initiation of the strategy of carrying private-label (or private-brand) apparel merchandise in the 1980s and their expanded pursuit of this strategy since then (Gereffi, 2002). Bonacich and Waller (1994) reported that large retailers, such as Sears and J.C. Penney, had already begun to carry private-label apparel merchandise by the 1950s and were having the merchandise produced in southern states in the United States to take advantage of the lower production costs in the South than the Northeast. Private-brand products are sold exclusively by the retailer that owns the brand (Keiser, & Garner, 2010). For example, apparel products with the Mossimo brand are only carried by Target, and those with the George brand are only carried by Walmart. Abercrombie & Fitch, Forever 21, The Gap, H&M, The Limited, Uniqlo, and Zara are among the many other apparel retailers that carry private-label merchandise today.

To obtain their private-brand apparel merchandise, retailers may contract with wholesalers or manufacturers to supply particular products only to them; however, private-brand retailers have come to design and develop their private-brand products in-house or to hire other firms, such as retail product development companies or full-package contractors, to design and develop the products. The retailers then hire contractors, typically in low-income countries, to produce these products (Gereffi, 2002; Kunz & Garner, 2011; Staritz, 2011). The retailers locate the contractors through various means, such as hiring import and export trading companies to source apparel production from contractors or operating their own sourcing offices abroad, as does Walmart in China (Kunz & Garner, 2011).

A new group of companies, exemplified by Nike and Liz Claiborne, entered the U.S. apparel industry in the 1980s (Tewari, 2006). Various terms, such as apparel marketers, brand marketers, and brand managers, have been used to refer to these companies (Gereffi, 2002; Kunz & Garner, 2011; Staritiz, 2011). These firms focus on the high value-added activities of apparel design, development, branding, and marketing. They are not directly involved in manufacturing; they hire contractors, mainly in low-income countries, to produce their apparel products according to their production specifications (Staritz, 2011). The ranks of brand managers continue to expand as apparel manufacturers in the United States and other developed countries increasingly abandon apparel production, considered a low value-added activity, and ultimately convert themselves into brand managers (Kunz & Garner, 2011). Apparel manufacturers are another group of firms involved in importing apparel into the United States. Apparel manufacturers in the United States and other developed countries have increasingly sourced apparel production in low-income countries to reduce costs while sustaining the production of some of their apparel products in their own factories (Kunz & Garner, 2011). Gereffi (2002) cited U.S. customs data on the import shares of particular types of companies in the top 100 U.S. apparel importers in 1993, a group responsible for about one-quarter of the total value of U.S. apparel imports that year. The data showed that retailers accounted for 48% of the total apparel import value, apparel marketers accounted for 22%, and apparel manufacturers 20%.

Under the globalized apparel market, the efficiency of supplying apparel products to developed-country markets has increased, partly as a result of countries specializing in their core competencies (Bonacich, Cheng, Chinchilla, Hamilton, & Ong, 1994). Firms in developed countries provide financial and technical resources, along with highly skilled labor for designing, developing, and marketing apparel products (Bonacich et al., 1994). On the other hand, firms in low-income countries provide low-skill, low-wage labor for apparel production (Bonacich et al., 1994). In addition, low-income countries often specialize in the types of apparel produced within them. For example, apparel manufacturers in some of these countries mainly produce women's wear, and those in other countries mostly produce underwear or sleepwear. Consumers in developed countries benefit from the apparel products offered at low prices and providing a variety of choices (Bonacich et al., 1994).

Even though textile production has become highly automated and requires less labor today than apparel production, textile manufacturers in the United States and other developed countries have increasingly shifted their yarn and fabric production to low-income countries to reduce production costs and the distance from factories in low-income countries that produce apparel for developed-country markets. The shift of textile manufacturing to low-income countries has helped develop the capability in many of these countries to provide locally produced yarns and fabrics to support their apparel production for export. As a result, U.S. textile imports have increased along with U.S. apparel imports (see Figure 1).

The United States has imported large amounts of textiles and apparel for many years. Some evidence of these large import amounts is that the United States is currently the top importer of apparel in the world and has imported more than 95% of the apparel products sold domestically in several recent years (Keiser & Garner, 2010). The United States accounted for 24.8% of total world apparel imports in 1995, 31.9 % in 2000, 27.6% in 2005, and 22.8% in 2008 (Staritz, 2011). The United States has been an important player in world trade in general since the early 1900s. As a leader in world commerce, it has responsibilities in world trade. U.S. actions can have positive impacts on the economies of the rest of the countries in the world or can disrupt world trade, as

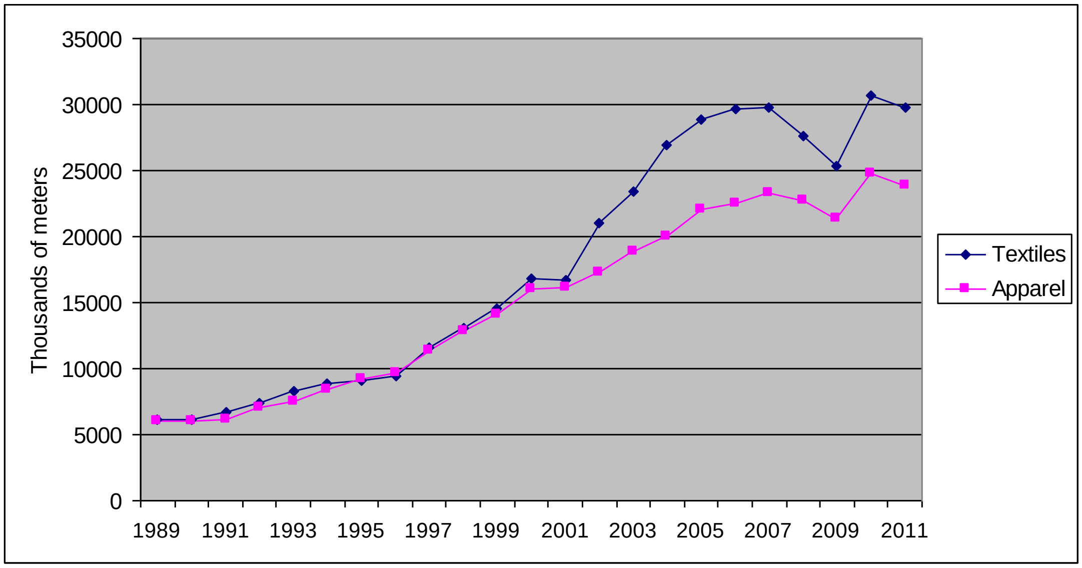

Figure 1. U.S. textile and apparel imports, 1989-2011.

Source: Based on data provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

through trade policies to protect domestic producers (Dickerson, 1995).

During the 1960s, U.S. government expenditures expanded because of U.S. involvement in the Vietnam War. Instead of raising taxes, the government increased the number of dollar bills it printed, leading to devaluation of the U.S. dollar and a consequent slight decline in U.S. imports of textiles and apparel. The U.S. oil crises during the 1970s negatively influenced the quantity of U.S. textile and apparel imports because shipping costs are sensitive to oil prices and many textile products are composed of petroleum-derived synthetic fibers; thus, U.S. textile and apparel imports increased more in value than quantity over the 1970s (Dickerson, 1995). During the 1990s and the early 2000s, U.S. textile and apparel imports increased greatly in both total quantity and value. As shown in Figure 1, the quantity of U.S. textile and apparel imports climbed nearly continuously over the 1989-2011 period, with a noticeable dip during 2008-2009 due to reduced demand for textile products as a result of the deep recession in those years (Kunz & Garner, 2011). The textile and apparel imports increased again in 2010 but then declined a bit in 2011.

To improve their competitiveness against low-cost imported products, many U.S. manufacturers of textiles or apparel integrated vertically or horizontally in the 1980s and 1990s through merger with or acquisition of other companies, and many worked to improve productivity and lower costs by reducing employment; however, textile and apparel producers in the United States and other developed countries continued to lose domestic market share to imports. Researchers and U.S. policymakers have paid close attention to the U.S. textile and apparel industry over the years, partly because of the large number of people employed in this industry compared to other manufacturing industries until recently.

Employment in U.S. textile and apparel manufacturing totaled 2.4 million workers in 1950, but dropped to 390,000 by 2011 (see Figure 2). Employment in apparel manufacturing increased slightly from 1950 to 1973 but has declined precipitously since 1973. On the other hand, employment in U.S. textile manufacturing declined almost steadily from 1950 to 2011. The drop in employment in those two sectors is due to two main factors: (a) falling U.S. production of textiles and apparel that resulted from the inability of U.S. manufacturers to compete with the increasing influx of low-cost textile and apparel imports; and (b) increased productivity, especially in textile manufacturing, that resulted from the expanding adoption of high-speed production machinery needing little labor input (Cline, 1990). The different employment patterns shown in Figure 2 for U.S. textile and apparel manufacturing owe mostly to the higher labor intensity in apparel manufacturing than textile manufacturing, largely because apparel assembly has been automated far less than textile manufacturing, making it more difficult for U.S. apparel manufacturers than U.S. textile manufacturers to compete with imports from low-wage countries.

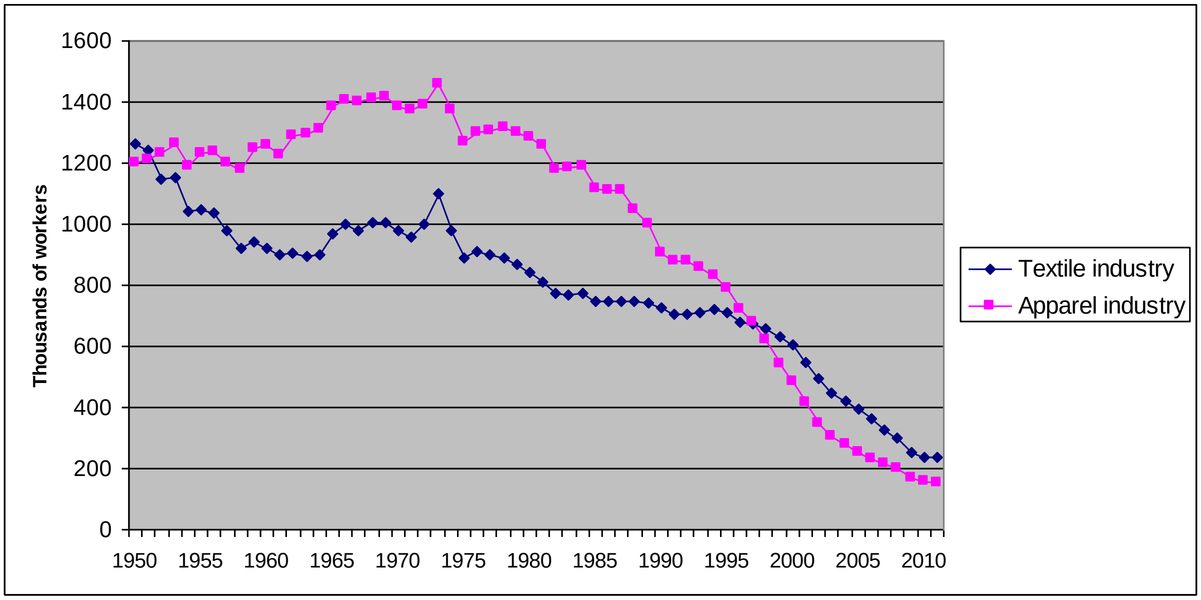

Figure 2. U.S. textile and apparel manufacturing employment, 1950-2011.

Source: Based on data provided by the U.S. Department of Labor.

The United States has long imposed import restraints to protect domestic textile and apparel producers. The following sections describe major policies that have affected U.S. textile and apparel imports since the 1950s.

The General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO)

Many international trade policies since World War II have been formed through multilateral agreements. Following the war, government leaders in the main trading countries at the time believed that multilateral rules were needed to regulate and promote trade among them. The United States and other developed countries decided to forge the General Agreement on Tariffs and Trade (GATT), which became effective in 1947 (Kreinin, 2002). A major purpose of the GATT was to contribute to the economic development of all member countries by substantially reducing the general level of trade barriers (World Trade Organization [WTO], *n.d.*). On the basis of this purpose, the signatory countries agreed to significant reduction of tariff levels. In addition, they established the most favored nation (MFN) principle, which specified that a GATT member country was not allowed to discriminate between GATT member countries when they trade. For example, if a GATT member country granted a reduced tariff rate on a particular product imported from another GATT member country, the country had to charge the same tariff rate on that product from all other GATT members (WTO, *n.d.*). Free trade agreements and customs unions are important exceptions to MFN (Baldwin, 2009; Kreinin, 2002).

After establishing the GATT in Geneva, Switzerland in 1947, seven rounds of trade talks were completed among its members over 1949-1994, namely the Annecy Round, the Torquay Round, the Geneva Round, the Dillon Round, the Kennedy Round, the Tokyo Round, and the Uruguay Round. The four rounds held over the 1949-1962 period were "the Annecy Round (1949), the Torquay Round (1950-1951), the Geneva

Round (1955-1956), and the Dillon Round (1961-1962)" (Baldwin, 2009, p. 516). Each of these rounds began with the item-by-item procedure by which each member submitted an exchange of offer and request lists that included items on which the member country would reduce tariff rates (Baldwin, 2009). This procedure worked well when the number of GATT countries was only 23 as of 1948; however, when the number of member countries increased to 67 by 1964, the procedure no longer worked well (Baldwin, 2009). This procedure became so cumbersome that the members needed to find new negotiation methods.

The GATT members therefore established in the Kennedy Round (1964-1969) a new negotiation method, a numerical formula to reduce tariffs. This method was, however, more difficult to apply to agricultural goods than manufactured goods. The United States wanted to increase its agricultural exports to the EU, but under the new formula U.S. agricultural exports to Europe declined because tariffs on agricultural goods were reduced less than those on manufactured goods.

The Tokyo Round (1973-1979) focused on nontariff distortions of trade among GATT member countries (Baldwin, 2009). These nontariff distortions covered "subsidies and countervailing duties, antidumping practices, government procurement policies, valuation and licensing practices, and technical barriers to trade" (Baldwin, 2009, p. 517). In addition, Swiss proposed a new formula for tariff reduction that was accepted by all member countries.

The Uruguay Round (1984-1994) was the most successful round of GATT trade talks in terms of the depth and scope of trade liberalization achieved (Baldwin, 2009; Preeg, 1995). Along with tariff-reduction decisions in this round, decisions were made on a broad set of trade functions including “transactions in commercial services, intellectual property rights, foreign investments, and related matters” (Kreinin, 2002, p. 169). A key decision in the Uruguay Round was to erect the World Trade Organization (WTO). On January 1, 1995, the WTO officially absorbed the GATT, including the GATT trade rules as of 1994. Another key decision in the Uruguay Round was to disband the Multi-Fiber Arrangement (MFA) in 1995 and replace it with the Agreement on Clothing and Textiles, which was an administrative structure to phase out by January 1, 2005 all quantitative trade restrictions established under the MFA. The Uruguay Round resulted in both gainers and losers. For example, suppliers in low-income countries and consumers in developed countries gained, but manufacturers and workers in developed countries suffered losses in some of their domestic markets.

The Doha Development Round, the first round of trade talks under the WTO, was launched in 2001 (WTO, *n.d.*). The main objective of the Doha Development Agenda is to increase the trade volume of the trade of low-income countries by reducing their trade barriers and revising their other trade rules (WTO, *n.d.*). The WTO changed the name of the MFN in 1998 to normal trade relations (NTR). The MFN principle specified that all member countries are to be treated equally and without discrimination, but member countries sometimes applied a literal meaning of the “most-favored-nation” term; thus this term was replaced with “normal trade relations” (Pregelj, 2005). The MFN term is still used nearly universally however (Pregelj, 2005).

Precursors to the MFA

The basic ideas for the Multi-Fiber Arrangement (MFA, 1974-1994) came from restrictions that were imposed on Japan's cotton textile and apparel exports to the United States for 5 years beginning in 1957, as well as the Short Term Arrangement (STA) and the Long Term Arrangement (LTA) in the 1960s and early 1970s.

VERs on Japan's textile and apparel exports to the United States in the 1950s and 1960s. The textile and apparel industry has contributed to the industrialization of most countries. Japan is currently a developed country, but was a low-income country in the 1950s and 1960s. Japan suffered much destruction during World War II, and following the war it had low wage rates like those of other low-income countries. Taking advantage of its low wages, Japan became the largest textile and apparel exporter in the 1950s. After Japan joined the GATT in 1955, it should have had MFN benefits, but the United States and other developed countries worried about the dramatic growth of their imports from Japan. The United States, the main importer of Japanese products at the time, pressured Japan to make a bilateral agreement in 1957 to restrict its exports to the United States. This agreement imposed five-year VERs on Japanese exports of cotton textile and apparel products to the United States (Goto, 1989). In spite of these VERs, U.S. imports of cotton textiles and apparel continued to climb because its imports of such products from other countries, especially Hong Kong, increased greatly and more than filled the gap left by reduced U.S. imports of these products from Japan. Japan's share of U.S. cotton textile product imports declined from 63% in 1958 to 26% in 1960 while Hong Kong's share rose from 14% to 28% (Cline, 1990). The United States therefore began negotiations with Hong Kong in the 1960s for a bilateral agreement to set VERs on cotton product exports from Hong Kong to the United States. The United Kingdom negotiated similar bilateral agreements with Hong Kong, Pakistan, and India (Goto, 1989).

The Short Term Arrangement (STA) and the Long Term Arrangement (LTA). The fundamental objective of GATT was to promote international trade by reducing trade barriers without discrimination among countries. Bilateral agreements made to restrict the cotton product exports of specific countries to the United States therefore violated the objectives of GATT. To justify the bilateral agreements and retain or reinforce the trade restrictions resulting from such agreements, U.S. negotiators led GATT members in developing the concept of market disruption, defined as "instances of sharp import increases associated with low import prices not attributable to dumping or foreign subsidies" (Cline, 1990, p. 147). In 1960, the GATT members accepted "the Decision on the Avoidance of Market Disruption" (Cline, 1990, p. 147). GATT members thereby adopted the concept of market disruption, even though this concept violated the most-favored-nation (MFN) principle. On the basis of the market disruption concept, an importing country could restrict its imports from an exporting country when those imports were shown to cause or threaten market disruption in the importing country.

On the basis of the market disruption concept, the Short Term Arrangement Regarding International Trade in Cotton Textiles (STA) (1961-1962) and the Long Term Arrangement Regarding International Trade in Cotton Textiles (LTA) (1962-1973) were established to legitimize and provide frameworks for limiting on the imports of cotton textile products of the signatory countries, including the United States (Kunz & Garner, 2007). The United States played an important role in developing the STA. Although the STA violated the purposes of GATT, U.S. textile and apparel producers succeeded in convincing the U.S. government to provide protection against imports of cotton textile products. Keesing and Wolf (1980) cited several reasons that U.S. textile and apparel producers sought and received this protection. First, the demand for U.S. textiles and apparel had declined. For example, the portion of U.S. products in total U.S. consumption expenditures for textiles and apparel had declined from 14% in 1919 to less than 9% in 1959. Second, the U.S. textile and apparel industry during this time was large enough and organized well enough to have the power to successfully pressure the government for protection. Third, the political power of Japan and other low-income countries was weak during that time. These factors led to special beneficial treatment of U.S. textile and apparel producers in import protection.

At the time of the STA and the LTA over 1960-1973, low-income countries had limited bargaining power relative to developed countries such as the United States and European countries (Yoffie, 1983). The cotton textile product exports of several low-income countries to the United States were restricted through bilaterally negotiated VERs under the STA and LTA. During 1961-1962, the exports of 64 categories of cotton textile products to the United States were restricted under the STA. The LTA was adopted in 1962 by 19 major trading countries, including the United States. The renewal of the LTA each year through 1972 provided an automatic annual VER growth rate of 5% for cotton textile and apparel products (Cline, 1990).

The Multi-Fiber Arrangement

In spite of the VERs instituted under the STA and the LTA, U.S. import growth in textiles and apparel continued. U.S. textile imports increased from $1.02 billion in 1961 to $2.39 billion in 1972, and U.S. apparel imports rose from $648 million to $3.47 billion in real value based on 1982 prices (Cline, 1990).

U.S. imports of unrestricted synthetic fibers and products made of them increased immensely from 31 million pounds to 329 million pounds over 1960-1970 (Cline, 1990; Kunz & Garner, 2007). As a result, the United States made bilateral agreements with Japan, Hong Kong, South Korea, and Taiwan that set VERs on their exports of synthetic fibers and synthetic-fiber products to the United States. These restrictions led to diverting such large exports of these products to European countries that the prices of these products declined substantially in those countries (Kunz & Garner, 2007), prompting European countries to seek negotiations with the United States for a multilateral agreement to authorize trade restrictions on a broader range of textile and apparel products than covered by the LTA, that is more than just cotton products. The resulting negotiations led to the MFA, which became effective in 1974. The operational core of the MFA was a framework that authorized any MFA signatory importing country to make bilateral agreements with exporting countries to set VERs on particular textile and apparel product categories of the exports of the exporting countries to the importing country (Cline, 1990).

OTEXA categories of textile and apparel products were developed for use in setting VERs under the MFA so that these categories also came to be called MFA categories. OTEXA product categories are numbered according to the fiber content of each type of product. The 200 series of products is composed of cotton and/or man-made fibers, the 300 series of products is composed of cotton fiber, the 400 series is composed of wool fiber, the 600 series is composed of man-made fibers, and the 800 series is composed of silk blends or non-cotton vegetable fibers. In each series, textile and apparel products are grouped into similar or like product categories for the purpose of imposing quantitative restrictions. For example, OTEXA category 338 includes men's and boys' knit shirts, and OTEXA category 339 includes women's and girls' knit shirts and blouses. Several part categories were also created for use in negotiating VERs. Each part category is designated by a letter that follows the applicable OTEXA category number. Tables 1 and 2 illustrate the OTEXA system of product categories. Table 1 shows many OTEXA categories of made-ups, which are non- apparel final end-use textile products. Made-up category 369 in this table includes all "other cotton manufactures" except cotton sheets (361), cotton bedspreads/quilts (362), and cotton terry/other pile towels (363). Because OTEXA category 369 includes a large range of cotton made-up products, this category

Table 1

OTEXA Categories of Made-ups

OTEXA number	Category name
360	Cotton pillowcases
361	Cotton sheets
362	Cotton bedspreads/quilts
363	Cotton terry/other pile towels
369	Other cotton manufactures
464	Wool blankets
465	Wool floor coverings
469	Other wool manufactures
665	Man-made fiber floor coverings
666	Other man-made fiber furnishings
669	Other man-made fiber manufactures
670	Man-made fiber flat goods, handbags, luggage
863	Towels, silk/vegetable blends
870	Luggage, silk/vegetable blends
871	Handbags/flatgoods, silk/vegetable blends
899	Other silk/vegetable blend manufactures

Source: Compiled from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

Table 2

Part Categories in OTEXA Category 369, Other Cotton Manufactures

Part category	Part category name
369-D	Dish towels
369-H	Handbags only
369-L	Luggage only
369-S	Shop towels only

Source: Compiled from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

was divided into part categories like 369-D, 369-H, 369-L, and 369-S for imposing VERs or quotas (see Table 2).

Merged product categories were also used frequently in negotiating MFA VERs (see Table 3). The merged product categories were developed according to product type rather than product fiber content. For example, merged category 330/630 includes handkerchiefs of various fiber contents. Even though 330 refers to cotton handkerchiefs and 630 refers to man-made-fiber handkerchiefs, these two categories were combined in a merged category because they refer to the same product type. Policymakers use merged categories by product type because textile or apparel articles of one product type (e.g., handkerchiefs, shirts), regardless of fiber content, are typically produced by the same process and in the same factories. As discussed previously, textile products and apparel products are produced by different processes. For example, textile production is less labor intensive and requires more mechanically complex equipment than apparel production. Even within apparel production, variation exists in the processes used to produce women's wear, men's wear, accessories, and sleepwear and underwear. For example,

Table 3

Examples of OTEXA Merged Categories

Merged categories	Merged category name
300/301	Cotton yarns
330/630	Handkerchiefs
331/631	Gloves and mittens
334/634	Men's and boys' coats
335/635	Women's and girls' coats
336/636	Dresses
338/339	Cotton knit shirts
340/640	Non-knit shirts
341/641	Non-knit blouses
342/642	Skirts
347/348	Cotton trousers
349/649	Brassieres
350/650	Dressing gowns
351/651	Cotton and MMF nightwear[a]
352/652	Underwear
445/446	Wool sweaters
638/639	Man-made fiber knit shirts
645/646	Man-made fiber sweaters
647/648	Man-made fiber trousers
845/846	Sweaters – silk and vegetable
237-D/333-D/334-D/342-D/347-D/348-D	Blue denim apparel
338-S/339-S	Other than t-shirts and tank t-shirts
340/341/640/641 YD	Non-knit shirts/blouses yarn-dyed
340/640 YD	Non-knit shirts yarn-dyed
341/641 YD	Non-knit blouses yarn-dyed
359-C/659-C	Overalls and coveralls
359-S/659-S	Swimwear

[a]MMF refers to man-made fiber.

Source: Compiled from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

mechanization and assembly-line methods are more prevalent in producing men’s wear than women’s wear due to the lower degree of style variation in men’s wear than women’s wear. Many countries are specialized in the types of textile and apparel products supplied by domestic manufacturers. For example, the United States has imported large amounts of baby clothes from the Philippines, underwear from Sri Lanka, and men’s shirts from Mauritius due to product specialization by apparel manufacturers within these exporting countries (Rivoli, 2009).

It should be noted that any one VER the United States negotiated with an exporting country specified the quantity in square meter equivalents (SME) of textile or apparel products in a particular OTEXA product category, part category, merged category, or product group the exporting country was allowed to export to the United States in a particular year. Product groups are discussed later in regard to the data for this study. SME refers to the amount of fabric used in an article or set of articles in a product category. The LTA specified a 5% annual VER growth rate, but the MFA specified a 6% annual VER growth rate as a general guideline except in unusual cases when bilateral agreements between an importing country and exporting countries specified VER growth rates higher or lower than 6%. The MFA also contained flexibility provisions called swing, carry forward, and carry over.

The swing provision of the MFA permitted an exporting country to shift limited portions of its VER-allowed quantities across product categories within one year. The “shift-add” notation in trade data denotes the quantity an exporting country added to its allowed VER quantity of a product category in a particular year by subtracting this quantity from its total allowed VER quantity of another product category that year. The “shift-subtract” notation in trade data denotes the quantity an exporting country subtracted from its total allowed VER quantity of a product category in a particular year and then added to its allowed VER quantity of another product category that year (J. Bennett, OTEXA analyst, personal communication, June 19, 2012).

The carry forward provision of the MFA permitted an exporting country to augment its allowed VER quantity of a product category in one year by borrowing a constrained portion of its allowed VER quantity of that product category for the next year. The “carry forward-used” notation in trade data denotes the quantity of a product category that an exporting country subtracted from its allowed VER quantity of the product category in one year and carried forward (added) to its total allowed VER quantity of the product category for the previous year. The carry forward-used quantity was said to offset the carry forward quantity (J. Bennett, OTEXA analyst, personal communication, June 19, 2012). An example is that Macau borrowed (carried forward) 20,419 SME of the 338 product category (men’s and boys’ knit shirts) in 1997 by subtracting this SME quantity of carry forward-used from its total allowed VER quantity of the 338 product category for 1998.

The carry over provision of the MFA permitted an exporting country to augment its allowed VER quantity of a product category in one year with an unfilled portion of its total allowed VER quantity of that product category for the previous year (Cline, 1990). The carry over quantity was constrained, with the maximum quantity both country- and product-specific. The “shortfall-used” notation in trade data denotes the portion of the allowed VER quantity of a product category for a particular year that an exporting country did not use (i.e., export to the United States) that year and added (carried over) to its allowed VER quantity of that product category for the next year. The shortfall-used quantity was said to offset the carry over quantity (J. Bennett, OTEXA analyst, personal communication, June 19, 2012). An example is that Malaysia carried over to 1998 the unfilled portion, specifically 3,285 SME, of its allowed VER quantity of the 445/446 merged category for 1997.

Table 4 illustrates the implications for data on U.S. imports and the associated VERs that resulted from the application of the MFA flexibility provisions. The data in this table refer to some U.S. textile and apparel imports from Bangladesh in 2004. In Table 4, "Level coverage" refers to a VER-controlled OTEXA product category (e.g., 237), part-category (e.g., 369-S), merged category (e.g., 336/636), or product group (not shown in Table 4, is discussed later). "Base level" refers to the originally negotiated VER-allowed SME export quantity of a product category in a particular year (called a period under the MFA) during the typically multiple-year term of the relevant bilateral agreement between the United States and the relevant exporting country before potential changes to the allowed SME export quantity of the product category that year through the exporting country's application of the flexibility provisions; thus in Table 4, the base level of each listed product category is the SME quantity of that product category that Bangladesh was allowed to export to the United States in 2004 before it made adjustments to its allowed SME export quantity of the product category for 2004 through applying the flexibility provisions. The above definition of base level refers to the case of a pre-existing bilateral agreement that had set VERs for an exporting country; however, at the time the United States first requested consultation with the government of an exporting country to make a bilateral agreement to set VERs on the exporting country's product exports, that is before any bilateral agreement and thus VERs existed, the base level of a product category of the exporting country was determined by reviewing the U.S. import quantity of that product category from the exporting country over the last 12 months of the last 14-month period.

Table 4

Sample VER Data in Square Meter Equivalents for U.S. Textile and Apparel Imports from Bangladesh in 2004

Level coverage	Base level	Adjustment made[1]	Adjusted level	Import charged	Fill rate (%)
237	933,218	U, SS	431,770	115,169	26.60
331	207,754	SS	39,115	0	0.00
334	284,704	U, SA	347,327	284,702	81.90
335	511,186	U, SA	560,084	475,023	84.80
336/636	914,780	U, SS	920,095	584,607	63.50
338/339	2,650,021	U, SA	3,030,502	2,686,195	88.60
369-S	3,407,103	U, SA	3,533,399	3,224,644	91.20

[1]U = carry forward-used; SS = shift subtracted after swing; SA = shift added after swing.

Source: Adapted from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

Over the term of a bilateral agreement, the base level of each VER-controlled product category of the exporting country in the agreement grew each year by a fixed known rate specified in the agreement. The annual VER growth rates (e.g., 6%) under the MFA that were discussed previously in this chapter refer to the annual growth rates of the base levels of the VERs. The growth rate was 6% per year on average across product categories and exporting countries, although the growth rates of the base levels did vary by product category and exporting country. For example, the specified growth rates of the base levels of products from China were 1% to 2%, and those of its wool products were slower than those of its cotton or man-made-fiber products (J. Bennett, OTEXA analyst, personal communication, June 19, 2012).

In Table 4, “Adjusted level” refers to the adjusted base level of a product category in SME after the application of swing, carry forward, and/or carry over. “Fill rate” refers to the percentage volume of U.S. imports of the allowed VER amount of a category. The “Fill rate” of a product category equals the “Import charged” divided by the “Adjusted level.” The “Import charged” is the actual U.S. import quantity of a product category in SME in a particular year (2004 in the case in Table 4). All product measurement units were unified in terms of square meter equivalents (SME) by conversion factors. For example, the conversion factor for OTEXA category 237, knit apparel, is 19.2. Exported knit apparel is usually measured in dozens of garments so that the number of dozens of exported knit garments is multiplied times 19.2 to find the SME of knit fabric in the garments.

The MFA specified, according to fiber content, the textile and apparel products that could be trade-constrained through bilateral agreements between an MFA signatory importing country and exporting countries, meaning the overall product coverage in the agreements. The lifespan of the MFA can be divided into the periods when the original agreement and its four renewals were in force: MFA I (1974-1977), MFA II (1978-1981), MFA III (1982-1986), MFA IV (1986-1991), and the extension of MFA IV (1991-1994). Under MFA I, II, and III, the products that could be trade-constrained were those composed of cotton, wool, and man-made (manufactured) fibers. MFA I was less restrictive than any of the renewals; under it, most signatory countries applied trade restrictions to select product categories. Only the United States applied comprehensive restriction, that is restriction of all products covered by MFA I. This comprehensive restriction led to a great increase in the textile and apparel imports of European countries as low-income countries diverted their exports from the United States to Europe (Goto, 1981). European countries then followed the United States in setting comprehensive restrictions under MFA II, including restrictions on 114 product categories and five groups of products in the form of new VERs or reduced VER levels for products that had been subject to VERs under MFA I (Goto, 1981).

MFA III included an "anti-surge" provision to "prevent sharp and substantial increases in imports within quotas" (Anjaria, Kirmani, & Peterson, 1985, p. 161). In addition, a number of exporting countries not previously subject to VERs were brought into bilateral agreements under MFA III, and large suppliers like Hong Kong, South Korea, and Taiwan faced more severe restrictions than previously. Under MFA IV, the textile and apparel imports of the United States and European countries were more restricted than under earlier MFA versions. The product coverage, that is, the range of products that was allowed to be trade-constrained, was extended under MFA IV into those composed of silk blends and vegetable fibers in addition to cotton. The VERs imposed under the MFA governed much of textile and apparel trade until January 1, 2005, despite the elimination of the MFA in 1995 (see the next section).

Under the MFA, 73 exporting countries, mainly low-income countries, faced restrictions on their textile and apparel exports to the EU, the United States, and Canada (Staritz, 2011). The MFA authorized signatory importing countries to impose unilateral quotas on products from exporting countries that refused to make bilateral agreements.

As shown in Table 9 in Chapter 3 of the dissertation, the United States had bilateral agreements with 40 to 48 countries per year over 1995-2008, with the low of 40 in 1995 and the high of 48 in 1997 and 2000. U.S. textile and apparel imports from the main suppliers, Japan, Hong Kong, South Korea, Taiwan, and China, often reached allowed VER limits (i.e., had fill rates of 100% or nearly so); therefore, manufacturers in those countries, along with U.S. retailers and other buyers sought supplier countries that were not constrained by, or had underutilized, quotas or VERs (Staritz, 2011). For example, South Korean apparel manufacturers built apparel factories and trained apparel workers in other Asian countries like Bangladesh and Vietnam, and then had the apparel that was produced in such countries shipped directly from them to the United States to avoid quantitative restrictions on South Korean exports to the United States. These are examples of the triangular manufacturing networks that were described in discussing the U.S. textile and apparel industry, although the networks do not operate today for the sole purpose of avoiding trade restraints. Through such networks, manufacturers in other Asian countries, as well as African and Caribbean countries, learned to produce apparel for export to the United States. The MFA therefore had the unintended effect of contributing to the spread of apparel production for export to many more low-income countries than before the MFA became effective.

The Agreement on Textiles and Clothing

The WTO and the Agreement on Textiles and Clothing (ATC) were created in the Uruguay Round negotiations under the GATT. Member countries agreed to phase out, through the ATC mechanism, the quantitative trade restrictions that had been imposed under the MFA. The ATC included a time line for a four-stage phase out of those restrictions, beginning on January 1, 1995 and completing on January 1, 2005. This schedule allowed a 10-year transition to avoid market disruption in importing countries and exporting countries due to rapid policy changes. The ATC time line provided WTO-member importing countries with “categories and percentages of textile and apparel trade” to free from quantitative restrictions in each phase-out stage (Kunz & Garner, 2007, p. 107); thus the ATC specified the percentages of textile and apparel product volume, in total and by product type, to be released from quantitative restrictions in each of the four phase-out stages (see Tables 5 and 6).

The ATC also allowed importing countries (e.g., the United States) to select the particular products to remove from restrictions at each stage and even to set new quotas and bilaterally agreed VERs during the 10-year phase-out period even though its purpose

Table 5

The Percentage of Textile and Apparel Product Volume to be Released from Quantitative Restrictions in Each of the Four Phase-out Stages under the Agreement on Textiles and Clothing

Stage	Period	Volume percentage freed from quantitative restrictions
Phase I	1/1/1995-12/31/1997	16%
Phase II	1/1/1998-12/31/2001	17%
Phase III	1/1/2002-12/31/2004	18%
Phase IV	From 1/1/2005	49%
Total		100%

Source. Adapted from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

Table 6

The Percentages of Textile and Apparel Volume of Product Types to be Released from Quantitative Restrictions in Each of the Four Phase-out Stages under the Agreement on Textiles and Clothing

Product type	Phase I	Phase II	Phase III	Phase IV
Apparel	2%	2%	3%	31%
Fabric	2%	3%	4%	12%
Made-ups	3%	5%	8%	3%
Yarns	8%	8%	3%	3%
Total	16%	17%	18%	49%

Source. Adapted from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

was to phase out the MFA quotas and VERs. The EU quickly removed the quantitative restrictions on its textile and apparel imports according to the ATC requirements; however, the United States retained as many of its restrictions as allowed at each stage and even imposed new restrictions over 1995-2005. Of the 758 constraints on textile and apparel products that the United States carried from the MFA to the ATC, 701 (92.8%) were left to be eliminated on January 1, 2005 (Nordås, 2004). Only 6.5% of the constraints on apparel products that the United States carried from the MFA to the ATC were eliminated before January 1, 2005, leaving 93.5% of the constraints on U.S. apparel imports to be eliminated January 1, 2005 (Nordås, 2004). The upshot was that the United States eliminated large numbers of the quantitative restrictions on its textile and apparel imports in the fourth phase-out stage on January 1, 2005, causing a suddenly unpredictable and unstable trade environment. Market disruption ensued, along with confusion for buyers and suppliers of textiles and apparel in both importing countries and exporting countries (Shen, 2008).

The removal of the MFA quotas and VERs was generally favored by low-income countries that were active exporters of textiles and apparel because governmental and business leaders in such countries viewed the MFA restrictions as limiting not only the textile and apparel exports, but also the economic development of the countries. However, many leaders and producers in these countries began to worry that, once the MFA restrictions were gone, they would lose U.S. and EU market share to China, the largest textile and apparel exporter. They realized that, despite the associated limitations on their exports and economic development, the MFA quotas and VERs had guaranteed them textile and apparel market share in importing countries like the United States. Nordås (2004) predicted significant post-ATC gains for China and India in their textile and apparel market shares in the United States, the EU, and Canada. The worries of many low-income countries about losing market share to China were especially sparked when U.S. and EU imports shot up in 2002 in some textile and apparel categories from China, by then a member of the WTO, following the removal of MFA quotas and VERs on such products in the third ATC phase-out stage. A group of textile and apparel exporting countries launched an unsuccessful lobbying effort, called the Istanbul Declaration, in 2004 to convince the WTO to extend the quantitative trade restrictions on textiles and apparel past January 1, 2005 because the restrictions under the MFA and ATC had guaranteed them market share in the United States and other developed countries (Magder, 2005; U.S. Agency for International Development, 2004).

Textile and apparel producers in developed countries were concerned about losing their domestic markets to import competition after the MFA trade restrictions were eliminated. Kunz and Garner (2011, p. 192) characterized three types of reactions of these producers to the ensuing end of the restraints as follows: “Some firms started to panic, others started to plan, and still others started to beg.” The firms in panic sought mergers and acquisitions (M & A) under the notion that increased size would improve their ability to compete in a market without the quantitative restrictions. U.S. examples of the resulting M & A activity are that V.F. Corporation acquired Vans Inc., Kellwood Company acquired brands such as Phat Farm, and Jones Apparel Group purchased Maxwell Shoe Co. and Barneys New York, all in 2004 (“Merger Mania,” 2006). The producers that planned began to identify favorable production sites in low-income countries according to criteria such as product quality and on-time delivery capability, no longer whether or how much exporting countries were subject to limits on their textile and apparel exports (Staritz, 2011). The developed-country producers that begged joined exporting countries in lobbying the WTO to extend the quantitative trade restrictions on textiles and apparel past January 1, 2005.

Safeguard Quotas on U.S. Textile and Apparel Imports from China

Shortly after the removal of all remaining MFA quotas and VERs on January 1, 2005, China’s exports of textiles and apparel to the United States increased rapidly and by large amounts as a result of product orders that U.S. buyer firms had placed in anticipation of the end of the restrictions. China’s apparel exports to the United States had larger growth rates than its textile exports. U.S. apparel imports from China were 97.9%

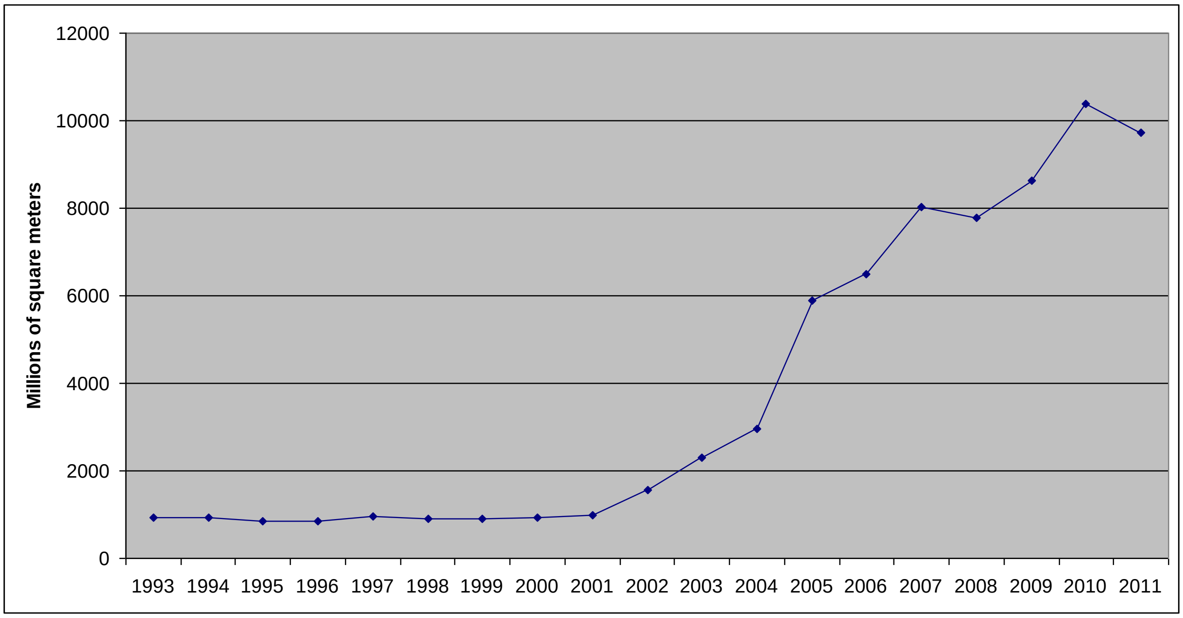

Figure 3. U.S. Apparel Imports from China in Millions of Square Meters, 1993-2011. Source: Based on data provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

higher in 2005 than 2004. On the other hand, U.S. textile imports from China were 25.2% higher in 2005 than 2004. Figure 3 shows the nearly steady growth in U.S. apparel imports from China since 2001, the year China joined the WTO. Figure 3 also shows the steepest growth in the imports from 2004 to 2005, the year the MFA quotas and VERs were completely removed. The EU also experienced large growth in its textile and apparel imports from China over 2004-2005.

Many textile and apparel manufacturers in the EU and the United States had difficulty competing with the rapidly rising textile and apparel imports their countries received from China in the aftermath of the ATC. Such manufacturers pressured policymakers in the EU and the United States to negotiate safeguard quotas on textile and apparel imports from China. The United States and the EU had insisted that China's WTO accession agreement include allowance for imposing safeguard quotas, albeit for relatively short durations, on select imports of any WTO member country from China if the imports were demonstrated to cause or threaten disruption of the domestic market (Staritz, 2011). In June 2005, the EU imposed safeguard quotas on some categories of its textile and apparel imports from China to be effective from 2005 through 2007. In December 2005, the United States imposed safeguard quotas on 21 categories of its textile and apparel imports from China to be effective from 2006 through 2008 (Staritz, 2011) (see Table 7). In addition, Turkey, Argentina, Brazil, and South Africa imposed safeguard quotas on some categories of their textile and/or apparel imports from China.

The safeguard quotas were less restrictive than the trade restraints in place under the MFA or ATC. The safeguard quota on any one product was much greater than the quantitative restriction on that product under the MFA or ATC (Martin, 2009). The annual growth rates of the safeguard quotas were also higher than those of the quantitative restraints under the MFA or ATC. For example, the EU and China reached an agreement in June 2005 that the safeguard quotas on 10 categories of EU textile and apparel imports from China over the period 2005-2007 would have annual growth rates of 8% to 12.5% (Clark, 2005). The United States and China had several rounds of negotiations to establish the U.S. safeguard quotas. During the seventh round, they reached agreement in November 2005 to establish the U.S. safeguard quotas that were in effect from 2006 through 2008. China tried to limit the safeguard quotas to 13 product categories and a two-year period, but the United States first proposed 30 categories for three years (Shen, 2008). In addition, the United States and China disagreed on the base

Table 7

The Categories of U.S. Textile and Apparel Imports from China Controlled by Safeguard Quotas, 2006-2008

Category	Category description
200/301	Cotton and man-made fiber (MMF) yarn for retail sale and sewing thread, and combed cotton yarn
222	Knit fabric, cotton and MMF
229	Special purpose fabric, cotton and MMF
332/432/632	Hosiery, including baby socks: cotton, wool, and MMF
338/339	Men's and boys' (M&B) cotton knit shirts, and women's and girls' (W&G) cotton knit shirts and blouses
340/640	M&B not knit shirts, cotton and MMF
345/645/646	Sweaters: cotton, M&B MMF, and W&G MMF
347/348	M&B cotton trousers, breeches and shorts, and W&G cotton trousers, slacks and shorts
349/649	Brassieres and other body supporting garments, cotton and MMF
352/652	Underwear, cotton and MMF
359-S/659-S	Other apparel: cotton and MMF
363	Cotton terry and other pile towels
443	M&B wool suits
447	M&B wool trousers, breeches and shorts
619	Polyester filament fabric, light-weight
620	Other synthetic filament fabric
622	Glass fiber fabric
638/639	M&B MMF knit shirts, and W&G MMF knit shirts and blouses
647/648	M&B MMF trousers, breeches and shorts, and W&G MMF trousers, breeches and shorts
666	Other MMF furnishings
847	Trousers, breeches and shorts, silk and vegetable fibers

Source. Adapted from information provided by the U.S. International Trade Commission (2009).

quantities and the growth rates of the safeguard quotas. They finally agreed on U.S. safeguard quotas for three years on 21 product categories, with some of these being part or merged categories (see Table 7), along with higher growth rates and base levels for the quota-controlled products than the United States first proposed (Shen, 2008).

The 21 categories controlled by U.S. safeguard quotas included three that accounted for a large portion of U.S. apparel imports from China: “cotton knit skirts and blouses, cotton trousers, and cotton and man-made fiber underwear” (Kunz & Garner, 2007, p. 360). The agreed U.S. safeguard quotas were much larger and had higher growth rates than the MFA quantitative restrictions on China’s exports to the United States in the relevant product categories. The United States and China agreed to a growth rate of 12.5 % for each safeguard quota (Staritz, 2011).

Figure 4 shows for 2003-2009 China’s percentage share of the total value of U.S. imports of each product category under a U.S. safeguard quota over 2006-2008 (U.S. International Trade Commission, 2009, 2011). The figure includes only the product categories that were constrained by the U.S. safeguard quotas over 2006-2008. Figure 4 also shows changes in China’s shares of U.S. imports in those categories before, during, and after the safeguard quotas were imposed. China’s shares of total U.S. imports in the listed categories increased by an average of 5.7% over 2004–2005, but by an average of only 1% over 2003-2004 before the removal of all MFA quotas and VERs on January 1, 2005. During the safeguard period, China’s shares of U.S. imports in these categories increased because the quota levels increased. Large increases in U.S. imports of the safeguard product categories occurred from 2008 to 2009 after the safeguard quotas were terminated on January 1, 2009.

Introduction to Gravity Models and Such Models Employed in Previous Research on Effects of Trade Policies and other Independent Variables

The gravity model has been the dominant framework used for the last 40 years to

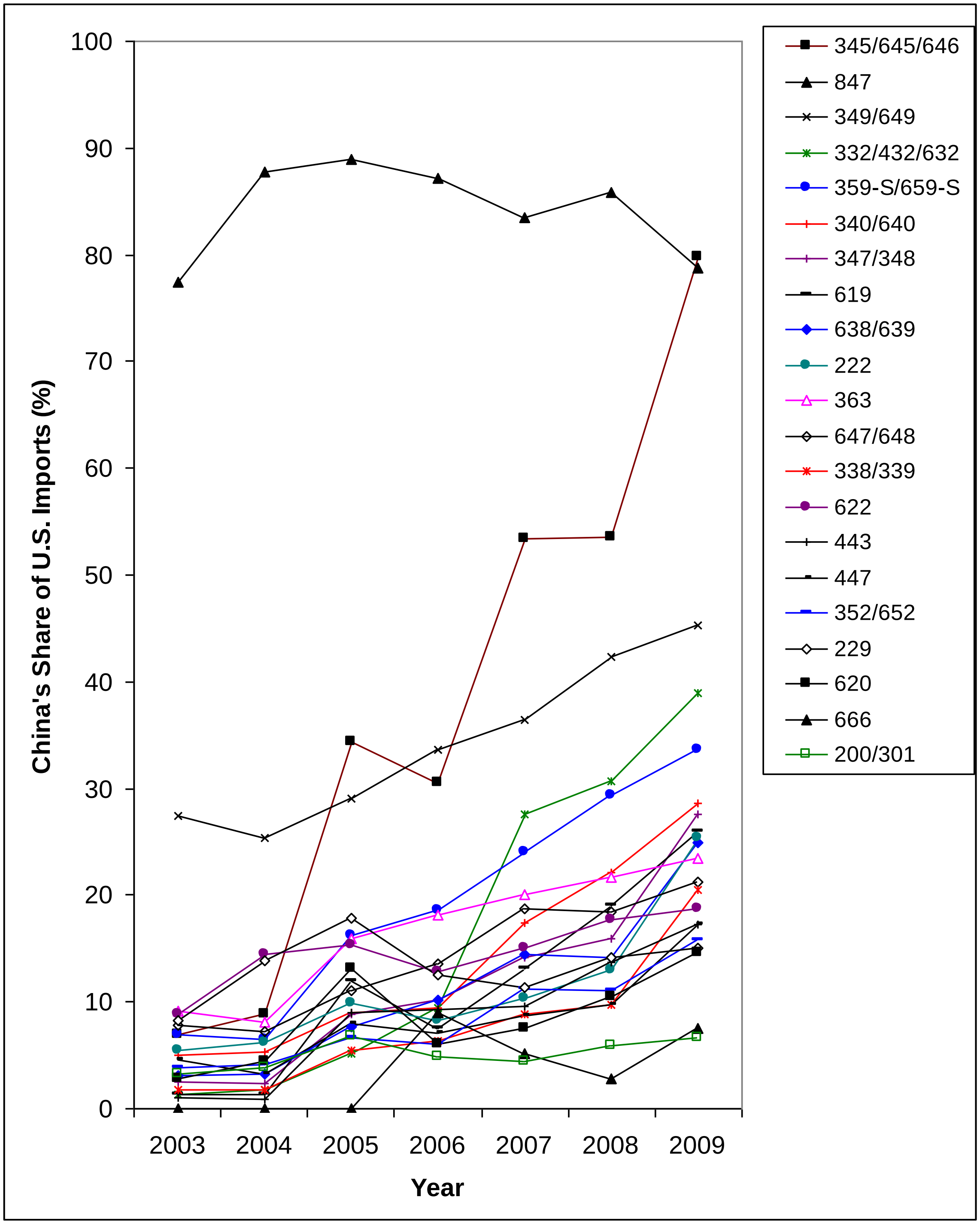

Figure 4. China's Percentage Share over 2003–2009 of the Total Value of U.S. Imports of each Product Category under a U.S. Safeguard Quota over 2006-2008.

Source: Based on data from the U.S. International Trade Commission (2009, 2011).

analyze trade between exporting countries and importing countries and to assess the effects of trade policies whiling controlling for other independent variables (Amponsah & Ofori-Boadu, 2006; Anderson, 1979; Baier & Bergstrand, 2007; Chi & Kilduff, 2011; Linnenmann, 1966). The gravity model originated from Newton's law of gravity in physics, hence the "gravity model." According to Newton's gravity law, the attraction between two objects is positively related to the mass of each object and negatively related to the distance between the objects.

When Newton's gravity law is applied to a gravity model in economics to analyze trade between two countries, the objects are interpreted as the countries, the mass of each object as the economic volume of each country measured by variables such as population, gross domestic product (GDP), or GDP per capita, and the distance between the objects as the distance between the importing country and the exporting country. On the basis of these notions, large countries should import and export more than small countries, and the distance between the importing country and the exporting country should be negatively related to the traded quantity because distance reflects shipping cost and time, as well as communication cost. Equations 1 and 2 show the original form of the gravity model in economics (Grossrieder, 2007).

$$F_{ijt} = (G^{\alpha}{}_{ijt} * M^{\beta}{}_{ijt} * M^{\gamma}{}_{ijt})/D^{\theta}{}_{ij} \qquad (1)$$

$$\ln F_{ijt} = \alpha \ln G_{ijt} + \beta \ln M_{it} + \gamma \ln M_{jt} - \theta \ln D_{ij} \qquad (2)$$

where F_{ijt} is the amount of trade flow; M_{it} and M_{jt} are the economic size (e.g., population, GDP) of respectively the importing country *i* and the exporting country *j*; D_{ij} is the distance between the importing country and the exporting country; G_{ijt} represents other independent variables that may affect trade between the two countries: ln is natural logarithm and *α, β,* γ, and *θ* (the parameters) are the empirically estimated coefficients.

Tinbergen (1962) was the first to use the gravity model in economic analysis. Since then, the gravity model has been applied to analyzing international trade or transactions in a wide range of products or industries such as agriculture, textiles, apparel, tourism, and foreign direct investment. Linneman (1966) indicated that the gravity model is a reduced form of partial equilibrium models of imports and exports or supply and demand. In applying the model to the analysis of trade flows, Linneman found that trade flow largely depends on the population sizes of the trading countries. Bergstrand (1985, p. 480) stated that "products are differentiated by national origin" and found that income, price, and exchange rate independent variables have statistically significant effects on trade flows. Since his study, analysts have developed a variety of theoretical and empirical forms of the gravity model.

Bergstrand (1989) showed that the gravity model is consistent with the Heckcher-Ohlin (H-O) model of international trade, which is based on the theory of comparative advantage proposed by David Ricardo. The theory of comparative advantage holds that countries export products that require cheap and abundant factors of production and import products that require scarce factors of production (Bergstrand, 1989). The study by Bergstrand showed that the income and income per capita of both the importing country and the exporting country significantly influence trade between the countries.

In the many studies in which the gravity model has been employed, log linear forms of the basic independent variables, including income, population, and distance, have been used (see Equation 2). In addition to those basic independent variables, researchers employing gravity models have included independent variables like exchange rates, trade policies, languages shared by importing countries and exporting countries, and the existence of seaports in importing countries and exporting countries, depending on the interests of the researchers. Table 8 displays independent variables used in gravity models in recent studies of textile and apparel trade, along with the typical signs on the coefficients associated with the variables.

Carrere (2006) ran and compared the results of two different types of regression in estimating the gravity model: the traditional gravity model in cross section and the gravity equation with panel data. Panel data include both cross-section variation and time-series variation. Panel data provide comparable information across countries, companies, households, or individuals over multiple time periods, so that panel data have been widely used to provide information across particular countries on living conditions such as GDP, health, wages, employment, poverty, housing, income, and population over particular periods (Hsiao, 2003). Panel data have advantages in that they provide a large number of observations, increasing the degrees of freedom and allowing researchers to examine economic questions that cannot be analyzed with either time-series data or cross-sectional data alone (Hsiao, 2003).

Because the purpose of the present research is to examine the impact of independent variables such as the GDP and population of each exporting country and the distance between the United States and each exporting country on U.S. textile and apparel imports over the analysis period, panel data are used in the study. Carrere found that the traditional gravity equation in cross section was misspecified and biased; however, the gravity equation with panel data provided meaningful results on trade promotion among

Table 8

Recent Studies in which the Gravity Model has been used to Analyze Textile and Apparel Trade

Independent variables (signs of the associated coefficients)	Recent studies
GDP (+)	Amponsah & Ofori-Boadu (2006), Chan & Au (2007), Chi & Kilduff (2010), Eichengreen, Rhee, & Tong (2007), Grossrieder (2007), Liping (2010)
GDP per capita (+)(-)	Amponsah & Ofori-Boadu (2006), Chan & Au (2007), Chi (2010), Datta & Kouliavtsev (2009), Eichengreen et al. (2007), Grossrieder (2007), Liping (2010)
Distance (-)	Amponsah & Ofori-Boadu (2006), Chan & Au (2007), Chi & Kilduff (2010), Eichengreen et al. (2007), Grossrieder (2007), Liping (2010)
Exchange rate (-)	Amponsah & Ofori-Boadu (2006), Chan & Au (2007), Datta & Kouliavtsev (2009), Grossrieder (2007)
Price deflator (-)	Amponsah & Ofori-Boadu (2006)
Regional trade agreement dummy (+)	Chan & Au (2007), Chi (2010), Chi & Kilduff (2010), Datta & Kouliavtsev (2009), Liping (2010)
Population (+)(-)	Chi (2010), Chi & Kilduff (2010), Liping (2010)
Common language dummy (+)	Chi & Kilduff (2010), Eichengreen et al. (2007)
Landlocked dummy (-)	Eichengreen et al. (2007)
Shared land border dummy (+)	Eichengreen et al. (2007), Grossrieder (2007)
Post-1945 common colonizer dummy (+)	Eichengreen et al. (2007), Grossrieder (2007)
Ever in colonial relationship dummy (+)	Eichengreen et al. (2007), Grossrieder (2007)
Dependence on foreign trade (+)	Liping (2010)
Textile industry competitiveness index (+)	Liping (2010)

Continued

Table 8 *(continued)*

Independent variables (signs of the associated coefficients)	Recent studies
Presence or absence of quota restrictions dummy (+)(-)	Grossrieder (2007), Liping (2010)
FDI attractiveness (+)	Grossrieder (2007)
Literacy (+)	Chi & Kilduff (2010)
Political risk dummy (+)	Eichengreen et al. (2007)
Infrastructure level dummy (+)	Chi (2010), Chi & Kilduff (2010)
Quota fill rate (+)	Evans & Harrigan (2004)
Transport cost (-)	Evans & Harrigan (2008)
Tariffs (-)	Datta & Kouliavtsev (2009), Evans & Harrigan (2008)

members of regional agreements. Because the estimation of the fixed effects of the independent variables on the dependent variable results in removing the time-invariant variables, Carrere estimated only the random effects. Similarly, only random effects are estimated in the present research.

The present research includes the estimation of several gravity models to examine how U.S. textile and apparel imports over 1995-2010 were affected by VERs and quotas on these products, as well as a set of independent variables that have been used by many researchers who employed gravity models. The analysis period 1995-2010 was chosen for this study because MFA quotas and VERs were phased out over 1995-2005, safeguard quotas were imposed on 21 categories of U.S. textile and apparel imports from China over 2006-2008, and the United States has had no VERs or quotas on its textile and apparel imports since 2008. The study includes analysis of the effects of quotas and VERs on the total quantity of U.S. textile and apparel imports over 1995-2010 and on the ratio of the total value of U.S. textile and apparel imports to that of the rest-of-world

(ROW) textile and apparel imports over 1995-2008 in each of four product types: yarn, fabric, apparel, and made-up products (non-apparel final textile products). The next chapter describes the theoretical framework for this research and the empirical models estimated in the research, as well the data, data sources, and various issues in estimating the empirical models.

CHAPTER 3

THEORETICAL FRAMEWORK, EMPIRICAL MODELS, DATA SOURCES AND ESTIMATION ISSUES

Theoretical Framework

Quotas and voluntary export restraints (VERs) are quantitative restrictions on trade. As such, they are nontariff barriers to trade. Quotas and VERs on products are absolute limits on the amounts of the products that, respectively, can be imported by an importing country and can be exported by an exporting country to an importing country (Kreinin, 2002). For example, suppose U.S. imports of men's wool trousers from China were limited to 75,000 SME and the actual amount of U.S. imports of the trousers from China were also 75,000 SME. The quota or VER fill rate in this case is 100% and is thus a binding quota or VER. If the actual U.S. demand for the wool trousers from China were 100,000 SME, U.S. buyers would import 100,000 SME of the trousers under free trade, that is with no quota or VER on the trousers. However, under a quota or VER of 75,000 SME on the trousers from China, U.S. buyers could not import more than 75,000 SME of the trousers from China. In this case, excess U.S. demand would exist for such trousers from China. If the allowed quota or VER amount of men's wool trousers from China were increased and U.S. demand for the trousers remained above the previously allowed import amount, U.S. imports of the trousers from China would increase.

China may not be the only country that exports men's wool trousers. If excess U.S. import demand exists for such trousers from China in the face of a quota or VER on the trousers, or if the price of the trousers from China increases, U.S. retailers may import men's wool trousers from other countries whose exports of such trousers to the United

States are not limited by quotas or VERs or for which such quotas or VERs on the trousers are unfilled or for which the prices of the trousers are lower than those from China. In addition, U.S. retailers might substitute men's trousers from China that are made of cotton or manufactured fibers for those made of wool if the trousers made of other fibers have no quotas or VERs on them or have unfilled quotas or VERs or are cheaper than the wool trousers from China. Thus, the total U.S. imports of men's trousers made of wool or other fibers may increase when a quota or VER on men's wool trousers from China is in place.

The GDP per capita of an importing country, such as the United States, is a measure of the average income level including both capital and labor income of the residents of the country and it is commonly used as proxy of the ratio of capital to labor. It is thus a measure of the ability of the residents to purchase imported products. The GDP per capita of an exporting country is also used as proxy of the ratio of capital to labor in the country. The higher GDP per capita, the higher capital income. The lower GDP per capita, the higher labor income. Textile and apparel industry is labor intensive rather than capital intensive. Thus, countries with low GDP per capita is attractive to buyers in importing countries. Therefore, the GDP per capita of the United States, the importing country in this research, and the GDP per capita of each country that exports textiles and apparel to the United States can affect U.S. imports of textiles and apparel. The GDP per capita of an exporting country does not, however, account for the whole economic scale and production capacity of the country, which can also affect the total amount of U.S. textile and apparel imports from the country. The total GDP of each exporting country can account for the whole economic scale and production capacity of the country when examining U.S. textile and apparel imports.

Under a model with two industries (luxuries and necessities) and with a two-factor endowment ratio (the ratio of labor to capital) in both the importing country and the exporting country, Bergstrand (1989) analyzed the impacts of the relative income levels in exporting countries and importing countries on trade flows between the exporting countries and the importing countries. He used a gravity model that included independent variables for the GDPs per capita of importing countries and exporting countries. The model was derived from the Heckscher-Ohlin model of international trade, based on the theory of comparative advantage proposed by David Ricardo. According to the theory of comparative advantage, countries export products whose production is intensive in factors of production that are abundant and cheap in the countries, whereas countries import products whose production is intensive in factors of production that are scarce and costly in the countries (Bergstrand, 1989). For example, low-income countries with abundant and cheap labor export labor-intensive goods, and developed countries with scarce and expensive labor import labor-intensive goods. In his empirical analysis, Bergstrand (1989) found positive effects of the GDPs per capita of exporting countries on the exports of the countries in chemicals, machinery, transport equipment, and food products whose production tends to be capital intensive, but negative effects of the GDPs per capita of such countries on their exports of beverages and tobacco whose production tends to be labor intensive. Further, he found positive effects of the GDPs per capita of importing countries on their imports of luxuries such as tobacco and beverages, but negative effects of the GDPs per capita of such countries on their imports of necessities such as raw materials and fuel used in consumption.

The analysis Bergstand (1989) conducted did not include trade in textiles and apparel. Apparel production is generally considered labor intensive, and textile manufacturing is more capital intensive than apparel production. However, we should also consider the income elasticity of textiles and apparel when examining trade in these goods. Some apparel items, such as underwear, cotton T-shirts, and inexpensive jeans, may be considered necessities for many U.S. consumers, but some expensive clothing items may be luxuries; so it may not be possible to categorize all apparel products as either necessity or luxury goods. Fan and Lewis (1999) found the U.S. income elasticity of apparel to be 1.53, indicating that apparel is a luxury good. Wagner and Mokhtari (2000), however, found the U.S. income elasticity of apparel to be in the range of 0.404 to 0.621, indicating that apparel is a necessity. Another estimate of this elasticity is 0.902 (Seale, Regmi, & Bernstein, 2003). In research well before these studies, Wallace, Naylor, and Sasser (1968) found the U.S. income elasticity of apparel to be 1.05, thus essentially unitary income elasticity. Despite the varied estimates of the income elasticity of apparel, it can be concluded that apparel is a normal good and either a luxury or a necessity, but not an inferior good because the estimates of the income elasticity of apparel all exceed 0.

Wagner (1986) provided the only known estimates of the U.S. income elasticity of textiles: 0.72 for household textiles (e.g. sheets, blankets, towels) and 0.80 for textile home furnishings (e.g., carpets, draperies). Others (Norum, 2002; Winakor, 1975) found positive effects of income on U.S. household expenditures for such goods, but did not estimate income elasticity. Thus, the demand for apparel, household textiles, and textile household furnishings increases (decreases) as income rises (declines). Although one of the above estimates of the income elasticity of apparel is based on U.S. apparel retail sales data and the other elasticity estimates for apparel, as well as the estimates for household textiles and textile household furnishings are based on U.S. household expenditure survey data, the obtained estimates may suggest that U.S. import demand for these products rises (declines) as U.S. GDP per capita rises (declines).

Another factor that may affect trade between countries is the exchange rate between the currency of the importing country and that of the exporting country because it affects the ability of the residents of the importing country to purchase products from the exporting country. An appreciated (depreciated) U.S. dollar with respect to the currency of an exporting country reduces (increases) the prices of goods the United States imports from the exporting country. Many other factors may influence trade between countries. Among these are time-invariant variables such as the physical distance between the countries, which affects shipping and communication costs for companies involved in international trade, and whether the exporting countries are landlocked or not, which also affects shipping costs due to the common use of sea transport of goods exported from exporting countries to the United States. Another time-invariant factor that may influence trade between countries is whether an importing country and exporting country share the same language, which affects the comfort, ease, and accuracy of the communication between companies involved in international transactions. The imports of an importing country would be greater from exporting countries that share the language of the importing country than from those that do not share the language of the importing country.

The gravity model is used in this research to examine the effects of the factors described above on U.S. textile and apparel imports, Frankel (1997) and Sun and Reed (2010) indicated that the gravity model had evolved to have overwhelming richness as a theoretical framework for analyzing international trade flows. The history and basic form of the gravity model were discussed in Chapter 2 here. Due to the wide use and the benefits of the gravity model or equation in analyzing trade flows, gravity equations are estimated in this research.

Overview of the Estimated Gravity Equations

A total of three gravity equations are estimated in this study. STATA statistical programs were used to estimate each of these equations by random effects regression, which is a form of generalized least squares regression (GLS). A random effects estimator is used to determine the weighted average of the between effects and fixed effects of the independent variables on the dependent variable in the equation being estimated.

The independent variables in the first gravity equation in the study are ones widely used in gravity models and include all those discussed above except quotas and VERs. This gravity equation is estimated for two purposes. One is to assess the effects of the independent variables on the total annual value of U.S. textile and apparel imports from the 225 exporting countries that supplied such imports during 1995-2010, without considering quantitative restrictions on the imports. The other purpose is to determine the appropriate specification of the dependent variable to be used in the other two gravity equations. The second gravity equation estimated in this research includes the same independent variables as those in the first equation, but also a dummy variable for the presence or absence of quotas or VERs on any U.S. textile and apparel imports from each of the 225 countries that supplied such imports during the period of the ATC (1995-2005), that of the safeguard quotas on 21 product categories from China (2006-2008), and the aftermath over 2009-2010. The dependent variable in this equation is the total annual SME quantity of U.S. textile and apparel imports from each of the 225 exporting countries over 1995-2010, with the following two variants within the equation. One variant is the annual aggregate of the SME U.S. import quantity of the textile and apparel products from each country that were controlled by quotas or VERs; the other is the annual aggregate of the SME U.S. import quantity of such products from each country that were not restricted by quotas or VERs. Estimation of this equation provides information on the effect of the presence or absence of quotas or VERs on the total quantity of U.S. textile and apparel imports from the 225 exporting countries that supplied such imports over 1995-2010, while controlling for independent variables commonly included in gravity models.

The third gravity equation estimated in this research includes the independent variables used in the first equation, along with an independent variable on quota and VER levels. The independent variable on quotas and VERs has four variants, specified as the total annual SME quota or VER quantity of U.S. imports of yarn, fabric, apparel, or made-up products that each of the 50 countries subject to quotas or VERs on its textile and apparel exports to the United States at some point over 1995-2008 was allowed to export to the United States. Concomitantly, the dependent variable in the equation also has four variants and is specified as the annual ratio of the total value of U.S. imports of yarn, fabric, apparel, or made-up products to the total value of ROW imports of the relevant product type both from each exporting country, out of the 50 in the overall analysis, that was subject to quotas or VERs on its exports of the relevant product type to the United States at some point over 1995-2008 when these restraints were imposed on U.S. textile and apparel imports during the ATC and safeguard-quota periods. This equation is estimated separately for each of the four product types, that is, with the different specifications of the dependent variable and of the independent variable on the quantitative restrictions by product type. Separate estimation of the four variants of the third gravity equation provides information on the effect of the actual total quota or VER level of U.S. imports of yarn, fabric, apparel, or made-up products on the U.S. import/ROW import ratio for each of the four product types while controlling for independent variables commonly included in gravity models. By virtue of the dependent variables on the U.S./ROW import ratio and the independent variable on quota and VER levels, these estimations allow assessment of trade creation and trade diversion effects of the quotas or VERs.

The next section describes the data used to estimate the three equations. After that section, each of the three gravity equations is described in detail and the hypotheses on the effects of the independent variables on textile and apparel imports are presented.

Data and Data Sources

Data sources. The GeoDist dataset developed by Mayer and Zignago (2011) and available from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) is the source of the data for most of the independent variables in the three gravity equations estimated in this research. These data include annual exchange rates; the annual GDP per capita of the United States and of each exporting country in the analysis; the distance between the United States and each exporting country; the total annual GDP of each exporting country; and whether or not each exporting country is landlocked and has English as an official language. The Office of Textiles and Apparel (OTEXA) in the U.S. Department of Commerce is the source of much of the remaining data. These data include the total U.S. dollar value and the total quantity in square meter equivalents (SME) of U.S. textile and apparel imports from each of the 225 exporting countries each year over 1995-2010. The total dollar value and the total quantity of the imports are the dependent variable in the first and the second gravity equations respectively. Those data are available on the OTEXA website. In addition, OTEXA provided upon request the data for 1995-2008 on the annual SME quantities of textile and apparel products that each of the 50 exporting countries subject to VERs or quotas on its exports of such products to the United States at some point over that period was allowed to export to the United States. These data, used to estimate the third gravity equation, are only for the 1995-2008 period because 2008 was the last year that quantitative restrictions on U.S. textile and apparel imports were in force. The United Nations Commodity Trade (U.N. Comtrade) database is the source of the data on the annual total value, in U.S. dollars, of rest-of the-world (ROW) imports of textiles and apparel. In the present research, ROW is defined as world countries excluding the United States. These data are used to estimate the third gravity equation. Although data were available on the SME quantity of U.S. textile and apparel imports, comparable quantity data for ROW were not available. That is why the import value was used to calculate the U.S./ROW import ratio rather than SME quantity.

Use of panel data and estimation of fixed and random effects. Each gravity equation in this research is estimated using panel data. Panel data are characterized by including data on independent variables that vary in cross section and on those that vary in time series. The independent variables in the present research include some that vary only in cross section, such as the distance between the United States and each exporting country in the analysis; one that varies only in time series, that being U.S. GDP per capita; and others that vary in both cross section and time series, such as the GDP per capita of each exporting country. In general, panel data can provide comparable information across countries or companies or households or individuals over time. Panel data are widely used in research to provide information on socioeconomic characteristics, such as GDP, health status, wage rates, employment levels, the incidence of poverty, housing conditions, income level, and population size, across particular countries over a particular period of time (Hsiao, 2003). Panel data have the advantages that they can provide a large number of observations, thus a large number of degrees of freedom, in an analysis, and that they allow researchers to examine economic questions they could not address with either time-series data or cross-sectional data alone (Hsiao, 2003).

Carrere (2006) compared the results of two types of regression in estimating gravity models: the traditional gravity model with only cross-sectional data and the gravity model with panel data. Carrere found the traditional gravity model with only cross-sectional data was mispecified and yielded biased results; however, the gravity model with panel data provided meaningful results on trade promotion among the members of regional trade agreements. Random effects and fixed effects of the independent variables on the dependent variable in a gravity equation with panel data can be estimated. Estimation of random effects accounts for the effects of both cross-sectional and time-series variation in the independent variables on the dependent variable in the equation. Estimation of fixed effects does not account for time-invariant independent variables in the equation and thus accounts for only the effects of time-series variation in the independent variables on the dependent variable. For this reason, Carrere (2006) estimated only the random effects when using a gravity model with panel data. Similarly, only random effects are estimated in the present research.

Estimations for the First Gravity Equation Estimated to Address the Objective #5

The first gravity equation estimated in this research follows the traditional gravity model in that the equation includes only the basic independent variables in the gravity model. Thus, one reason for estimating this equation is to analyze how U.S. textile and apparel imports over 1995-2010 were affected by the independent variables included in the traditional gravity model, without considering quantitative restrictions on those imports.

Expressing the first gravity equation estimated in this research in the form of the original gravity model, the equation has the following form:

$$M_{it} = USGDP_t^{\beta_1}\, GDP_{jt}^{\beta_2}\, dist_j^{\beta_3}\, exchange_{jt}^{\beta_4}\, e^{(\beta_5 landlocked_j + \beta_6 English_j)}\, TGDP_j^{\beta_7}\, v_{jt} \qquad (3)$$

where M_{jt} = the total value ($1,000) of U.S. textile and apparel imports from exporting country *j* at time *t*; $USGDP_t$ = U.S. gross domestic product (GDP) per capita ($1,000) at time *t*; GDP_{jt} = GDP per capita ($1,000) of exporting country *j* (*j* = 1-225) at time *t*; $dist_j$

= distance between New York City in the United States and the largest city in exporting country j; $exchange_{jt}$ = the nominal exchange rate, the price per U.S. dollar of the currency of exporting country j at time t; $landlocked_j = 1$ if exporting country j is landlocked, 0 if not; $English_j = 1$ if English is an official language of exporting country j, 0 if not; $TGDP_j$ = the total GDP ($1,000) of exporting country j; $e \approx 2.718$, a mathematical constant called Euler's number which is the base number of the dummy variables; β_i (i = 1-7) = the parameters to be estimated; and v_{jt} = the error term.

Most gravity models are expressed in logarithmic form, that is as log-linear models, because the coefficients on the independent variables in a log-linear model can be easily interpreted (Vollrath & Hallahan, 2011). Part of this easy interpretation is that the slope coefficient on each metric independent variable in a log-linear model is an elasticity that indicates the percent change in the dependent variable per 1% change in the independent variable. Expressing Equation 3 in log-linear form, the equation becomes

$$\mathrm{LnM}_{it} = \alpha_0 + \beta_1\mathrm{LnUSGDP}_t + \beta_2\mathrm{LnGDP}_{jt} + \beta_3\mathrm{Lndist}_j + \beta_4\mathrm{Lnexchange}_{jt} + \beta_5\mathrm{landlocked}_j + \beta_6\mathrm{English}_j + \beta_7\mathrm{LnTGDP}_j + \varepsilon_{jt} \quad (4)$$

where Ln = the natural logarithm; α_0 = the intercept; β_i (i = 1-7) = the parameters to be estimated; ε_{jt} = the error term; and the variables are as defined for Equation 3.

The following examples illustrate the interpretations of the coefficients on the independent variables in Equation 4. The first set of examples involves one of the metric independent variables: U.S. GDP per capita for which the coefficient is denoted as β_1 in Equation 4. If the estimate of β_1 were +.98, this would mean that the elasticity of the total value of U.S. textile and apparel imports with respect to U.S. GDP per capita is .98, and the imports are normal goods. Specifically, a 1% increase (decrease) in U.S. GDP per capita resulted in a .98% increase (decrease) in the total value of U.S. textile and apparel imports. But if the estimate of β_1 were -.98, this would mean that the elasticity of the imports with respect to U.S. GDP per capita is -.98, and the imports are inferior goods. Specifically, a 1% increase (decrease) in U.S. GDP per capita resulted in a .98% decrease (increase) in the total value of the imports. The estimated coefficients on dummy variables in a log-linear model can also be interpreted easily. Thus, the second set of examples involves one of the dummy independent variables in this study: whether or not each exporting country has English as an official language (1 if so, 0 if not) for which the coefficient is denoted as β_6 in Equation 4. If the estimate of β_6 were +.98, this would mean that the total value of U.S. textile and apparel imports was 2.66 (= $e^{0.98}$) times higher from exporting countries with English as an official language than from those without it. But if the estimate of β_6 were -.98, this would mean that the total value of the imports was 2.66 times less from exporting countries with English as an official language than from those without it (Wooldridge, 2009).

The first gravity equation includes several of the basic independent variables used in the traditional gravity model, such as the GDP per capita of the importing country, in this case the United States, and of each exporting country, as well as the distance between the importing country and each exporting country (see Equation 4). The additional basic gravity-model independent variables in the first gravity equation are exchange rates, the distance between the United States and each exporting country, the total GDP of each exporting country, and whether or not each exporting country is landlocked and has English as an official language.

Year dummy variables have been widely used in gravity models estimated with panel data to control for unobservable factors such as the relative political stability of a country over time. However, year dummy variables cannot be included in the equations estimated in this study due to a perfect collinearity problem. Unlike many other gravity equations estimated by researchers, the first and second gravity equations in this study include data for only one importing country, the United States. Because year dummies and U.S. GDP per capita would be perfectly collinear, both cannot be included in the same equation. Amponsah and Ofori-Boadu (2006) and Chi (2010) included only one importing country in the gravity model they estimated. The models did not include year dummy variables. The present research also includes only one importing country. The annual GDP per capita of this country should be included in the gravity equation in this study in order to examine its effect on the imports of the country; therefore, this equation should exclude year dummies.

Zero trade-flow problem. Some countries export a large amount of textile and apparel while others export few. To export a large amount of textile and apparel, exporters should meet many conditions to produce goods that buyers want on time with expected quality. Otherwise, they export zero or few amounts of textile and apparel. Teng and Jaramillo (2005) developed an evaluation model to select suppliers in textile and apparel. They addressed exporters should be qualified in terms of delivery, flexibility, cost, quality and reliability to be a main suppliers for textile and apparel exports. Delivery includes geographic location, freight terms, trade restrictions, total order lead time for speed shipping. Flexibility includes capacity, inventory availability, information sharing, negotiability, and customization for each customer. Cost includes selling price of suppliers, internal cost, and invoicing. Quality include customer service and certifications. Reliability includes feeling of trust, country's political situation, exchange rate situation, and warranty policies. It is not easy for all textile and apparel exporters to satisfy these particular criteria. Even though some countries have advantages in cheap labor, they might have instability in political situation such as wars in the Middle East countries or African countries. Some countries have excellent logistic systems and flexibility and capability to produce a large amount with high quality but labor costs are too expensive to export goods. China and many other Asian countries meet most of conditions but many other countries cannot satisfy these particular criteria; therefore, they export few or zero value of textile and apparel goods. Therefore, international trade data in textile and apparel include many zero values.

Despite the common use of log-linear gravity models, the use of trade data in natural logarithmic form can be problematic because zero trade flows between countries are prevalent in some products in some years from some exporting countries as discussed in the previous paragraph, especially in trade of specific goods as opposed to overall trade between countries, and because the logarithm of zero is not defined (Grant & Boys, 2011; Sun & Reed, 2011; Vollrath & Hallahan, 2011). This issue is relevant to each gravity equation in the present study. Specifically, 19.12% of the observations of the values and SME quantities of U.S. textile and apparel imports used in estimating the equations are zeros.

Some analysts have dealt with the zero-trade problem in log-linear models by dropping the zero-trade observations, thus treating them as missing data; however, dropping these observations can cause biased estimates of the effects of the independent variables on the dependent variable in a gravity model (Vollrath & Hallahan, 2011). Excluding the zero trade flows is a form of sample selection bias involving the dependent variable and would ultimately cause endogenous sample selection bias (Wooldridge, 2013). In addition, the coefficient on the independent variable on the restriction would be overestimated without these zero values

Haq, Meilke, and Cranfield (2011) and Magee (2008) noted that many researchers who use log-linear models to analyze trade deal with the problem of zero trade flows in one of three alternative ways: (a) by dropping the zero-value observations; (b) by using a nonlinear estimator such as the Poisson pseudo-maximum-likelihood (PPML) estimator; or (c) by adding a small positive number to each trade-flow observation, such as (1 + M_{it}), before taking the logarithm. Dropping the zero-value observations of U.S. imports in this study would remove a high percentage of the import observations and thereby cause endogenous sample selection bias. To avoid the biased estimates resulting from dropping zero-trade observations, the Poisson pseudo-maximum-likelihood (PPML) method has been widely used to estimate gravity models because it allows the inclusion of these observations (Grant & Boys, 2011; Sun & Reed, 2011). In this method, exponentiation of the variables on both the left- and right-hand sides of a log-linear gravity equation removes the logarithmic form of the dependent variable so that the equation no longer has the log-linear form.

The main purpose of this study is to examine the effects on U.S. textile and apparel imports of the quantitative restrictions on these imports. The quantitative restrictions were the allowed SME quota and VER levels, which were likely influenced by many of the same variables that affected the total value and quantity of U.S. textile and apparel imports while the restrictions were in force and are therefore endogenous variables in this study. The endogeneity of the import restrictions means that an instrumental variable is required to account for the restrictions. However, instrumental variables can be used in only log-linear and linear models. Because the PPML estimator requires a non-linear model, the PPML method cannot be used in the present study. The remaining solution to the zero-trade problem is the addition of a small number to each import observation. Although researchers commonly add one to each trade-flow observation before taking the natural logarithm when a non-trivial percentage of a sample is zeros (Magee, 2008), the decision was made to add only 0.001 to each import observation in the present study so that each import volume in the analyzed data is very close to that observed in the original data. The dependent variable in the first gravity equation is therefore specified as $\ln(0.001+M_{it})$ which is called the scaled dependent variable scenario in this study. After this treatment, Equation 4 is transformed to Equations 5.

$$Ln(0.001+M_{it}) = \alpha_0 + \beta_1 LnUSGDP_t + \beta_2 LnGDP_{jt} + \beta_3 Lndist_j + \beta_4 Lnexchange_{jt} + \beta_5 landlocked_j + \beta_6 English_j + \beta_7 LnTGDP_j + \varepsilon_{jt} \quad (5)$$

where $Ln(0.001+M_{it})$ refers to the scaled dependent variable scenario; and all variables are as defined for Equation 3 and all terms are as defined for Equation 4.

Two variants of the first gravity equation were estimated, those in Equations 4 and 5. All the zero-import observations were dropped before estimating Equation 4. The estimation of Equation 5 of course included those observations, although each import observation was transformed by adding 0.001 to it, according to the scaled dependent variable scenario, before taking the natural logarithm. The two variants of the first gravity equation were estimated to see how many observation numbers increased.

Hypotheses. The GDP per capita of the United States is a measure of the average income level of the residents of the country and is thus a measure of the ability of U.S. residents to purchase imports. Therefore, the hypothesis for U.S. GDP per capita is the following.

H1: U.S. GDP per capita positively affected the total value of U.S. textile and apparel imports.

The GDP per capita of an exporting country is a measure of its level of economic development and of the average income level of the residents of the country, which is closely related to the ratio of capital income to labor income in the country. Higher GDP per capita, higher capital income; while lower GDP per capita, higher labor income. Labor costs are important in the textile and apparel industry, especially the apparel manufacturing sector, due to the relatively high labor intensity of the industry. Therefore, low GDP per capita in an exporting country is more attractive to buyers in importing countries. Based on this notion, countries with low GDP per capita export large amounts of textile and apparel products to countries with high GDP per capita. For this reason, textile and apparel exporting countries with relatively large labor income due to low wage rates, such as Bangladesh, India, and Vietnam, have labor-cost advantages over those with relatively large capital income. Hong Kong, South Korea, and Taiwan were major textile and apparel exporters in the 1960s and on through the 1980s, but since then they have lost competitive advantage in the global textile and apparel market, partly as a result of the rising capital income in these countries that have accompanied their economic development (Tewari, 2005, 2006).

H2: The GDPs per capita of the exporting countries negatively affected the total value of U.S. textile and apparel imports.

The distance variable reflects transportation and communication costs as well as shipping time; therefore, the distance between the United States and each exporting country is expected to negatively affect U.S. textile and apparel imports from the exporting country. Chan and Au (2007) indicated, however, that distance may no longer be important in determining trade between countries because modern advancements in transportation and logistics technology have greatly reduced shipping times between countries, thus making countries far more accessible to each other than historically. Despite this, distance is included as an independent variable in this study because it is one of the basic independent variables in the gravity model and many recent studies have included distance in gravity models. Given the discussion above, the following hypothesis was proposed.

H3: The distance between the United States and each exporting country negatively affected the total value of U.S. textile and apparel imports.

When the currency of an importing country appreciates (depreciates) with respect to that of an exporting country, products imported from the exporting country become less (more) expensive than before the appreciation (depreciation). Therefore, the following hypothesis was proposed.

H4: The exchange rates between the U.S. dollar and the currencies of the exporting countries positively affected the total value of U.S. textile and apparel imports.

The transport of U.S. textile and apparel imports from exporting countries is usually by ship rather than air due to the lower cost by ship than air. If an exporting country is landlocked and therefore has no seaports, goods exported from the country must be routed through another country that has a seaport to reach the United States, thereby adding time and expense to product shipment. Thus, landlocked exporting countries are at a disadvantage in textile and apparel trade, leading to the following hypothesis.

H5: The total value of U.S. textile and apparel imports was less from landlocked exporting countries than from non-landlocked exporting countries.

Although the United States has no official language, English is the dominant language used in U.S. firms. Whether English is or is not an official language in an exporting country is used in this study to measure the comfort, speed, and accuracy of communication between firms in that country and U.S. firms, as well as the similarity of the culture of the exporting country and that of the United States (Chi, & Kilduff, 2010). The use of a common language facilitates transactions between firms in an importing country and an exporting country, leading to the next hypothesis.

H6: The total value of U.S. textile and apparel imports was greater from exporting countries with English as an official language than from those without it.

Although Equations 4 and 5 include the GDP per capita of the United States and of each exporting country, GDP per capita cannot account for the whole economic scale of any one of these countries. Hence, the equations also include the total GDP of each exporting country as a measure of the economic volume and production capacity of the country. Table 8 shows that many researchers, such as Amponsah and Ofori-Boadu (2006), Chan and Au (2007), Chi and Kilduff (2010), Eichengreen, Rhee, and Tong (2007), Grossrieder (2007), and Liping (2010), have used total GDP as an independent variable in the gravity models they estimated. In each case, this variable was found to be positively related to trade flows. Given these findings, the following hypothesis was proposed.

H7: The total GDPs of the exporting countries positively affected the total value of U.S. textile and apparel imports.

Estimations for the Second Gravity Equation Estimated to Address the Objective #6

The second gravity equation estimated in this research includes the same independent variables as the first gravity equation described above (Equations 4 and 5), as well as a dummy variable for the presence or absence of quantitative restrictions (VERs or quotas) on the textile and apparel export quantity of each of 225 exporting countries. The dependent variable is the total annual SME quantity of U.S. textile and apparel imports over 1995-2010, with two variants within the equation. One variant is the annual aggregate of the SME quantity of U.S. textile and apparel imports from each country that were restricted by quotas or VERs. The other variant is the annual aggregate of the SME quantity of U.S. textile and apparel imports from each country that were not restricted by quotas or VERs. Thus, the purpose of estimating the second gravity equation is to determine the overall effect of the presence or absence of quantitative restrictions on the total quantity of U.S. textile and apparel imports over 1995-2010 while controlling for the other independent variables in the equation. Previewing the results from estimating the two variants of the first gravity equation, the scaled dependent variable scenario is applied to the second gravity equation as follows.

$$\text{Ln}(0.001+ Q_{jtr}) = \alpha_0 + \beta_1\text{LnUSGDP}_t + \beta_2\text{LnGDP}_{jt} + \beta_3\text{Lndist}_j + \beta_4\text{Lnexchange}_{jt} + \beta_5\text{landlocked}_j + \beta_6\text{English}_j + \beta_7\text{LnTGDP}_j + \beta_8\text{restrict}_{jtr} + \varepsilon_{jt} \quad (6)$$

where $0.001+Q_{itr}$ = the scaled total SME quantity of U.S. textile and apparel imports of the set of products controlled by quantitative restrictions (r=1) and of the set of products without these restrictions (r=0), each from exporting country j (j = 1-225) at time t; restrict_{jtr} = 1 if VERs or quotas restricted any U.S. textile or apparel imports from country j at time t, 0 if not; and all other variables and terms are as defined for the first gravity equation.

Hypotheses. The hypotheses proposed for the coefficients on the independent variables in Equation 5 also apply to the coefficients on these variables in Equation 6 except that "the total value of U.S. textile and apparel imports" in each hypothesis is replaced by "the total quantity of U.S. textile and apparel imports." Additionally, the restrict independent variable introduced in Equation 6 requires a hypothesis on the coefficient on that variable. Many studies have shown that regional trade agreements (RTAs), such as the Association of South East Nations (ASEAN), the North American Free Trade Agreement (NAFTA), and the EU, increased trade among the member countries. RTAs generally remove or reduce quantitative restrictions on products the member countries import from each other. Datta and Kouliavtsev (2009) found that NAFTA increased U.S. textile and apparel imports from other member countries, but reduced U.S. imports of these products from non-member countries such as Asian countries. Chan and Au (2007) found that China's WTO membership increased its textile exports to other WTO member countries, but the ASEAN, EU and NAFTA negatively influenced China's textile exports because China is not a member of these preferential trade agreements.

These findings show that the presence (absence) of VERs or quotas reduces (increases) trade between countries. Amponsah and Ofori-Boadu (2006) examined the effects of the MFA using a dummy variable for whether or not textile and apparel trade between a country pair was free of MFA quantitative restraints. They concluded that MFA trade restrictions had led to a reduction in textile and apparel trade. Given these findings, the presence (absence) of quotas or VERs on textile and apparel products exported to the United States is expected to have led to a reduction (increase) in the quantity of U.S. textile and apparel imports, thus that the estimated coefficient on this variable would have a negative sign. The following hypothesis was therefore proposed.

H8: The total quantity of U.S. textile and apparel imports was lower in the presence of quotas or VERs on the imports than in the absence of the quotas and VERs.

Estimations for the Third Gravity Equation Estimated to Address the Objective #7

The third gravity equation in this research is estimated to assess trade creation and trade diversion effects of the quota and VER levels of U.S. textile and apparel imports over the period when first the ATC was in effect and then the safeguard quotas were in force on 21 categories of U.S. textile and apparel imports from China and quotas or VERs were in effect on some U.S. textile and apparel imports from Belarus, Ukraine, and Vietnam. To accomplish this purpose, the third gravity equation is specified differently than either of the first two in several respects. One difference is that the period of analysis for the third equation is 1995-2008, not 1995-2010 as for the first two gravity equations.

The 1995-2008 analysis period for the third equation was chosen because it encompasses the ATC and the safeguard-quota periods. Because the 1995-2008 period encompasses the four-stage phase out of MFA quotas and VERs under the ATC as well as the annually rising levels of the safeguard quotas on U.S. imports from China, the estimation of the third gravity equation helps to capture trade creation and trade diversion effects of the rising levels of the quotas and VERs, as well as the successive increments to the amounts of the safeguard-controlled textile and apparel products that China was allowed to export to the United States. A second difference from the first two gravity equations is that the third accounts for both U.S. and ROW imports of textiles and apparel from only the 50 exporting countries that were subject to quotas and VERs on their textile and apparel exports to the United States at some point over 1995-2008, not from all countries that exported such products to the United States during that period. The 50 exporting countries are listed in Table A1 and by continent in Figure A1 in Appendix A. Only the imports from those 50 countries are considered in order to assess whether and the extent to which the rising quota and VER levels of U.S. textile and apparel imports led these countries to divert their exports of such products from ROW to the United States or sell them to the United States rather than ROW.

Another difference from the first two equations is that, instead of specifying the dependent variable as the total value or quantity of U.S. textile and apparel imports, the dependent variable in the third equation is specified in terms of products of four types: yarn, fabric, apparel, and made-up. The third gravity equation differs from the other two in additional aspects of the specification of the dependent variable and from the second equation in the specification of the independent variable on quotas and VERs. The dependent variable in the third equation is specified as the annual ratio of the total value of U.S. imports of the yarn, fabric apparel, or made-up product type to the total value of ROW imports of the same product type, both from each of the exporting countries, out of the total of 50 in the overall analysis, that was subject to quotas or VERs on its exports of the relevant product type to the United States. Table 9 shows the number of exporting countries with such restraints on their exports of textiles and apparel combined and of each of the four product types to the United States each year over 1995-2008. As seen in the table, the number of countries subject to these export restraints varied by year and by

Table 9

The Number of Exporting Countries Subject to VERs or Quotas on their Textile and Apparel Exports to the United States each Year over 1995-2008

	Number of Countries				
Year	Textiles and apparel combined	Yarn	Fabric	Apparel	Made-up
1995	40	18	18	40	17
1996	45	23	23	45	20
1997	48	23	24	48	21
1998	46	22	25	46	22
1999	47	23	25	47	21
2000	48	23	26	47	20
2001	44	21	24	43	19
2002	44	18	23	43	19
2003	45	19	24	45	19
2004	44	17	23	44	18
2005	4	2	3	4	0
2006	2	1	2	2	1
2007	1	0	1	1	1
2008	1	0	1	1	1

Note. Compiled from data provided by the U.S. Department of Commerce, Office of Textiles and Apparel product type, with many more having restricted exports of apparel than any other product type.

The independent variable on quotas and VERs in the third equation is specified as the total annual SME quota or VER levels of U.S. yarn, fabric, apparel, or made-up imports from the relevant countries, that is the total SME quantity of each of these product types that each of those exporting countries was allowed to export to the United States each year over 1995-2008. The specification of the independent variable on quotas and VERs in the second gravity equation accounts for only the presence or absence of these restrictions and not the actual quota and VER levels, which varied by exporting country, by product type, and by year. The variation in these levels by product type and by year is shown in Table A2 in Appendix A, which contains the total annual SME quota or VER levels of each of the four product types over 1995-2008. The described specifications of the dependent variable and the independent variable on quotas and VERs in the third gravity equation enable the assessment of trade creation and trade diversion effects of the quantitative restrictions and their relaxation as the quota and VER levels rose.

Eight variants of the third gravity equation are estimated separately. Each variant includes the same independent variables as the first gravity equation in this study in order to control for these variables. The eight variants of the third equation include two sets of four. The four variants in each of the two sets differ in the dependent variable and the independent variable on quotas and VERs, with each of these variables in any one of the variants specified for one of four product types: yarn, fabric, apparel, or made-up. Again applying the scaled dependent variable scenario, each of four variants of the third equation has the following form.

$$\text{Ln}\ (R^{k}_{jt}) = \alpha_0^{k} + \beta_1^{k}\text{Lndist}_j + \beta_2^{k}\text{LnUSGDP}_t + \beta_3^{k}\text{LnGDP}_{jt} + \beta_4^{k}\ \text{Lnexchange}_{jt} + \beta_5^{k}\text{landlocked}_j + \beta_6^{k}\text{English}_j + \beta_7^{k}\text{LnTGDP}_j + \beta_9^{k}\text{Lnqrestrict}_{jt} + \varepsilon_{jt} \quad (7)$$

where R^{k}_{it} is the ratio of the scaled total value ($1,000) of U.S. imports of *k* product type (yarn, fabric, apparel, or made up) from exporting country *j* at time *t* to the scaled total value ($1,000) of ROW imports of the same *k* product type from country *j* at time *t*; qrestrict_{jt} is the total allowed SME quota or VER quantity of *k* product type for exporting country *j* at time *t*; and the terms and remaining variables are as defined for the first gravity equation. Equation 7 is estimated separately for yarn, fabric, apparel, and made-up products. The four variants of the equation differ in the number of exporting countries considered due to variation by product type in the number of such countries with quotas or VERs on their exports of the United States. The difference in the number of considered exporting countries affected the number of countries from which U.S. and ROW received imports of the different product types and thus the data for the dependent variable. It also affected the number of exporting countries for which data are included for the quota and VER levels and for every other independent variable on characteristic of the exporting countries in the analysis. Also to be noted is that the ROW importing countries include 222 in total. These countries are all those besides the United States that are included in the Comtrade data. They include the 50 exporting countries in the overall analysis for two reasons. First, some of the exporting countries (e.g., Bangladesh, Mexico) that lack well-developed textile industries may import yarn and fabric for use as intermediate inputs in producing apparel or made-up products. Secondly, some exporting countries may import textile and apparel products of the same types they export due to the high degree of product differentiation in textiles and apparel within product types.

As discussed in Chapter 2, the United States negotiated with a number of exporting countries MFA- and ATC-authorized bilateral agreements that set VERs which limited the amounts of textile and apparel products the exporting countries were allowed to export to the United States. The United States tended to make such agreements with countries that supplied sizeable and rapidly growing amounts of its textile and apparel imports and to impose quotas or VERs on products from such countries that it imported in sizeable and rapidly growing amounts, especially relative to U.S. production output (Cline, 1990). In addition, the annual growth rates of the levels of the bilaterally negotiated VERs were partially determined by reference to previous U.S. textile and apparel import quantities from the exporting countries in the agreements with the United States. In addition, Trefler (1993) treated quota and VER levels as endogenous for his estimation and he used instrumental variables for the estimation. All this indicates potential endogeneity of the data for the independent variable on quota or VER levels because at least some variables that determined U.S. textile and apparel imports each year also determined the VER levels of the imports.

A further issue is that the MFA specified the general guideline of 6% annual growth rates of the levels of the negotiated VERs, except in unusual cases when bilateral agreements specified other growth rates. For example, the annual VER growth rates for some products from China were in the range of 1% to 2%, although the annual growth rates of the VER levels of the controlled product categories and aggregates from China averaged 6% per year. The negotiated annual growth rate of the safeguard quotas on 21 categories of U.S. textile and apparel imports from China over 2006-2008 was 12.5%. In addition, the fill rates of the quotas and VERs were 100% or nearly so for many exporting countries, such as China and some other Asian countries, whose textile and apparel exports to the United States were controlled by quotas and VERs (see Figure A1). These high fill rates and the annual growth in the allowed export quantities indicate that both U.S. textile and apparel imports and the quota or VER levels varied by year (see Table A2), again indicating potential endogeneity of the quota and VER levels.

Given the potential engogeneity of the quota and VER levels, two-stage regression (IV regression) was performed to estimate and incorporate an instrumental variable for the qrestrict variable on quota and VER levels of each product type and to test the endogeneity of the qrestrict variable for each product type. Due to the variation by year in the quota or VER levels, year dummy variables were included in the first-stage equation, specified as follows.

$$^{k}\text{Lnq}\widehat{\text{restri}}\text{ct}_{jt} = \pi_0^{k} + \pi_1^{k}\text{Lndist}_j + \pi_2^{k}\text{LnGDP}_{jt} + \pi_3^{k}\text{Lnexchange}_{jt} + \pi_4^{k}\text{landlocked}_j + \pi_5^{k}\text{English}_j + \pi_6^{k}\text{LnTGDP}_j + \pi_7 1995 + \pi_8 1996 + \pi_9 1997 + \pi_{10} 1998 + \pi_{11} 1999 + \pi_{12} 2000 + \pi_{13} 2001 + \pi_{14} 2002 + \pi_{15} 2003 + \pi_{16} 2004 + \pi_{17} 2005 + \pi_{18} 2006 + \pi_{19} 2007 + u_{jt} \quad (8)$$

where π_i (i = 0-19) refers the intercept and parameters to be estimated, u_{jt} is the error term, and the variables are as defined previously. The year omitted from the time-trend dummy variables is 2008; omitting one year in such time-trend dummy variables is necessary to avoid perfect collinearity. Note that when the 2sls command in STATA was applied to perform the IV regression, the U.S. GDP per capita (USGDP) variable was automatically dropped from the first-stage equation (Equation 8) to avoid perfect collineaity with the year dummy variables in the equation, although this variable was included in the second-stage equation (Equation 9). After estimating the parameters in Equation 8, this equation provided the estimated value of ${}^{k}\mathrm{Ln}\widehat{\mathrm{qrestrict}}_{jt}$ with the instrumental variables for ${}^{k}\mathrm{Lnqrestrict}_{jt}$, for the relevant product type, which was then used instead of the observed quota or VER levels of that product type in the second-stage of the IV regression. The second-stage equation has the following form.

$$\mathrm{LnR}^{k}_{jt} = \alpha_0^{k} + \beta_1{}^{k}\mathrm{Lndist}_j + \beta_2{}^{k}\mathrm{LnUSGDP}_t + \beta_3{}^{k}\mathrm{LnGDP}_{jt} + \beta_4{}^{k}\,\mathrm{Lnexchange}_{jt} + \beta_5{}^{k}\mathrm{landlocked}_j + \beta_6{}^{k}\mathrm{English}_j + \beta_7{}^{k}\mathrm{LnTGDP}_j + \beta_9{}^{k}\mathrm{Ln}\widehat{\mathrm{qrestrict}}_{jt} + \varepsilon_{jt} \quad (9)$$

where ${}^{k}\mathrm{Ln}\widehat{\mathrm{qrestrict}}_{jt}$ is the estimated value with instrumental variables for ${}^{k}\mathrm{Lnqrestrict}_{jt}$ and the terms and remaining variables are as defined previously. As for Equation 7, Equations 8 and 9 are estimated separately for yarn, fabric, apparel, and made-up products. As described in the Results chapter, tests for endogeneity were conducted after estimating Equation 9 for each product type. In addition, the results from estimating Equations 7 and 9 for each product type are compared to judge which one of these equations is the best for assessing trade creation and trade diversion effects of the quota and VER levels of the relevant product type.

Additional issues regarding the third gravity equation are discussed below. They involve the specification of the dependent variable, the decision to estimate the equation separately for the yarn, fabric, apparel, and made-up product types, the specification of the independent variable on quota and VER levels, and compilation of the data for this variable.

The dependent variable. As noted above, the dependent variable in the third gravity equation is specified as a ratio. The fraction that expresses this ratio has the following form.

$$\mathrm{LnR}^{k}_{it} = \log \frac{\begin{array}{c}.001\text{+the total value (\$1,000) of US imports of k}\\ \text{from exporting country } j\ (j = 1\text{–}50) \text{ at time } t\end{array}}{\begin{array}{c}.001\text{+the total value (\$1,000)of ROW imports}\\ \text{of k from exporting country } j \text{ at time } t\end{array}} \qquad (10)$$

where *k* refers to *k* product type = yarn, fabric, apparel, or made up; and ROW refers to the rest of the world besides the United States

An alternative specification of the dependent variable was considered to assess trade creation and trade diversion effects of the quotas and VERs imposed on U.S. textile and apparel imports. The alternative specification is D = the natural logarithm of the difference between the total value of U.S. imports of *k* product type and the total value of ROW imports of the same product type, both from exporting country *j* at time *t*. The specification of the dependent variable as a fraction is preferable to the difference specification for the following reason. If in many likely cases the values of D were negative or zero, the natural log of D would be undefined because a number must have a value greater than zero in order to take its natural log. In any of these cases, the import data would be treated as missing observations, thereby potentially leading to the loss of much import data. Omission of a large number of observations from the import data is a form of sample selection bias involving the dependent variable in the third gravity equation that would ultimately cause biased estimates of trade creation and trade diversion effects of the quantitative restrictions on U.S. textile and apparel imports.

The decision to estimate separately by product type. As previously indicated, the third gravity equation is estimated separately for the yarn, fabric, apparel, and made-up product types. Thus, the dependent variable and the independent variable on quotas and VERs in any one of the eight variants of the equation are specified for one of those four product types. A combination of factors influenced the decision to aggregate the data for each of those variables by product type and thus to specify those two variables according to product types in the eight separately estimated variants of the equation.

The total value or quantity of U.S. textile and apparel imports does not account for the diverse product types in textiles and apparel. The products of textile manufacturers and apparel manufacturers are related in that yarns and fabrics are used as inputs to produce apparel; however, the processes used to produce most products of textile manufacturers differ markedly from those to produce apparel, especially garments made of woven fabrics. For example, the processes to manufacture yarn and carpet differ greatly from those to manufacture apparel products. Partly because of these different production processes, many exporting countries specialize in producing and exporting either textiles or apparel, and therefore differed over 1995-2008 on whether or the degree to which quotas and VERs limited their exports of textile products versus apparel products. Even within textile products and within apparel products, countries often specialize in certain categories (e.g., denim fabric, sweaters).

The processes to manufacture products of one type are more similar than those to manufacture products of different types. The similarity of the production processes for products of any particular type is reflected in the export product specialization of many countries that supply textile and apparel products to the United States. For example, the exports of countries like Bangladesh and Vietnam to the United States have focused heavily on apparel, but the exports of countries like Pakistan to the United States have focused heavily on made-ups. Due to these different production processes and the manufacturing and export specialization of many countries, the quotas and VERs on the textile and apparel exports of any one exporting country over 1995-2008 were on particular product categories or sets of them. Aggregation of the data on quota and VER levels by product type was expected to yield more meaningful results on trade creation and trade diversion effects of the restraints than if aggregated by textiles and apparel as a whole or by textiles versus apparel as a whole.

Furthermore, the aggregation of the data on quota and VER levels by each of the four product types (yarn, fabric, apparel, and made-ups) improved the manageability of these data, given that the numbered OTEXA product categories include 158 in total. Although aggregation by fiber content also would have improved the manageability of the data, aggregating by product type is preferable. If the data on quota and VER levels were aggregated not by product type, but by the fiber content of the products, thus by the first digit of each OTEXA product category, most of the merged categories for quotas and VERs could not be included in the data, resulting in the loss of a large amount of data because the merged categories total 82 in number. Omission of a large amount of data on the quotas and VERs on merged categories would be a form of sample selection bias involving the independent variable on quotas and VERs that would ultimately cause biased estimates of trade creation and trade diversion effects of these restrictions on U.S. textile and apparel imports. The decision to aggregate by the yarn, fabric, apparel, and made-up product types is also partly due to the fact that the SME amounts that the 50 exporting countries subject to VERs or quotas at some point over 1995-2008 were allowed to export to the United States during that period were typically more similar within than between product types, as reflected in the common imposition of VERs and quotas on merged categories by product type. Despite the cogent arguments favoring the aggregation of the data on quota and VER levels by product type, challenges were encountered in compiling these data (see the next section).

Specification of the independent variable on VER and quota levels and data compilation for this variable. To reiterate, the independent variable on quotas and VERs on the relevant product type (yarn, fabric, apparel, or made-up) is specified as the quota or level of U.S. imports of the product type, that is the total allowed SME quantity of the U.S. imports of the product type each year from each exporting country in the analysis. An alternative specification of this variable was considered, that being the weighted average fill rates of the quotas and VERs on the products (described later); however, fill rates do not account for the amounts of textile and apparel products that exporting countries subject to quotas and VERs were allowed to export to the United States. A quota or VER fill rate for a product category is the percentage of the allowed quota or VER amount of the product category that was actually exported to or imported by the importing country at time *t*. The fill rate for a product category specifically equals the imported quantity of the category divided by the allowed quota or VER amount of the category times 100%. The allowed quota or VER quantities and the U.S. import amounts were large for some product categories controlled by quotas or VERs over 1995-2008, but small for others. These considerations led to the decision to specify the independent variable on quotas and VERs in the third gravity equation as indicated above.

The data received from OTEXA on the levels of the quantitative restrictions on U.S. textile and apparel imports that are used for the independent variable on quotas and

VERs in the third gravity equation include the annual amounts of textiles and apparel in square meter equivalents (SME) over 1995-2008 that each of the 50 exporting countries subject to VERs or quotas on its exports of such products to the United States at some point over that period was allowed to export to the United States each year during the period. The VERs and quotas on textile and apparel products were specified for three-digit OTEXA textile and apparel product categories in the unified SME units. The OTEXA product categories, often called MFA categories, are designated as follows. The 200 series denotes products made of cotton and/or man-made fibers; the 300 series denotes products made of cotton; the 400 series denotes products made of wool; the 600 series denotes products made of man-made fibers; and the 800 series denotes products made of silk blends or non-cotton vegetable fibers. Thus, the first digit of an OTEXA number for a product category refers to the fiber content of the product, not the type of the product (e.g., apparel, fabric).The additional digits of an OTEXA number for a product category denote the type of the product (i.e., yarn, fabric, apparel, or made-up) and the particular product (e.g., sheets, dresses) of that type.

The VERs and quotas included those on individual OTEXA product categories, as well as those on subsets of products and on aggregated product categories, called respectively “part” categories, such as 309-S, and “merged” categories, such as 334/634, or “group” categories, such as “Turkey Fabric Group” (see Tables 2 and 3 in Chapter 2 for additional examples). Some of the group categories are aggregates by product type (e.g., fabric), but many are aggregates of multiple product types (e.g., yarn and fabric). The groups containing multiple product types require special treatment for the present research. This special treatment is described later in this section.

Any one merged category is an aggregate by product type, regardless of fiber content. Examples of merged categories under the MFA are 330/630, 331/631, 334/634, 335/635, 336/636, 340/640, 341/641, 342/642, 347/348, and 349/649. Each of these merged categories contains two OTEXA product categories of the same type but with different fiber contents, as indicated by the different first digits in the OTEXA numerical product designations. For example, merged category 330/630 refers to handkerchiefs with two different fiber contents. It includes handkerchiefs designated as the 330 product category, which is in the 300 series denoting products made of cotton, and handkerchiefs designated as the 630 product category, which is in the 600 series denoting products made of man-made fibers. An important point is that a merged category served the purpose of specifying a set of similar products (e.g., handkerchiefs) of one type (yarn, fabric, apparel, or made-up) that was limited to one collective export amount. For example, an exporting country with a negotiated VER on merged category 330/630 was allowed to export to the United States each year an overall amount of handkerchiefs composed of cotton and/or man-made fibers during the period specified for the VER.

The aggregation of the data on the quota or VER levels according to each of four product types (yarn, fabric, apparel, or made-up) was described previously. Individual OTEXA product categories and products in part and merged categories, as well as those in quota or VER groups that do not contain multiple product types could be and were directly aggregated by product type to provide data on quota or VER levels of yarn, fabric, apparel, and made-up products for use in the independent variable on quotas and VERs in the third gravity equation (see Table 10).

Table 10

The OTEXA Product Categories and Part, Merged, and Group Categories Directly Aggregated by Product Type (*Yarn, Fabric, Apparel, or Made-ups) for Estimating Equations 7-9*

Product type	OTEXA product categories and part, merged, and group categories[a]
Yarn	200, 201, 300, 301, 400, 600, 603, 604, 606, 607, 800, 301-O, 301-P, 604-A, 300/301, 300/301/607, Canada Cotton & MMF Yarns
Fabric	218, 219, 220, 222, 223, 224, 225, 226, 229, 313, 314, 315, 317, 326, 410, 414, 611, 613, 614, 615, 617, 618, 619, 620, 621, 622, 624, 625, 626, 627, 628, 810, 218-1, 224-V, 410-A, 410-B, 218/225/317/326, 225/317,226/313, 326, 226/313, 317/326, 317/617/326, 410/624, 613/614/615, 613/614/615/617, 619/620, 625/626/627/628/629, Canada Cotton and MMF Fabrics, Egypt Fabric Group, Turkey Fabric Group
Apparel	237, 239, 330, 331, 332, 333, 334, 335, 336, 338, 339, 340, 341, 342, 345, 347, 348, 349, 350, 351, 352, 359, 431, 432, 433, 434, 435, 436, 438, 439, 440, 442, 443, 444, 445, 446, 447, 448, 459, 630, 631, 632, 633, 634, 635, 636. 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 659, 735, 736, 738, 739, 740, 741, 742, 743, 746, 750, 751, 752, 758, 759, 831, 832, 833, 834, 835, 836, 838, 839, 840, 842, 843, 844, 845, 846, 847, 850, 851, 852, 858, 859, 237-D/333-D/334-D/342-D/347-D/348-D, 359-C, 359-V, 369-1, 369-D, 369-O, 369-S, 440-M, 444 NP, 444SP, 640-D, 640-O, 640-Y, 641-Y, 644-O, 647-K. 648-K, 648-W, 651-B, 659-1, 659-2, 659-C, 659-H, 659-S, 845-1, 845-2, 330/630, 331/631, 333/334/335, 333/334/335/833/834/835, 333/335/833/835, 334/634, 335/635, 335/635/835, 336/636, 336/836, 338/339, 338/339-S, 338/339/638/639, 338/339/638/639-S, 338-S/339-S/638-S/639-S, 338-S/339-S, 340/341/640/641, 340/640, 340-D/640-D, 340/640-Y, 341-Y, 341/641, 341-Y/641-Y, 342/642, 342/642/842, 347/348, 347/348-T, 347-T/348-T, 347-W/348-W, 347/348/647/648, 347/348/847, 349/649, 350/650, 350/850, 351/651, 351/851, 352/652, 352-K/652-K, 352/652 NP, 352/652 SP, 353/354/653/654, 359/659-C, 359-C/659-C, 359-S/659-S, 369-C/659-C, 369-F/369-P, 369-L/670-L/870, 443/444/643/644/843/844, 445/446, 633/634/635, 638/639, 638/639/838, 641/840, 641/641, 642/842, 645/646, 647/648, 647-W/648-W, 845/846, Bahrain Group I, Canada Cotton and Man-made-fiber (MMF) Apparel, wool apparel, China Group II, Group IV, and Silk Group, Taiwan Group II, Group II sub Group, and Group III, Hong Kong Group II, Group III, and Subgroup II, Korea Group III, Mauritius Knit Apparel Group, Mexico wool apparel,

Continued

Table 10 (*continued*)

Product type	OTEXA product categories and part, merged, and group categories[a]
Apparel	non-wool apparel, Romania Group III, Thailand Group II
Made-up	360, 361, 362, 363, 369, 464, 465, 469, 665, 669, 670, 863, 870, 871, 899, 360-P, 369-D, 369-H, 369-L, 369-S, 669-P, 669-T, 670-H, 670-L, 863-S, 369-L/670-L/870, Korea Group VI

Note. Compiled from information provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

[a]Each quota or VER group identified by a country name or by a numbered or named group (e.g., Korea Group III, Turkey Fabric Group) is a set of products of one type that was controlled by a collective VER or quota during the 1995-2008 period.

Despite the capability to delineate, thus directly aggregate by product type the data on the quota or VER levels of many textile and apparel products controlled by VERs or quotas during the analysis period, many others that were included in quota or VER groups could not be directly aggregated for the data on quota or VER levels because the groups contain multiple product types. For example, China Group I includes three product types: yarn, fabric, and apparel. Additional examples of VER or quota groups that contain multiple product types are the following: Brazil Aggregation; Canada Chapters 60 and 63PT and Chapters 52-55, 58, and 63PT; China Group I and Group III; China Taiwan Group I and Group I subgroup; Hong Kong Group I and Group I subgroup; India Group II; Indonesia Group II and Group II wool subgroup; Korea Group I and Group II; Macau Group II; Malaysia Group II; Philippines Group II; and Romania Cotton Group. “Chapters” in some of the groups refer to separate chapters on different product types or sub-types in the Harmonized Tariff Schedule of the United States. Table 11 shows the number of exporting countries that were subject to quotas or VERs on groups containing multiple product types, as well as the total number of the VER or quota groups containing multiple product types each year over 1995-2008. Appendix Table A3 shows the name of each VER or quota group containing multiple product types for each affected exporting country each year over 1995-2008. The quota or VER level of each of the four product types in the quota or VER groups containing multiple product types could not be directly aggregated because of the impossibility of straightforwardly disentangling the level of each product type in any one of these groups.

Table 11

The Number of Exporting Countries Subject to Quotas or VERs on Groups Containing Multiple Product Types and the Total Number of these Groups Each Year over1995-2008

Year	Number of countries	Number of groups containing multiple product types
1995	12	18
1996	12	18
1997	12	18
1998	11	16
1999	11	16
2000	11	16
2001	11	16
2002	11	16
2003	11	16
2004	10	16
2005	0	0
2006	0	0
2007	0	0
2008	0	0

Note. Compiled from data provided by the U.S. Department of Commerce, the Office of Textiles and Apparel.

The problem just described is relevant to the data on the quantity of each textile or apparel product type that each exporting country subject to quotas or VERs on groups containing multiple product types was allowed to export to the United States per year over 1995-2008 (see Table 11 and Appendix Table A2). A set of sample data is assembled in Table 12 to illustrate the implications of the problem involving the numerous VER or quota groups that contain multiple product types. The data in the table are a subset of the extensive data shown in Appendix Table A4. Table 12 includes, for each year over 1995-2003, information about the quota or VER groups containing multiple product types for six of the many exporting countries that were subject to such quotas or VERs on their textile and apparel exports to the United States over 1995-2008. Table 12 shows, for each listed country, the percentage of its total allowed SME export quantity of textile and apparel products that was included each year over 1995-2003 in VER or quota groups containing multiple product types and was thus inseparable in terms of the allowed SME quantity of each product type represented in the groups. This

Table 12

The Percentage of the Total Allowed SME Export Quantity of Textile and Apparel Products that was included in Quota or VER Groups Containing Multiple Product Types for Each of Six Exporting Countries Subject to Quotas or VERs on Such Groups Each Year over 1995-2003

Country		1995	1996	1997	1998	1999	2000	2001	2002	2003
Brazil	VER/quota	69.7%	70.6%	70.4%	72.7%	70.5%	70.6%	70.6%	69.1%	69.0%
Canada	VER/quota	23.7%	23.8%	23.8%	24.3%	24.0%	24.0%	0.0%	0.0%	0.0%
China	VER/quota	61.4%	61.4%	61.9%	71.9%	70.9%	71.1%	70.6%	69.4%	67.4%
Philippines	VER/quota	69.7%	73.8%	79.6%	83.4%	84.1%	84.5%	81.2%	85.4%	79.7%
S. Korea	VER/quota	69.9%	69.8%	69.7%	68.5%	68.4%	68.5%	68.6%	21.3%	68.5%
Taiwan	VER/quota	30.0%	37.9%	38.0%	38.1%	7.3%	37.2%	30.9%	26.6%	27.1%

Source: Calculated from data provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

inseparability means that the allowed SME quantities of the products in these quota or VER groups could not be directly aggregated for the data for the independent variable on each exporting country's allowed SME quantity of exports of each product type to the United States for estimating the third gravity equation.

The information in Table 12 illustrates the considerable amount of data that would have been omitted from the estimation of the third gravity equation, thus would have caused sample selection bias involving the independent variable on quotas and VERs in the equation, and would cause the coefficient on quotas and VER levels to be underestimated, unless a procedure were devised to account for the allowed export quantity of each product type included in quota or VER groups containing multiple product types. It can be seen in Table 12 that the quota or VER groups containing multiple product types present more serious problems for the data on the products from some exporting countries than for the data on the products from others. Table 12 shows wide variation among the listed exporting countries in the percentages of their allowed SME export quantities of textile and apparel products that were included in quota or VER groups containing multiple product types and thus could not be directly aggregated by product type for the data on the quota or VER levels for estimating the third gravity equation. These percentages range from 0% of the allowed SME export quantity from Canada in 2001, 2002, and 2003 to 85.4% of that from the Philippines in 2002. Although the percentages of the allowed SME export quantity from Canada that could not be directly aggregated for the data on quota or VER levels range from 0% to 24.3%, the percentages from China range from 61.4% to 71.9% and those from the Philippines range from 69.7% to 85.4%. The percentages range from 7.3% to 38.1% of the allowed export quantity from Taiwan, from 21.3% to 69.9% of that from South Korea, and from 69.0% to 72.7% from Brazil.

Given the high percentage of products included in quota or VER groups containing multiple product types, a procedure was developed to account for each product type in those groups in the data on the total allowed SME export amounts. The procedure included the following five steps with respect to each quota or VER group containing multiple product types for each relevant exporting country for each relevant year:

1. counted the total number of OTEXA product categories in the group;
2. separated the OTEXA product categories in the group according to product types (yarn, fabric, apparel, and made up);
3. counted the number of product categories of each of the two to four product types found in Step 2;
4. divided the number of product categories of each of the two to four product types found in Step 3 by the total number of product categories found in the group in Step 1 and multiplied the result times 100, yielding the percentage of each product type included in the group; and
5. multiplied each percentage found in Step 4 by the total allowed SME quantity of the group for the relevant exporting country in the relevant year, yielding an estimate of the SME quantity of each product type in the group that the exporting country was allowed to export to the United States that year.

As indicated in the five steps enumerated above, the described procedure relied on two pieces of observed data for each relevant exporting country: (a) the identities of the OTEXA product categories included in each quota or VER group containing multiple product types in each relevant year; and (b) the total SME quantity of each of these groups that the country was allowed to export to the United States in that year. Table 13 illustrates the application of the five-step procedure described above. The illustration refers to “Group II wool subgroup” on which a VER for 2003 was imposed in a bilateral agreement between the United States and Indonesia.

Table 13

For VER Group II Wool Subgroup for Indonesia for 2003, the Particular OTEXA Product Categories and the Number of these Categories of Each Product Type in the Group and the Percentage Share and Estimated VER Level of Each Product Type in the Group

Product type	OTEXA product categories of each product type	Share of each product type in the group	VER level (SME)
Yarn	400 (1 category)	7.14%	232,367
Fabric	410, 414 (2 categories)	14.29%	464,734
Apparel	431, 434, 435, 436, 438, 440, 442, 444, 459PT. (9 categories)	64.29%	2,091,305
Made-up	464, 469PT. (2 categories)	14.29%	464,734
Total	14 categories	100.00%	3,253,141

Note. Based on data provided by the U.S. Department of Commerce, the Office of Textiles and Apparel.

As shown in the Table 13 column labeled “OTEXA product categories of each product type,” Group II wool subgroup was found in Step 1 to contain a total of 14 OTEXA product categories, which were then found in Step 2 to represent each of the four product types into which textile and apparel products were aggregated for estimating the third gravity equation. Then in Step 3, the number of product categories of each product type found in Step 2 was counted (e.g., 9 product categories of the apparel type). The Table 13 column labeled "Share of each product type in the group" indicates the percentage of the product categories of each of the four product types in Group II wool subgroup in 2003; each of these percentages was calculated as described in Step 4 above [e.g., (9/14) x 100 = 64.29% for apparel]. The Table 13 column labeled "VER level (SME)" indicates the estimated total SME quantity of the product categories of each product type in Group II wool subgroup that Indonesia was allowed to export to the United States in 2003, as calculated in Step 5 of the procedure described above (e.g., 2,091,305 SME of apparel products found by multiplying 64.29% times 3,253,141, the total VER level for the group in 2003).

The procedure used to estimate the allowed SME quantity of exports of each product type in each quota or VER group containing multiple product types is not perfect because the calculation of the share of each product type in each group is based on the number of OTEXA product categories of each product type in each group, not the actual share of the total allowed SME amount of each product type in the group, because the actual share was not specified in any quota or VER group containing multiple product types and is thus not observable. However, the procedure does allow the use of estimates of a large amount of data on allowed SME quantities of exports to the United States of the four textile and apparel product types that would otherwise be omitted from the analysis of trade creation and trade diversion effects of the quantitative restrictions on U.S. textile and apparel imports. The estimated data on the allowed SME export quantity of each of the four product types included in quota or VER groups containing multiple product types for each exporting country subject to quotas or VERs on such groups were combined with the observed data on the allowed SME export amounts of single, merged, or part OTEXA product categories of the respective product types for the respective exporting country to compile the data for the independent variable on quotas or VERs in the third gravity equation.

Hypotheses. The main purpose of estimating the third gravity equation in this research is to assess trade creation and trade diversion effects of the relaxation of the quotas and VERs on U.S. textile and apparel imports over the 1995-2008 period encompassing the ATC and the safeguard quotas on 21 categories of such imports from China. This equation includes independent variables in addition to the quota and VER levels in order to control for those other variables. Viner (1950) was the first to define trade creation and trade diversion, although others have proposed refined and otherwise revised definitions of the concepts. According to Viner (1950), trade creation occurs when policies that reduce trade barriers result in shifting from reliance on expensive domestic products to reliance on low-cost imports, and trade diversion occurs when the trade policies result in relatively low-cost production in some countries being displaced by relatively high-cost production in other countries. Trade creation and trade diversion are often discussed as effects of regional trade agreements or other forms of preferential trade agreements (PTAs), which typically include discriminatory trade policies that reduce barriers to trade among the member countries while retaining barriers to trade with non-member countries.

As noted by Eicher et al. (2009), trade creation is a beneficial effect of a PTA on the member countries in that reduced barriers to trade between the member countries lead to lowering the prices paid by domestic consumers and importing companies. The reduced prices are partially due to the displacement of inefficient domestic producers by efficient producers in another PTA member country. On the other hand, trade diversion is "the undesirable or efficiency-reducing effect" of a PTA (Eicher et al., 2009, p. 252). Trade diversion occurs when low-cost imports by a PTA member country from a non-member country are displaced by high-cost products from a member country. Krueger (1999) noted that the increased trade among NAFTA member countries exemplifies trade creation and the decreased trade between members and non-members of NAFTA reflects trade diversion. Regional trade agreements may thus cause benefit or harm, depending on the situations of the countries involved (Magee, 2008; Panagariya, 2000). Despite the frequent application of the trade creation and trade diversion concepts to PTAs, such effects may have occurred under the trade policies considered in the present study.

Trade creation and trade diversion in textiles and apparel may have occurred as the quotas and VERs on U.S. imports of these products were relaxed during the ATC period (1995-2005) and the safeguard period (2006-2008). During the ATC period, the levels of the quotas and VERs on U.S. textile and apparel imports increased annually and these restraints were also gradually removed to meet their required phase out by January 1, 2005, although as discussed in Chapter 2, the United States retained until the January 1, 2005 deadline a high percentage of these restraints, albeit at higher levels than in the past. During the safeguard period, the levels of the safeguard quotas on 21 categories of U.S. textile and apparel imports from China increased 12.5% per year. The assessment of trade creation and trade diversion effects through estimation of the third gravity equation in this study is specifically to determine whether and the extent to which the textile and apparel exports of the 50 exporting countries subject to quotas or VERs on their exports of such products to the United States at some point over 1995-2008 were shifted from the United States to the rest of the world or were sold to the United States rather than ROW as the quota and VER levels rose over the period.

Before presenting hypotheses on the relationships between the dependent and independent variables in the third gravity equation, it is useful to note the cases in which the dependent variable R, specified as the ratio of the total value of U.S. imports of *k* product type to the total value of ROW imports of that product type, would increase or decrease and the implications for trade creation and trade diversion as quota and VER levels rose during the 1995-2008 period, as well as the implications of an increase or decrease in the value of the U.S./ROW import ratio with changes in the values of other independent variables in the equation. The R ratio would increase (decrease) in the following cases.

1. U.S. imports, the numerator, increase (decrease) and ROW imports, the denominator, decrease (increase).
2. U.S imports increase (decrease) more than ROW imports increase (decrease).
3. U.S. imports decrease (increase) less than ROW imports decrease (increase).

If the U.S./ROW import ratio were positively related to the rising quota and VER levels, this would indicate that U.S. imports increased and ROW imports declined or increased less than U.S. imports or that both U.S. and ROW imports declined, but U.S. imports less than ROW imports. Any of these cases implies trade creation for the United States and trade diversion for ROW, such that U.S. imports of textiles and apparel either increased or declined along with ROW imports, but less than the ROW imports as the products were diverted away from ROW under the rising levels of the quotas and VERs on U.S. textile and apparel imports over the period encompassing the ATC and the safeguard quotas on 21 categories of such U.S. imports from China. If alternatively the U.S./ROW import ratio were negatively related to the rising quota and VER levels, this would indicate that U.S. imports fell, but ROW imports either rose or fell less than U.S. imports or that both U.S. and ROW imports rose, but the ROW imports more than the U.S. imports. Any of these cases implies trade diversion for the United States and trade creation for ROW, such that U.S. imports of textiles and apparel either declined or increased along with ROW imports, but less than the ROW imports as the products were diverted to ROW under the rising levels of the quotas and VERs on U.S. textile and apparel imports during the period encompassing the ATC and the safeguard quotas.

The interpretation of the relationships between the U.S./ROW import ratio and other metric independent variables in the third gravity equation would be similar to those described above. In addition, the relationship between the U.S./ROW import ratio and a dummy variable in the equation can be interpreted as follows. If the import ratio were positively related to, say, the landlocked variable, this would indicate more U.S. than ROW imports from landlocked exporting countries or more ROW than U.S. imports from non-landlocked countries. If alternatively the U.S./ROW import ratio were negatively related to the landlocked variable, this would indicate less U.S. than ROW imports from landlocked countries or less ROW than U.S. imports from non-landlocked countries.

The qrestrict variable in the third gravity equation is the independent variable of primary interest in the equation. This variable is specified as the total quota or VER level of U.S. imports of *k* product type from each exporting country in the analysis each year over 1995-2008. It is expected to be positively related to the U.S./ROW import ratio for the yarn, fabric, apparel, and made-up product types and thus to have resulted in trade creation for the United States and trade diversion for ROW in each product type. The reasons for these expectations require a detailed explanation.

At the heart of the hypothesis that the total quota or VER level of each of the four product types is positively related to the U.S./ROW import ratio for each of those product types is the notion that the larger the quantity of textile and apparel products that the exporting countries were allowed to export to the United States, the larger the U.S. import quantity of these products from the countries. Inherent in this notion is that many exporting countries subject to quotas or VERs supplied textile and apparel products to the United States in the largest amounts possible; thus the fill rates were high for the quotas or VERs on their textile and apparel exports to the United States. Evidence of the high fill rates is seen in Figure A1 in Appendix A. This figure shows, for each of five continents or continent groups for each year over 1995-2008, the average of the weighted average fill rates (WAFRs) of the quotas or VERs on U.S. textile and apparel imports that countries on the continents or continent groups faced under the ATC and the post-ATC safeguard quotas on 21 categories of U.S. imports of such products from China and the quotas or VERs on U.S. imports of some products from Belarus, Ukraine, and Vietnam. Ukraine and Vietnam joined the WTO in 2008 and 2007 respectively and thus did not enjoy the removal of quotas or VERs on their textile and apparel exports to the United States until after they joined the WTO. Belarus had not joined the WTO as of June 26, 2014 and remains an observer government to the WTO. Nevertheless, quantitative restrictions on its textile and apparel exports to the United States were no longer in effect after 2005.

The WAFRs were calculated using data OTEXA provided upon request for each year over 1995-2008 and for each country subject to quotas or VERs on its textile and apparel exports to the United States during that period. These data include (a) the quantity of U.S. imports from each of these countries in each OTEXA single, part, or merged product category or product group controlled by quotas or VERs and (b) the fill rate of each of these quotas or VERs on these product categories or product groups, each called a category below to simplify the explanation.

The WAFRs were calculated to account for the relative importance of each controlled category in the total controlled U.S. textile and apparel imports from each exporting country each year over 1995-2008. Each WAFR was calculated across all categories controlled by quotas or VERs for each exporting country for each year over that period, and then the average WAFR was found for the countries on each continent or continent group each year according to the following six steps:

1. in a process repeated for each category *p* for country *j* in year *t*, divided the total SME quantity of U.S. imports of category *p* from country *j* in year *t* by the sum total of the SME quota or VER levels of all categories for country *j* in year *t*, yielding the share of the U.S. import quantity of category *p* from country *j* in year *t* in all the U.S. textile and apparel imports from country *j* that were controlled by quotas or VERs that year;
2. in another process repeated for each category for country *j* in time *t*, multiplied the observed fill rate for category *p* for country *j* in year *t* times the U.S. import share of category *p* found in Step 1;

3. summed all the multiplication products found in Step 2 for the different categories for country *j* in year *t*, yielding the WAFR for country *j* in year *t*;
4. in a process repeated for each country *j* on continent or continent group *c* in year *t*, divided the total SME quantity of U.S. imports from country *j* on continent or continent group *c* in year *t* by the sum total of the SME quota or VER levels for all countries on continent or continent group *c* in year *t*, yielding the share of the U.S. import quantity of country *j* out of continent or continent group *c* in year *t* in all the U.S. textile and apparel products of country *j* that were controlled by quotas or VERs that year;
5. in another process repeated for each country on continent or continent group *c* in time *t*, multiplied the WAFR for country *j* in year *t* times the U.S. import share of country *j* found in Step 4; and
6. finally, summed all the multiplication products found in Step 5 for all countries on continent or continent group *c*, yielding the average WAFR for each continent or continent group that is reported in Figure A1.

Although the WAFR was calculated for each exporting country subject to quotas or VERs on its textile and apparel exports to the United States over 1995-2008, the average WAFRs for continents or continent groups in Figure A1 provide an overall summary of the WAFRs. The WAFRs in Figure A1 show that the quota or VER fill rates varied considerably across continents or continent groups and across years. The lack of WAFRs for 2005-2008 for all continents except Asia is because Belarus, China, Ukraine, and Vietnam were the only countries with quantitative restrictions on their textile and apparel exports to the United States after the ATC expired on January 1, 2005. African countries generally had the lowest fill rates, followed by North and South American countries, and then European countries. Fiji, the only Pacific Island country in Figure A1, had high and binding fill rates over 1995-2000 and reduced, but still relatively high fill rates over 2001-2004. On the other hand, Asian countries had consistently high and binding fill rates over 1995-2008. The described patterns in the average WAFRs shown in Figure A1 do not fully support the hypothesized positive relationships between the U.S./ROW import ratio and the total annual quota or VER levels of yarn, fabric, apparel, and made-up products; however, the data in Table 14 should also be considered. Table 14 shows, for each year over 1995-2008, the share of each continent or continent group in

Table 14

The Shares of Five Continents or Continent Groups in the Total U.S. Import Quantity of Textile and Apparel Products Controlled by VERs or Quotas Each Year over 1995-2008

Year	Africa	North and South America	Asia	Europe	Pacific Islands (Fiji)
1995	0.65%	3.31%	96.00%	0.02%	0.02%
1996	0.35%	5.07%	94.30%	0.25%	0.02%
1997	0.59%	8.25%	90.81%	0.33%	0.02%
1998	0.52%	4.70%	94.69%	0.07%	0.02%
1999	0.36%	5.53%	94.03%	0.04%	0.03%
2000	0.60%	4.64%	94.57%	0.16%	0.02%
2001	0.57%	1.86%	97.36%	0.17%	0.03%
2002	0.36%	3.80%	95.68%	0.13%	0.03%
2003	0.32%	5.01%	94.57%	0.06%	0.04%
2004	0.27%	6.67%	92.93%	0.09%	0.05%
2005	N/A	N/A	97.82%	2.18%	N/A
2006	N/A	N/A	100.00%	N/A	N/A
2007	N/A	N/A	100.00%	N/A	N/A
2008	N/A	N/A	100.00%	N/A	N/A

Note. Calculated from data provided by the U.S. Department of Commerce, Office of Textiles and Apparel.

the total U.S. import quantity of textile and apparel products that were controlled by quotas or VERs during that period.

As seen in Table 14, countries in Africa, North and South America, Europe, and the Pacific Islands consistently supplied small percentages, ranging from 0.02 % to 0.65%, of the total annual quantity of U.S. imports of textiles and apparel controlled by quotas or VERs over 1995-2004. On the other hand, Asian countries supplied most of these controlled U.S. imports during that period, with shares ranging from 90.81% to 97.36%, and of course 100% over 2006-2008 when the safeguard quotas were in force on 21 categories of U.S. textile and apparel imports from China and quotas or VERs were in effect on such imports from Vietnam in 2006. To a great extent, the high shares of Asian countries during 1995-2004 were due to the large product volume from China, which overtook Mexico in 2002 as by far the top source of U.S. textile and apparel imports and has long possessed the capability to produce virtually any textile or apparel product (U.S. International Trade Commission, 2004). The hypotheses that the U.S./ROW import ratios for yarn, fabric, apparel, and made-up product types are positively related to the total quota or VER level of each of these product types are partially supported by the combination of the generally high and binding fill rates for Asian countries over 1995-2004 and the overwhelming dominance of these countries in supplying U.S. imports of textile and apparel products controlled by quotas or VERs.

Additional support for the expected positive relationships between the total quota or VER levels of U.S. imports and the U.S./ROW import ratio for the yarn, apparel, and made-up product types is seen in Table 15. This table shows the correlation between the total value and SME quantity of U.S. imports of each of the four product types and that between the total value of the imports and the total SME quota or VER level of each of these product types, in all cases over 1995-2008. As indicated in the table, the correlation between the total value and quantity of U.S. imports is positive, significant at a conventionally accepted level ($p<.05$), and close to 1 for each of the four product types. Relative to those correlations, the correlation is not as strong between the total value of U.S. imports and the total SME quota or VER level of any of the product types, but the correlations are positive and significant for fabric, apparel, and made-up products. Of these, that for apparel is the highest at 0.6940, followed by fabric at 0.5174 and made-up at 0.5172. Although the correlation is negative for yarn, it is not significant.

Table 15

Pearson Product Moment Correlations between the Total Value and SME Quantity of U.S. Imports and between the Total Value of U.S. Imports and the Total SME Quota or VER Levels of Yarn, Fabric, Apparel, an Made-up Products over 1995-2008

	Total import value			
	Yarn	Fabric	Apparel	Made-up
Total SME import quantity	.9646***	.9547***	.9785***	.9840***
Total SME quota/VER level	-.0590	.5174***	.6940***	.5172***

***$p<.001$

Yet other pertinent data are the percentage changes in the total values of U.S. and ROW imports of each of the four product types from 1995 to 2008 (see Table A2). As shown in Table A2, growth occurred in the total value of both the U.S. and ROW imports of each product type from 1995 to 2008. Even though the total U.S. import value and the total SME quota or VER level of yarn are not significantly correlated (see Table 15), the percentage growth in the total value of U.S. imports exceeded that of ROW imports of yarn as well as apparel and made-up products. Despite the larger percentage increase in the total value of ROW than U.S. imports of fabric from 1995 to 2008, the total value of U.S. fabric imports rose by a greater percentage (25.54%) than did that of ROW fabric imports (15.89%) from 1995 to 2005 (not shown in Table A2). The percentage changes in the table value of U.S. and ROW fabric imports from 1995 to 2005 were examined in addition to those from 1995 to 2008 because the period between 1995 and 2005 includes 11 out of 14 years which is overall period of the analysis of the third gravity model and the period from1995 to 2005 is the ATC period. The growth rate of U.S. fabric imports is larger than that of ROW fabric imports for 11 years but the growth rate of U.S. fabric imports is less than the growth rate of ROW fabric imports for three years. Taken together, the correlations in Table 15, the import growth percentages in Table A2 for yarn, apparel, and made-up products, and the relative U.S. and ROW fabric import growth percentages from 1995 to 2005 add support for positive relationships between the U.S./ROW import ratios and the total SME quota or VER levels of U.S. imports of the yarn, fabric, apparel, and made-up product types. This is because a positive relationship between the value of U.S. imports and the quota or VER levels of the imports would have led to an increase in the total U.S. import value and thus in the U.S./ROW import ratio, given the greater increase in U.S. than ROW import values of yarn, apparel, and made-up products from 1995 to 2008 and of fabric from 1995 to 2005. On the basis of the discussion above, the following hypotheses were proposed.

H13-a: The total SME quota or VER level of U.S. yarn imports was positively related to the ratio of the total value of U.S. yarn imports to the total value of ROW yarn imports.

H13-b: The total SME quota or VER level of U.S. fabric imports was positively related to the ratio of the total value of U.S. fabric imports to the total value of ROW fabric imports.

H13-c: The total SME quota or VER level of U.S. apparel imports was positively related to the ratio of the total value of U.S. apparel imports to the total value of ROW apparel imports.

H13-d: The total SME quota or VER level of U.S. made-up imports was positively related to the ratio of the total value of U.S. made-up imports to the total value of ROW made-up imports.

Hypotheses 13-a through 13-d indicate the expectation of trade creation for the United States and trade diversion for ROW in the yarn, fabric, apparel, and made-up product types.

For some independent variables in the third gravity equation that are also in the first equation, the hypotheses are similar to those proposed for these variables in the first equation. For the first gravity equation, U.S. GDP per capita is hypothesized to have positively affected the total value of U.S. textile and apparel imports. Because the total value of U.S. imports of *k* product type is the numerator in the dependent variable on the U.S./ROW import ratio in the third gravity equation. U.S. GDP per capita is also expected to have positively affected the U.S./ROW import ratios, with the implications discussed previously. As this relationship is expected for imports of each of the four product types, the following hypotheses were proposed.

H9-a: U.S. GDP per capita positively affected the ratio of the total value of U.S. yarn imports to the total value of ROW yarn imports.

H9-b: U.S. GDP per capita positively affected the ratio of the total value of U.S. fabric imports to the total value of ROW fabric imports.

H9-c: U.S. GDP per capita positively affected the ratio of the total value of U.S. apparel imports to the total value of ROW apparel imports.

H9-d: U.S. GDP per capita positively affected the ratio of the total value of U.S. made-up imports to the total value of ROW made-up imports.

The hypotheses for the distance and exchange rate variables in the first gravity equation are that the distances between the United States and the exporting countries are expected to have negatively affected the total value of U.S. textile and apparel imports, but the exchange rates between the U.S. dollar and the currencies of the exporting countries are expected to have positively affected the total value of the imports. Applying reasoning similar to that above for U.S. GDP per capita, the distance variable in the third equation is expected to have negatively affected the U.S./ROW import ratio, but the exchange rate variable is expected to have positively affected this ratio for each product type for each of these variables, leading to the following hypotheses.

H10-a: The distances between the United States and the exporting countries negatively affected the ratio of the total value of U.S. yarn imports to the total value of ROW yarn imports.

H10-b: The distances between the United States and the exporting countries negatively affected the ratio of the total value of U.S. fabric imports to the total value of ROW fabric imports.

H10-c: The distances between the United States and the exporting countries negatively affected the ratio of the total value of U.S. apparel imports to the total value of ROW apparel imports.

H10-d: The distances between the United States and the exporting countries negatively affected the ratio of the total value of U.S. made-up imports to the total value of ROW made-up imports.

H11-a: The exchange rates between the U.S. dollar and the currencies of the exporting countries positively affected the ratio of the total value of U.S. yarn imports to the total value of ROW yarn imports.

H11-b: The exchange rates between the U.S. dollar and the currencies of the exporting countries positively affected the ratio of the total value of U.S. fabric imports to the total value of ROW fabric imports.

H11-c: The exchange rates between the U.S. dollar and the currencies of the exporting countries positively affected the ratio of the total value of U.S. apparel imports to the total value of ROW apparel imports.

H11-d: The exchange rates between the U.S. dollar and the currencies of the exporting countries positively affected the ratio of the total value of U.S. made-up imports to the total value of ROW made-up imports.

The sign of the coefficient on the English variable in the third gravity equation is expected to be positive, as also expected for this variable in the first equation. The positive sign is expected for each of the four product types. A positive sign on the English variable in the third equation would indicate more U.S. than ROW imports of *k* product type from exporting countries with English as an official language or more ROW than

U.S. imports of *k* product type from exporting countries without English as an official language. The reasons for expecting the positive sign of the coefficient on the English variable in the third equation are the following. English is the dominant language in U.S. companies, and the 50 exporting countries in the analysis under the third equation are not only the countries that were subject to quotas or VERs on their textile and apparel exports to the United States at some point over 1995-2008, but of course are also countries that host companies that made deals with U.S. companies over that period to have their textile and apparel products imported into the United States. Textile and apparel manufacturers in those 50 countries may thus have favored the U.S. market over other import markets, perhaps making the English variable not only a measure of the relative ease of business transactions, but also a proxy for unobserved characteristics of the U.S. market that led foreign companies to favor or disfavor this import market. In light of the foregoing discussion, the hypotheses for the English variable are the following.

H12-a: The ratio of the total value of U.S. yarn imports to the total value of ROW yarn imports was greater for yarn imports from exporting countries with English as an official language than from those without it.

H12-b: The ratio of the total value of U.S. fabric imports to the total value of ROW fabric imports was greater for fabric imports from exporting countries with English as an official language than from those without it.

H12-c: The ratio of the total value of U.S. apparel imports to the total value of ROW apparel imports was greater for apparel imports from exporting countries with English as an official language than from those without it.

H12-d: The ratio of the total value of U.S. made-up imports to the total value of ROW made-up imports was greater for made-up imports from exporting countries with English as an official language than from those without it.

Directional hypotheses were not proposed for the three remaining independent variables in the third gravity equation that are also included in the first equation, although each of these variables is expected to be significantly related to the U.S./ROW import ratios. The three variables are the total and per capita GDPs of each exporting country and whether or not each exporting country is landlocked. No clear relationship between the U.S./ROW import ratio and any of these variables was apparent. These variables may have various effects on U.S and ROW imports from the exporting countries in the analysis. For example, the per capita GDPs of the exporting countries may have negatively affected both U.S. and ROW imports of textiles and apparel because relatively low wage rates in exporting countries may be attractive to importing companies in many high-wage countries. If however the wage rates in some importing countries are comparable to those in the exporting countries, the per capita GDPs of the exporting countries may have had no effect on the textile and apparel imports of the importing countries.

The total GDPs of exporting countries may have positively affected both U.S. and ROW imports because the larger the production capacity in exporting countries, the more production output may have been available to provide products that could be imported by many other countries. But the production capacities of the exporting countries and of some importing countries may have so similar that the production capacities of the exporting countries had no bearing on the textile and apparel imports of some countries.

The landlocked variable is also problematical. The United States shares land borders with only two countries, and it has multiple seaports. Some other countries have similar features and may therefore import more from non-landlocked countries than from landlocked ones. However, many countries in the world share land borders with three or more countries, and some have seaports, but some do not. Importing companies in such countries may find it quicker and more cost effective to import from landlocked countries than from non-landlocked ones or equally advantageous to acquire products from landlocked and non-landlocked countries. The possible variation among the importing countries in the indicated respects obviated the formulation of directional hypotheses for the three independent variables in question

CHAPTER 4

RESULTS

This chapter includes the presentation and discussion of the estimation results for the three gravity equations in the research. The results for the three equations are presented and discussed in separate sections of the chapter. A summary of the results is provided at the end of the chapter.

Estimation Results for the First Gravity Equation to Address the Research Objective 5.

The first gravity equation was estimated for two purposes: (a) to assess the effects of seven basic independent variables commonly included in gravity models on the total value of U.S. textile and apparel imports over 1995-2010 from all the exporting countries for which complete data were available; out of the 225 in total that supplied the imports, and (b) to determine the appropriate specification of the dependent variable in the other two gravity equations in the study, that is whether this variable should be specified as the natural logarithm of the total annual value of the imports (M_{it}) in Model B or as that of the total import value plus 0.001 (i.e., with application of the scaled dependent variable scenario) in Model A. Table 16 contains the results from estimating the first gravity equation with and without application of the scaled dependent variable scenario in Models A and B respectively.

The R^2 of Model A is only 0.22. The R^2 values indicate that the independent variables in Model A explain 22% of the variance in the total annual value of U.S. textile and apparel imports. The Wald chi^2 test is a test of multiple hypotheses for the parameters of an unrestricted model. The Wald chi^2 is essentially an *F* statistic, which is generally used to test a set of exclusion restrictions (Wooldridge, 2009) and is a measure of the significance of an estimated regression model. The Wald chi^2 for a model has an asymptotic chi-square distribution, with the degrees of freedom equal to the number of restrictions in the model. The null hypothesis for the Wald test is that the independent

Table 16

Results for the Two Variants of the First Gravity Equation: Effects of the Independent Variables on the Total Annual Value of U.S. Textile and Apparel Imports over 1995-2010

Independent variables	Model A ln (0.001+ M_{it})	Model B ln (M_{it})
Ln U.S. GDP per capita (LnUSGDP$_t$)	-1.20	.18***
	(1.12)	(.53)
Ln Exporting country GDPs per capita (Ln GDP$_{jt}$)	-1.58***	-1.18
	(.27)	(.15)
Ln Distance (Lndist$_j$)	-2.28*	-.92†
	(.89)	(.49)
Ln Exchange rates (Lnexchange$_{jt}$)	.17*	-.12**
	(.08)	(.04)
Landlocked or not (landlocked$_j$)	-.10	-1.50
	(1.17)	(.64)
English or not (English$_j$)	1.19	-.69
	(1.00)	(.59)
Ln Exporting country total GDPs (LnTGDP$_j$)	1.86***	.76***
	(.22)	(.12)
_cons	14.44	14.09*
	(12.85)	(6.39)
N	*N*=2735	*N*=2408
	(187 countries)	(177 countries)
R^2	.22	.14
Wald chi^2 (7)	86.60	80.10
p value	0.00	0.00

Note. Standard errors are in parentheses under the estimated parameters; the degrees of freedom for the Wald chi^2 test are in parentheses beside "Wald chi^2''; and _ cons refers to the intercept in each model. †*p*<.10. **p*<.05. ***p*< .01. ****p*< .001.

variables do not explain the dependent variable. Wooldridge (2009) noted that the analyst should examine an *F* statistic, such as the Wald chi^2, for an estimated model and not only rely on the R^2 for the model. Even though R^2 is not high, the Wald chi^2 value for Model A is 86.60 with a *p* value of 0.00, indicating that the null hypothesis can be rejected, thus that the independent variables in the model explain the total value of U.S. textile and apparel imports.

In Model A, the statistically significant variables are distance, exchange rates, and the total and per capita GDPs of the exporting countries, with each significant at conventionally accepted levels (p<.05 or p<.001 in these cases). The sign of the coefficient on each of these variables is as hypothesized, as also true for all the non-significant variables except U.S. GDP per capita. The results for the per capita GDPs of the exporting countries indicate that the higher (lower) the per capita GDPs, the less (more) was the total value of U.S. textile and imports. This relationship agrees with those found by Chan and Au (2007), but not those found by Amponsah and Ofori-Boadu (2006), Chi (2010), Eichengreen et al. (2007), Grossrieder (2007) and Liping (2010). Datta and Kouliavtsev (2009) found a positive coefficient on the per capita GDPs of low income exporting countries and a negative sign on that of high income exporting countries. Specifically in the present study, the results indicate that the total value of U.S. textile and apparel imports increased (decreased) 1.58% per 1% decrease (increase) in the per capita GDPs of the exporting countries. According to the intuition in the rationale for the hypothesis for this variable, the negative effect of the per capita GDPs of the exporting countries suggests that the total value of U.S. textile and apparel imports was higher (lower), the less (more) were the wage rates in the exporting countries, given the relatively high labor intensity of the production of these products.

The distance variable in Model A also negatively affected U.S. imports, with the results indicating that the total value of U.S. textile and apparel imports increased (decreased) 2.28% per 1% decrease (increase) in the distances between the United States and the exporting countries. This variable had the largest effect on U.S. textile and apparel imports of any of the significant independent variables in Model A, suggesting relatively large effects of international shipping time and costs on the total import value. The apparent importance of both relatively low wage rates and shipping time and costs suggested by the results for Model A may largely reflect the finding of Staritz (2011) that low cost and lead time have long been major factors in U.S. retailers' selection of global apparel sources, given that apparel accounted for never less than 76.68% and up to 80.38% of the total annual value of U.S. textile and apparel imports over at least 1995-2008 (see Table A2). Although most research (e.g., Amponsah & Ofori-Boadu, 2006; Chi & Kilduff, 2010; Eichengreen et al., 2007; Grossrieder, 2007; Liping, 2010) has also shown negative effects of distance on U.S. textile and apparel imports, Chan and Au (2007) found no significant influence of distance on these imports, in line with their statement that countries have become increasingly accessible to each other due to technological advancements in shipping and logistics that have reduced international shipping time and costs.

The significant variable in Model A with the next largest effect on U.S. textile and apparel imports is the total GDPs of the exporting countries, which positively affected the imports. Positive effects of this variable on U.S. textile and apparel imports have been found in some other research (e.g., Amponsah & Ofori-Boadu, 2006; Chan & Au, 2007; Chi & Kilduff, 2010; Eichengreen et al., 2007). The results in Table 16 indicate that the total value of U.S. textile and apparel imports increased (decreased) 1.86% per 1% increase (decrease) in the total GDPs of the exporting countries. As noted in the rationale for the hypothesis for this variable, such a relationship may suggest that the total value of U.S. textile and apparel imports increased (decreased) as the production capacities of the exporting countries also increased (decreased).

The significant variable with the least effect on U.S. imports in Model A is exchange rates. The positive effect of this variable indicates that appreciation (depreciation) of the U.S. dollar against the currencies of the exporting countries increased (decreased) the U.S. imports. In most previous gravity-model research on textile and apparel trade flows, the exchange rate variable has been specified as the currencies of the importing countries relative to those of exporting countries and negative signs on this variable have been found, whereas in the present research, the exchange rate variable is specified as the values of the currencies of the exporting countries per U.S. dollar and shows a positive sign on this variable. Therefore, positive sign on exchange rates aligns with the findings in many studies such as Amponsah and Ofori-Boadu (2006), Chan and Au (2007), Datta and Kouliavtsev (2008), and Grossrieder (2007). Specifically, Table 16 shows that the total value of U.S. textile and apparel imports increased (decreased) .17% per 1% decrease (increase) in the values of the currencies of the exporting countries per unit U.S. dollar.

The R^2 for Model B is 0.14 indicating the independent variables in Model B explain only 14% of variance in the total annual value of U.S. textile and apparel imports.

Despite the low R^2, the Wald chi^2 value for Model B is 80.10 with a *p* value of 0.00 suggesting that the model is significant, thus that the independent variables in the model explain the total value of U.S. textile and apparel imports.

All but two of the variables, including the significant and non-significant variables, in Model B have the expected signs; however, only one of the two lacking the expected signs is significant, that being exchange rates. Three variables in the model are significant at conventionally accepted levels ($p<.05$ to $p<.001$ in these cases). They are U.S. GDP per capita, exchange rates, and the total GDPs of the exporting countries. The latter two are also significant in Model A, but the first is not. In addition, the distance variable in Model B is significant at only $p<.10$ and, despite the associated coefficient having a negative sign as in Model A. Some other differences between the two models involve the exchange rate variable. This variable is significant at $p<.05$ in Model A and $p<.01$ in Model B, but the sign of the associated coefficient is reversed in Model B from that in Model A.

The variable in Model B with the largest effect on U.S. imports is the total GDPs of the exporting countries; however, it has a positive sign as in Model A and as hypothesized. The results in Table 16 indicate that a 1% increase (decrease) in the total GDPs of the exporting countries led to a .76% growth (decline) in the total value of U.S. textile and apparel imports. In a further difference from Model A, U.S. GDP per capita is significant in Model B although not in Model A. The results for Model B indicate that this variable had a positive effect on U.S. imports as hypothesized and in agreement with the findings of Chan and Au (2007), Eichengreen et al. (2007), and Liping (2010). The results in Table 16 indicate a .18% increase (decrease) in the total value of the imports per 1% increase (decrease) in U.S. GDP per capita. On the basis of the intuition in the rationale for the hypothesis for this variable, the results suggest that the more (less) the financial capability of U.S. residents to purchase textile and apparel imports, the higher (lower) was the total value of the U.S. imports. Lastly, exchange rates are significant in Model B.as in A, but contrary to economic intuition and the expectation in this research, the results for Model B indicate that this variable negatively affected U.S. textile and apparel imports, albeit with a relatively low degree of influence: 0.12 % increase (decrease) in the total value of the imports per 1% decrease (increase) in the values of the currencies of the exporting countries per unit U.S. dollar.

A factor that may partially account for the different results for Models A and B is biased parameter estimates in Model B due to sample selection bias, specifically a biased sample of U.S. imports for the dependent variable in Model B. The scaled dependent variable scenario was applied to the dependent variable in Model A, but not B so that the zero-value U.S. import observations were included in the sample for the dependent variable in Model A and 0.001 was added to each import observation before taking its natural logarithm, but were omitted from the sample for Model B. This led to the use of 2,735 observations and data on U.S. imports from 187 exporting countries in estimating Model A, but 2,408 observations and data on U.S. imports from 177 exporting countries in estimating Model B (see Table 16).

In light of the comparative results for the two models for the first gravity equation, Model A with application of the scaled dependent variable scenario to the observations for the dependent variable is preferable to Model B without application of this scenario due to the seemingly greater potential for sample selection bias involving the import data for the dependent variable when this scenario is not applied than when it is applied. It was therefore concluded that the scaled dependent variable scenario should be applied to the import data for the dependent variables in the second and third gravity equations so that the zero-value import data could be included in the samples for the dependent variables with 0.001 added to each import observation before taking the natural logarithm of the observation.

Estimation Results for the Second Gravity Equation to Address the Research Objective 6.

The second gravity equation in this research was estimated to assess the overall effect on the total annual SME quantity of U.S. textile and apparel imports over 1995-2010 of the presence or absence of quotas and VERs on these imports while controlling for basic independent variables commonly included in gravity models. To help accomplish this purpose, the second gravity equation in the study includes an independent variable for the presence or absence of quotas or VERs, as well as the same set of independent variables as in the first equation in the study. The variable on quotas and VERs is a dummy variable equal to 1 if quotas or VERs were imposed on any U.S. textile and apparel imports from each exporting country *j* and 0 if not each year over 1995-2010.

As described in Chapter 3, the dependent variable in the second gravity equation was specified as the total annual quantity of U.S. imports from each exporting country with two variants: (a) the quantity of the imports from country *j* that were limited by quotas or VERs and (b) the quantity of the imports from country *j* that were not limited by quotas or VERs. Thus, the dependent variable in the second gravity equation was specified to include two observations of U.S. imports from each of the 187 exporting countries for which complete data were available for each year over 1995-2010. However, two factors obviated the inclusion of data for every year over 1995-2010 for these two observations of U.S. textile and apparel imports from every one of the 187 countries in the analysis. One factor is that the United States imported either zero or small amounts of textiles and apparel from some exporting countries in some or all years over 1995-2010, and, likely for this reason, it imposed no quotas or VERs on the imports from those countries. In the case of Afghanistan, for example, no quotas or VERs were imposed on its textile and apparel exports to the United States in any year over 1995-2010. Given the decision to apply the scaled dependent variable scenario to the U.S. import data for estimating the second gravity equation, the addition of 0.001 to the zero quantity of U.S. textile and apparel imports from, say, Afghanistan for any observation of U.S. imports from it that were controlled by quotas or VERs would indicate incorrectly that quotas or VERs severely restricted the import quantity from Afghanistan to only 0.001 SME. For this reason, the sample for the second gravity equation includes, for each year over 1995-2010, only one observation of U.S. textile and apparel imports from any exporting country that supplied such imports without quotas or VERs on them over that period. The data on the quantity of restricted U.S. imports from each of these exporting countries were therefore treated as missing.

The second factor that obviated the inclusion of data, for every year over 1995-2010, for two observations of the U.S. textile and apparel import quantity from every country that supplied such imports is that the imports from some countries were limited by quotas or VERs in some, but not all years over that period. The imports from countries such as Hong Kong, Malaysia, and Taiwan, were limited by quantitative restrictions over 1995-2004, but not over 2005-2010, the part of the analysis period after the ATC expired. In the case of U.S. textile and apparel imports from China, they were limited by quotas or VERs over 1995-2005 and then 21 categories of the imports were limited by safeguard quotas over 2006-2008, but the imports were entirely free of quantitative restraints in 2009 and 2010. In addition, quotas or VERs limited U.S. textile and apparel imports from Belarus, Ukraine, and Vietnam in some years over 1995-2005, but not those from Belarus and Ukraine after 2005 and those from Vietnam after 2006.

For the reasons just explained, the data on the quantity of U.S. imports from countries subject to quotas or VERs on their textile and apparel exports to the United States in some, but not all years over 1995-2010 were treated as follows: The sample for the second gravity equation includes data on the total quantity of both U.S. imports from each relevant exporting country that were limited by quotas or VERs and U.S. imports from the country that were not limited by quotas or VERs for each year when such restraints were in place on any U.S. textile and apparel imports from the country; however, the sample includes data on only the total quantity of U.S. imports from the exporting country for each year when none of its textile and apparel exports to the United States were limited by quotas or VERs. The data on the total quantity of restricted U.S. imports from any relevant exporting country for each year over 1995-2010 when no quotas or VERs were imposed on U.S. textile and apparel imports from the country were treated as missing. All this resulted in two observations of the total U.S. import quantity from each relevant exporting country for each year over for some years over 1995-2004, of that from only Belarus, China, Ukraine, and Vietnam for 2005, of that from only China and Vietnam for 2006, and of that from China alone for 2007 and 2008, but only one observation of the total U.S. import quantity from each relevant country except Belarus, China, Ukraine, and Vietnam for each year over 2005-2010, only one observation of the total import quantity from Belarus and Ukraine for each year over 2006-2010, of that from Vietnam for each year over 2007-2010, and of that from China for 2009 and 2010.

Due to dropping some observations from the import data for the reasons explained, the total number of observations in the sample for the second gravity equation declined from 5,470 to 3,006. The resulting number of observations is still greater than the total number of observations in the sample for either Model A or B for the first gravity equation because the sample for the second equation includes two observations of U.S. imports from some countries for some years over 1995-2010, but only one observation of U.S. imports from some countries for either all or some years over that period. However, it would be biased estimation without the observations, because the coefficient of the dummy variable of presence or absence of quota or VER would be overestimated without the observations.

Given the two observations of the total annual U.S. import quantity from each of several exporting countries for each year over much of the 1995-2010 period, a new variable, specified as id, was added to each such pair of observations in the panel data for estimating the second gravity equation and therefore the STATA group command was applied to each of these pairs of observations. The purpose of adding the id variable and applying the STATA group command was to identify each pair of observations of U.S. imports from each relevant country *j* for each relevant year, with each pair including the total quantity of both U.S. imports that year from country *j* that were limited by quotas or

VERs and those that year from country *j* that were not limited by quotas or VERs. The id variable indicates in the STATA program that the two observations within same year are different observations.

The results from estimating the second gravity equation, denoted as Model C, are in Table 17. Only three variables in this model are statistically significant at conventionally accepted levels ($p<.01$ or $p<.001$ in these cases). They are the annual total and per capita GDPs of the exporting countries, which are also significant in Model A, and the restrict variable, the dummy variable for the presence or absence of quotas or VERs on any U.S. textile and apparel imports from each exporting country in each year. Despite only three significant variables in Model C, the R^2 of .27 for Model C is slightly higher than that of .22 for Model A. In addition, the Wald chi^2 value for this model is 120.79 with a *p* value of 0.00, indicating that the independent variables in the model explain the total SME quantity of U.S. textile and apparel imports. The coefficient on each independent variable in Model C that is also included in the first gravity equation has the same sign as in Model A, thus has the expected sign, with the exception of that on U.S. GDP per capita. Although the Model C coefficients on the total and per capita GDPs of the exporting countries have the expected signs, that on the restrict variable does not.

The restrict variable is the independent variable of primary interest in Model C, and the coefficient on this variable has a larger magnitude than that on either of the other two significant variables in the model. The positive sign on the restrict variable is not the expected sign. After extensive literature search, studies that used the exactly same methods were not found but there are some studies which have included similar dummy variables. Liping (2010) predicted a negative sign on a trade protection dummy variable,

Table 17

Results for the Second Gravity Equation: Effects of the Presence or Absence of Quotas or VERs on U.S. Textile and Apparel Imports and of Other Independent Variables on the Total Annual Quantity of U.S. Textile and Apparel Imports

Independent variables	Model C
Ln U.S. GDP per capita ($LnUSGDP_t$)	-.88 (.47)
Ln Exporting country GDPs per capita ($LnGDP_{jt}$)	-.84*** (.21)
Ln Distance ($Lndist_j$)	-.99 (.58)
Ln Exchange rates ($Lnexchange_{jt}$)	.13† (.07)
Landlocked or not ($landlocked_j$)	-.53 (.84)
English or not ($English_j$)	.76 (.72)
Ln Exporting country total GDPs ($LnTGDP_j$)	1.44*** (.16)
Quantitative restriction (restrict)	2.69** (.80)
_cons	14.44 (6.42)
N	*N*=3006 (187 countries)
R^2	.27
Wald chi^2 (8)	120.79
p value	0.00

Note. Standard errors are in parentheses under the estimated parameters; the degrees of freedom for the Wald chi^2 test are in parentheses beside "Wald chi^2"; and _cons refers to the intercept. †p<.10. *p<.05. **p< .01. ***p< .001.

but found a positive sign on the associated coefficient, as in the present study. Grossrieder (2007) found both positive and negative signs on quota-binding dummy variables, depending on the traded product groups. The results for these restrict variable in Table 17 indicate that the total SME quantity of U.S. textile and apparel imports was 14.7 times greater in the presence than in the absence of quotas or VERs. The coefficient would be inflated and upwardly biased due to dropping zero-input value as discussed before. According to the result, if the total quantity of U.S. textile and apparel imports were actually greater in the presence than in the absence of these restrictions, this may have occurred because the United States tended to impose quotas and VERs on textile and apparel products that it imported in large amounts, especially those with relatively high market shares in the domestic U.S. market (Cline, 1990; Dean, 1995).

The larger magnitude of the coefficient on the restrict variable than of that on either of the other two significant variables, in Model C suggests the great importance of quotas and VERs in determining the quantity of U.S. textile and apparel imports while the ATC was in force. Given both the previously noted large share of apparel in annual U.S. textile and apparel imports and the fact that the total annual quota or VER levels of apparel typically comprised more than 35% of the sum total of the quota or VER levels of U.S. textile and apparel imports over 1995-2008 and more than 70% in four years during that period (see Table A2), the relatively large effect of the quantitative restrictions on the imports may partially reflect the finding of Staritz (2011) that such restraints in effect under the ATC strongly influenced not only the particular countries from which U.S. retailers sourced apparel, but also the amount of apparel they sourced from any one country during the ATC era.

The total and per capita GDPs of the exporting countries are significant in both Models A and C. The significance of these two variables in not only Model A, but also Model C in the midst of the seemingly great importance of the restrict variable suggests that the total and per capita GDPs of the exporting countries were themselves important in determining the annual U.S. textile; and apparel import quantity over 1995-2010 or that these variables are related to or indicative of others, such as wage rates and production capacities in exporting countries, that were important in determining the import amounts.

Estimation Results for the Third Gravity Equation to Address the Research Objective 7.

The main purpose for estimating the third gravity equation was to assess trade creation and trade diversion effects of the quota and VER levels of U.S. textile and apparel imports over 1995-2008 while controlling for the same independent variables as in the first gravity equation in the study. Unlike either of the first two gravity equations in the study, the third is focused on imports of yarn, fabric, apparel, and made-up products, not textile and apparel imports in aggregate. And unlike in the second gravity equation, the quotas and VERs in the third equation are specified as the total annual SME levels of these restraints on U.S. imports of each of the four product types, not merely the presence or absence of these restraints on U.S. textile and apparel imports. With application of the scaled dependent variable scenario, the dependent variable in the third gravity equation is specified as the annual ratio of the total value plus 0.001 of U.S. imports of *k* product type (yarn, fabric, apparel, or made up) to the total value plus 0.001 of ROW imports of the same product type, both from each of the exporting countries, out of the total of 50 in the overall analysis, that was subject to quotas or VERs on its exports of the *k* product type to the United States at some point over 1995-2008. The 50 exporting countries in the overall analysis for the third gravity equation are the grand total of the exporting countries with quotas or VERs on their textile and apparel exports to the United States at some point over that period, although not all these countries had such restraints on their exports of all four product types. The described specifications of the dependent variable and the independent variable on quotas and VERs in the third gravity equation enabled examination of trade creation and trade diversion effects of the quota and VER levels.

Eight variants of the third gravity equation were estimated. These include two sets of four variants, with each set including one variant specific to one of the four product types. One variant for each product type was estimated by random effects regression using the observed data on the total annual quota or VER levels for the ${}^{k}\text{Lnqrestrict}_{jt}$ variable. Due to potential endogeneity of these levels, the other variant for each product type was estimated by IV regression to estimate ${}^{k}\text{Lnq}\widehat{\text{restr}}\text{ict}_{jt}$, the instrumental variable for ${}^{k}\text{Lnqrestrict}_{jt.}$ Table 18 contains the results from estimating the two variants of the third gravity equation for each product type. The ${}^{k}\text{Lnqrestrict}_{jt}$ and ${}^{k}\text{Lnq}\widehat{\text{restr}}\text{ict}_{jt}$ variables for each product type are the independent variables of primary interest in the variants. The results for each variant are discussed below; results of the tests for endogeneity of the ^{k}Lnqrestrict variable for the four product types are also discussed. It should be noted that no known comparable research prior to the present study has been conducted; that is no previous research has addressed the effects of the quota or VER

Table 18

Results for the Third Gravity Equation: Effects of Quota or VER Levels and Other Independent Variables on the Ratio of the Total Value of U.S. Imports to the Total Value of ROW Imports of Each of Four Product Types (Yarn, Fabric, Apparel, or Made-ups), over1995-2008

Independent variables	Yarn		Fabric		Apparel		Made-ups	
	Model D Random Effects	Model E IV	Model F Random Effects	Model G IV	Model H Random effects	Model I IV	Model J Random effects	Model K IV
Ln U.S. GDP per capita	-3.27†	.50	-.94	-3.32	-.85	-.76	-6.61**	-6.93†
($LnUSGDP_t$)	(1.72)	(3.86)	(.65)	(2.69)	(.53)	(1.54)	(2.19)	(3.59)
Ln Exporting country	.13	-.19	-.36	.77**	.41	.47**	-1.24	.61†
GDP per capita ($LnGDP_{jt}$)	(.85)	(.42)	(.56)	(.27)	(.30)	(.15)	(.84)	(.33)
Ln Distance	-3.12	-1.45	-.91	-.06	-.32	-.58†	-5.80**	-2.11**
($Lndist_j$)	(2.02)	(.90)	(1.48)	(.58)	(.74)	(.31)	(2.01)	(.90)
Ln Exchange rates	1.42***	.25	-.05	.24†	-.01	.08	.75	.19
($Lnexchange_{jt}$)	(.34)	(.20)	(.15)	(.13)	(.12)	(.09)	(.48)	(.22)
Landlocked or not	-3.25	-.08	-.94	-.76	.23	.22	-18.62**	-8.42**
($landlocked_j$)	(4.26)	(1.63)	(5.24)	(1.66)	(1.51)	(.77)	(6.4)	(2.73)
English or not	-1.71	-2.53*	-.50	-.87	-1.74	-2.07***	-5.49†	-2.30*
($English_j$)	(3.08)	(1.07)	(2.38)	(.72)	(1.19)	(.52)	(2.93)	(1.07)
Ln Exporting country	.57	1.35*	- .07	-.16	-.62*	-.80***	-5.03***	-3.48***
total GDPs ($LnTGDP_{jt}$)	(.87)	(.65)	(.57)	(.40)	(.27)	(.19)	(.89)	(.50)
Ln Quota or VER levels	.33	.43	.20†	.68**	1.01***	1.13***	1.81***	1.87***
(${}^{k}Lnqrestrict_{jt}$, ${}^{k}Lnq\widehat{restrict}_{jt}$)	(.21)	(.33)	(.11)	(.25)	(.03)	(.21)	(.23)	(.26)
_cons	34.18	-36.07	17.00	18.45	7.60	10.66	228.38***	143.12***
	(31.03)	(41.69)	(16.97)	(26.21)	(8.86)	(14.98)	(32.68)	(35.86)
N	209 (26 countries)		241 (28 countries)		459 (50 countries)		200 (23 countries)	

Continued

Table 18 (*continued*)

Independent variables	Yarn		Fabric		Apparel		Made-ups	
	Model D Random effects	Model E IV	Model F Random Effects	Model G IV	Model H Random effects	Model I IV	Model J Random Effects	Model K IV
R^2	.15	.25	.07	.28	.34	.29	.25	.35
Wald chi^2 (8)	24.88	53.76	13.32	55.91	1323.63	106.66	129.58	114.81
p value	.00	.00	.10	.00	.00	.00	.00	.00
First-stage regression								
F		*F* (10,191) =7.34		*F* (12,221) =4.02		*F* (12,439) =3.08		*F* (12,180) =8.60
Prob>*F*		.00		.00		.00		.00
R^2		.63		.50		.39		.65
Test of the validity of overidentifying restrictions								
Sargan chi^2		1.64 (10)		.83 (12)		5.08 (12)		37.04 (12)
p value		1.00		1.00		.96		.00
Basmann chi^2		1.51 (10)		.76 (12)		4.90 (12)		40.92 (12)
p value		1.00		1.00		.96		.00
Test of endogeneity								
Durbin chi^2 (1)		2.99		.03		4.05		10.71
p value		.08		.87		.04		.00
Wu-Hausman *F*		*F* (1,199) =2.89		*F* (1,231) =.02		*F* (1,449) =4.00		*F* (1,190) =10.75
p value		.09		.88		.05		.00
p value		1.00		1.00		.96		.00

Note. Standard errors are in parentheses under the estimated parameters; the degrees of freedom for the Wald and Durbin chi^2 tests are in parentheses beside "Wald chi^2" and "Durbin chi^2". The degrees of freedom for the *F* test are shown beside *F*, and for the Sargan chi^2, and Basmann chi^2 are shown beside the obtained value for each product type. †p<.10. *p<.05. **p< .01. ***p< .001.

levels of U.S. yarn, fabric, apparel, and made-up imports on either U.S. or ROW imports of these products.

Models D and E in Table 18 refer respectively to the random effects and IV regressions for the yarn product type. Each was estimated using 209 observations and data for 26 exporting countries for the dependent variable and each independent variable on a characteristic of the exporting countries. The 26 exporting countries include each country with quotas or VERs on its yarn exports to the United States at some point over 1995-2006 because no quantitative restrictions were imposed on U.S. yarn imports in 2007 and 2008, unlike U.S. imports of the other three product types; thus, the data on U.S. and ROW yarn imports for the dependent variable in each yarn model include the total annual values of U.S. and ROW yarn imports from each of those 26 exporting countries. The data for the independent variable on quotas and VERs include the quota or VER levels of U.S. yarn imports from each of those countries, the data for the distance variable include the distance between each of those countries and the United States, and so on for other independent variables.

The results for the two yarn models differ in some respects. One difference is that the R^2 of .25 for Model E is higher than that of .15 for Model D; thus the R^2 is higher for the IV than the random effects regression for yarn. However, the Wald chi^2 results indicate that the independent variables in both of these models explain the U.S./ROW yarn import ratio. The Wald chi^2 values for Models D and E respectively are 24.88 and 53.76, each with a *p* value of 0.00, indicating that the independent variables in each model explain the U.S./ROW yarn import ratio.

The coefficients on the ${}^{k}\text{Lnqrestrict}_{jt}$ and ${}^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ variables in Models D and E respectively are positive as expected, but neither is significant. The lack of significance may be due to various factors such as the lack of a statistically significant correlation between the yarn quota or VER levels and the total value of U.S. yarn imports (see Table 15), the relatively small sum total of the quota or VER levels of U.S. yarn imports (see Table A2), and possible error in measuring such levels of yarn imports in cases when yarn was among the product types in quota or VER groups containing multiple product types. Of the other variables in Model D for which directional signs were hypothesized, distance and exchange rates have the expected signs, but U.S. GDP per capita and the English variable do not. Only one variable, exchange rates, is significant in this model at a conventionally accepted level ($p<.001$ in this case). Exchange rates positively affected the U.S./ROW yarn import ratio, as expected. This positive effect indicates that appreciation (depreciation) of the U.S. dollar against the currencies of the exporting countries led to an increase (decrease) in the U.S./ROW import ratio, such that the total value of U.S. yarn imports rose (fell) and that of ROW yarn imports declined (rose) or rose (fell) less than that of U.S. yarn imports. Specifically, the results for exchange rates in Table 18 indicate a 1.42% increase (decrease) in the U.S./ROW yarn import ratio per 1% increase (decrease) in the values of the currencies of the exporting countries per unit U.S. dollar. U.S. GDP per capita is significant in Model D at only $p<.10$, and the sign of the associated coefficient is negative, thus opposite that expected.

Of the variables in Model E besides ${}^{k}\text{Lnqrestrict}_{jt}$ for which directional signs were hypothesized, all but the English variable have the expected signs. Only the English variable and the total GDPs of the exporting countries are significant in the model, both at $p<.05$. The English variable had the largest effect on the U.S./ROW import ratio, and the effect is negative. This negative effect indicates a lower total value of U.S. than ROW yarn imports from exporting countries with English as an official language. Specifically, the results in Table 18 indicate exporting countries with English as an official language have the U.S./ROW yarn imports 12.6 times less than exporting countries without it. Even though U.S. companies want to import more yarn from exporting countries with English as an official language than countries without it, ROW countries also want to import yarn more from exporting countries with English as an official language than without it. If these results reflect reality, they would support the notion that English is a common language in international yarn trade and much more so than just in U.S. firms' transactions with companies in other countries that supply yarn imports. The total GDPs of the exporting countries, however, had a positive effect on the U.S./ROW yarn import ratio, indicating that the more (less) the total GDPs of the exporting countries, the more (less) was the total value of U.S. yarn imports and the less (more) was that of ROW yarn imports. Specifically, the results in Table 18 indicate a 1.35% increase (decrease) in the U.S./ROW yarn import ratio per 1% increase (decrease) in the total GDPs of the exporting countries. On the basis of the intuition in the rational for the hypothesis on the total GDP of the exporting countries, the higher the total GDPs of such countries, the larger is their yarn production capacity. The positive effect of the total GDPs of the exporting countries on the U.S./ROW yarn import ratio may suggest that the exporting countries that supplied U.S. yarn imports had larger yarn production capacities than did those that supplied yarn to ROW countries.

Models F and G in Table 18 refer respectively to the random effects and IV regressions for the fabric product type. Each was estimated using 241 observations and data for 28 exporting countries for the dependent variable and each independent variable on a characteristic of the exporting countries. As for yarn Models D and E, the R^2 for the IV regression (Model G) is higher than that for the random effects regression (Model F) for fabric. The R^2 for Model G is .28, and that for Model F is .07. The Wald chi^2 results also differ for the two fabric models. The Wald chi^2 value for Model F is 13.32 with a *p* value of 0.10, providing evidence that the independent variables in the model do not explain the U.S./ROW fabric import ratio. On the other hand, the Wald chi^2 value for Model G is 55.91 with a *p* value of 0.00, indicating that the independent variables in this model do explain the U.S./ROW fabric import ratio.

The results for Models F and G differ in further respects. Even though they are similar in that both ${}^{k}\text{Lnqrestrict}_{jt}$ and ${}^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ have the positive signs, ${}^{k}\text{Lnqrestrict}_{jt}$ is significant in Model F at only $p<.10$ and ${}^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ is significant in Model G at a conventionally accepted level ($p<.01$). The positive effect of ${}^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$, in Model G indicates that the U.S./ROW fabric import ratio increased as the quota or VER levels of U.S. fabric imports rose, thus that the total value of U.S. fabric imports rose and that of ROW fabric imports either fell or rose less than that of U.S. fabric imports as the fabric quota or VER levels rose. Specifically, the results for Model G in Table 18 indicate a .68% increase in the U.S./ROW fabric import ratio per 1% increase in the fabric quota or VER levels. All this implies trade creation for the United States and trade diversion for ROW in fabric imports as a result of the increase in the fabric quota or VER levels, thus diversion of fabric exports of the fabric exporting countries away from ROW to the

United States. The trade creation for the United States may be due to pent-up demand for U.S. fabric imports that was increasingly satisfied as the quantitative restraints on the imports were relaxed.

Of the variables in Model F besides $^{k}\text{Lnqrestrict}_{jt}$ for which directional signs were hypothesized, distance has the expected sign, but U.S. GDP per capita, exchange rates, and the English variable do not. Furthermore, none of these variables is significant in this model. Of the variables in Model G besides $^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ for which directional signs were hypothesized, distance and exchange rates have the expected signs, but U.S. GDP per capita and the English variable do not. The per capita GDPs of the exporting countries are the only variable in this model besides $^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ that is significant at a conventionally accepted level (p<.01 in this case). The English variable is significant in the model at only p<.10. The positive sign on the per capita GDPs of the exporting countries indicates that the more (less) these per capita GDPs, the more (less) the U.S./ROW fabric import ratio, thus that the more (less) were the per capita GDPs, the more (less) was the total value of U.S. fabric imports and the less (more) was that of ROW fabric imports. Specifically, the results in Table 18 indicate a .77% increase (decrease) in the U.S./ROW fabric import ratio per 1% increase (decrease) in the per capita GDPs of the exporting countries.

No directional sign was hypothesized for the per capita GDPs of the exporting countries in the third gravity equation; however, in light of the intuition in the rationale for the hypotheses for this variable in the first and second gravity equations in the study and the significant negative effects of the variable in Models A and C, it may not seem to make sense that the per capita GDPs of the exporting countries would positively affect the U.S. import part of the U.S./ROW fabric import ratio. On the other hand, it may be that U.S. fabric imports came mainly from exporting countries with high per capita GDPs, given the relatively high intensity of fabric production in capital and engineering knowledge with the implication that the higher the levels of economic development in exporting countries and thus the higher the per capita GDPs of the countries, the more fabric the countries would produce for export, especially fabric that meets the quality standards of U.S. companies. Dyeing and finishing, two of the processes in the overall production of fabric, are the most intensive in capital and engineering knowledge of all the processes in textile and apparel manufacturing. Dyeing and finishing also require large amounts of pure water, which is often scarce in countries at low levels of economic development. These factors may help account for the positive effect of the per capita GDPs of the exporting countries on the U.S./ROW fabric import ratio.

Models H and I in Table 18 refer respectively to the random effects and IV regressions for the apparel product type. Reflecting the larger number of exporting countries with quantitative export restraints on apparel than on yarn or fabric, each apparel model was estimated using 459 observations and data for 50 exporting countries for the dependent variable and each independent variable on a characteristic of the exporting countries. Unlike the model pairs discussed previously, the R^2 of .34 for the apparel random effects regression is higher than that of .29 for the apparel IV regression. The two apparel models are similar, however, in the overall results of the Wald chi^2 tests for the models. The Wald chi^2 values for Model H and I respectively are 1323.63 and 106.66, each with a *p* value of 0.00, indicating that the independent variables in each model explain the U.S./ROW apparel import ratio.

The two apparel models are also similar from the standpoint that both ${}^{k}\mathrm{Lnqrestrict}_{jt}$ and ${}^{k}\mathrm{Lnq}\widehat{\mathrm{restrict}}_{jt}$ are significant at $p<.001$ and the coefficient on each has the expected positive sign. The positive signs on these variables indicate that the more the total annual SME quota or VER levels of U.S. apparel imports, the more was the U.S./ROW apparel import ratio, thus that the total value of U.S. apparel imports rose and that of ROW apparel imports either fell or rose less than that of U.S. apparel imports as the quota or VER levels of U.S. apparel imports rose. Specifically, the results in Table 18 for ${}^{k}\mathrm{Lnqrestrict}_{jt}$ in Model H indicate a 1.01% increase in the U.S./ROW apparel import ratio per 1% increase in the total annual SME quota or VER level of U.S. apparel imports. The results for ${}^{k}\mathrm{Lnq}\widehat{\mathrm{restrict}}_{jt}$ in Model I indicate a 1.13% increase in the U.S./ROW apparel import ratio per 1% increase in the total annual SME quota or VER level of U.S. apparel imports. All this implies trade creation for the United States and trade diversion for ROW in apparel imports as the quota or VER levels of U.S. apparel imports rose. As for U.S. fabric imports, trade creation for the United States in apparel imports may be due to pent-up demand for U.S. apparel imports that was increasingly met as the quantitative restraints on the imports were relaxed.

Of the other variables in Model H for which directional signs were hypothesized, distance has the expected sign, but U.S. GDP per capita, exchange rates, and the English variable do not. The only significant variable in this model besides ${}^{k}\mathrm{Lnqrestrict}_{jt}$ is the total GDPs of the exporting countries ($p<.05$). This variable negatively affected the U.S./ROW apparel import ratio, indicating that the more (less) those total GDPs, the less (more) was the total value of U.S. apparel imports and the more (less) was that of ROW apparel imports. Specifically, the results in Table 18 indicate a .62% increase (decrease) in the U.S./ROW apparel import ratio per 1% decrease (increase) in the total GDPs of the exporting countries.

If the negative effect of the total GDPs of the exporting countries on the U.S./ROW apparel import ratio reflects reality, it may be partially because more ROW than U.S. apparel imports came from exporting countries with large production capacities, given that ROW includes some of the world's most populous countries (e.g., China, India) which may therefore have more demand than the United States for apparel imports, not to mention that the population of ROW is larger than that of the United States. This is supposition, however, because the third gravity equation does not include a variable for the population of either the United States or ROW. Another factor that may have contributed to the negative effect of the total GDPs of the exporting countries on the U.S./ROW apparel import ratio is that, depending on how individual countries categorize their imports, some apparel imports of countries in ROW, especially those of low-income countries, may actually have been cut fabric pieces that were imported to be assembled into garments. This would be consistent, for example, with the transnational apparel production networks governed by firms in countries such as South Korea and Taiwan that were discussed in Chapter 2. In addition, apparel companies in the United States and other developed countries have sometimes exported cut fabric pieces for assembly into garments in nearby low-income countries and then imported the assembled garments with tariffs on only the value added in assembly, as allowed, for example, by Item 9802 in the Harmonized Tariff Schedule of the United States and the similar outward processing provision in the EU tariff schedule. In the case of U.S. companies, the cut fabric pieces have gone mainly to Mexico and other Latin American countries; in the case of EU companies, the cut fabric has gone largely to Eastern European countries. Companies in developed countries may have exported the cut fabric pieces to countries with relatively large apparel production capacities, thus with relatively large total GDPs.

Of the variables in Model I besides ${}^{k}\text{Ln}\widehat{\text{qrestrict}}_{jt}$ for which directional signs were hypothesized, distance and exchange rates have the expected signs, but U.S. GDP per capita and the English variable do not. Three variables in addition to ${}^{k}\text{Ln}\widehat{\text{qrestrict}}_{jt}$ are significant in this model at conventionally accepted levels. They are the total and per capita GDPs of the exporting countries and the English variable (p<.001, p<.01, and p<.001, respectively). Distance is significant at only p<.10. The English variable interestingly had a negative effect on the U.S./ROW apparel import ratio, as also found for the yarn import ratio in Model E. The results in Table 18 indicate that exporting countries with English as an official language have the U.S./ROW apparel import 7.9 times less than exporting countries without it. It therefore appears that English is commonly used in international apparel commerce, as in yarn commerce, and not just in U.S. firms' transactions with apparel suppliers in other countries. As in Model H, the total GDPs of the exporting countries negatively affected the U.S./ROW apparel import ratio. Specifically, the results in Table 18 indicate a .80% increase (decrease) in the U.S./ROW apparel import ratio per 1% decrease (increase) in the total GDPs of the exporting countries.

The variable in Model I with the least effect is the per capita GDPs of the exporting countries, although it is significant at p<.01. As for the fabric import ratio in Model G, this variable positively affected the U.S./ROW apparel import ratio; however, the associated coefficient has a smaller magnitude in Model I than G. The positive effect of the per capita GDPs of the exporting countries in Model I could indicate that the total value of U.S apparel imports rose and that of the ROW apparel imports fell or that the total value of both U.S. and ROW apparel imports fell, but that of the ROW imports more than that of the U.S. imports as the per capita GDPs of the exporting countries rose (declined). Specifically, the results in Table 18 indicate a .47% increase (decrease) in the U.S./ROW apparel import ratio per 1% increase (decrease) in the per capita GDPs of the exporting countries. Although no directional hypothesis was proposed for the per capita GDPs of the exporting countries in the third gravity equation, an increase in the total value of U.S. apparel imports as these per capita GDPs rose would be inconsistent with the intuition in the rationale for the hypotheses for the per capita GDPs of the exporting countries for the first and second gravity equations in the study and with the results for this variable in Models A and C. If the Model I results for this variable reflect reality, it seems that rising (falling) per capita GDPs of the exporting countries led to a decline in the total value of both U.S. and ROW apparel imports, but with a greater decline in that of the ROW than the U.S. apparel imports.

Models J and K in Table 18 refer respectively to the random effects and IV regressions for the made-up product type. Each was estimated using 200 observations and data for 23 exporting countries for the dependent variable and each independent variable on a characteristic of the exporting countries. As for the yarn and fabric model pairs, but not the apparel model pairs, the R^2 for the made-up IV regression (Model K) is higher than that for the made-up random effects regression (Model J). The R^2 for Model K is .35; that for Model J is .25. However, the Wald chi^2 results for these models indicate that the independent variables in each explain the U.S./ROW made-up import ratio.

Specifically, the Wald chi^2 values for Models J and K are respectively 129.58 and 114.81, each with a p value of 0.00, indicating that the independent variables in each model explain the U.S./ROW made-up import ratio.

The two made-up models are like those for apparel in that both $^{k}\text{Lnqrestrict}_{jt}$ and $^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ are significant at p<.001, and the coefficient on each has the expected positive sign. The positive signs on these variables indicate that the more the total annual SME quota or VER levels of U.S. made-up imports, the more was the U.S./ROW made-up import ratio, thus that the total value of U.S. made-up imports rose and that of ROW made-up imports either fell or rose less than that of U.S. made-up imports as the quota or VER levels of U.S. made-up imports rose. Specifically, the results in Table 18 for $^{k}\text{Lnqrestrict}_{jt}$ in Model J indicate a 1.81% increase in the U.S./ROW made-up import ratio per 1% increase in the total annual SME quota or VER level of U.S. made-up imports. Similarly, the results for $^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ in Model K indicate a 1.87% increase in the U.S./ROW made-up import ratio per 1% increase in the total annual SME quota or VER level of U.S. made-up imports. All this implies trade creation for the United States and trade diversion for ROW in made-up imports as the quota or VER levels of U.S. made-up imports rose. As for U.S. fabric and apparel imports, trade creation for the United States in made-up imports may be due to pent-up demand for U.S. made-up imports that was increasingly met as the quantitative restraints on the imports were relaxed.

Along with the similar results for the $^{k}\text{Lnqrestrict}_{jt}$ and $^{k}\text{Lnq}\widehat{\text{restrict}}_{jt}$ variables in Models J and K, these models are alike in that, of the other variables for which directional signs were hypothesized, distance and exchange rates have the expected signs, but U.S. GDP per capita and the English variable do not. The models are also alike in that distance, the landlocked variable, and the total GDPs of the exporting countries in addition to the variable on quota or VER levels are significant in each model at conventionally accepted levels (p<.01 in these cases) and distance, the landlocked variable, and the total GDPs of the exporting countries have negative signs in each model. However, U.S. GDP per capita is significant at p<.01 in Model J, but at only p<.10 in Model K. The English variable is significant in Model K at p<.05, but at only p<.10 in Model J. The signs on both of these variables are negative in each model, thus opposite those expected.

The landlocked variable has the largest effect in both Models J and K. It is interesting that this variable is significant in no models in the study except the two made-up models for the third gravity equation. The results for Model J in Table 18 indicate landlocked exporting countries have the U.S./ROW made-up exports lower than non-landlocked countries. Those for Model K indicate landlocked exporting countries have the U.S./ROW made-up exports than non-landlocked countries. Although no directional hypothesis was proposed for the landlocked variable for the third gravity equation, the negative effects of this variable in the two made-up models are consistent with the intuition in the rationales for the hypotheses for the variable in the first and second gravity equations in the study. The results indicating a much lower total value of U.S. than ROW made-up imports from landlocked countries may be related to the relatively high weight and bulk per unit of at least some made-up products such as carpet, rugs, and luggage. Typically, the more the weight and bulk of a product shipment, the higher is the shipping cost. The need to route a shipment from a landlocked country through a non-landlocked country to reach the destination country raises the shipping cost. Adding increased shipping cost onto the already relatively high shipping cost for relatively heavy and bulky made-up products may have discouraged U.S. companies from importing such products from landlocked countries. To the extent that ROW countries share land borders with exporting countries that supply their made-up imports, the total value of the ROW imports may have been affected little by whether or not the exporting countries are landlocked.

The variable in Model J with the next largest effect is U.S. GDP per capita. Model B is the only other model in the study in which this variable is significant. The variable had an unexpected negative effect on the U.S./ROW made-up import ratio in Model J, indicating that the total value of U.S. made-up imports fell (rose) and that of ROW made-up imports either rose (fell) or fell (rose) less than that of the U.S. imports as U.S. GDP per capita rose (fell). Specifically, the results in Table 18 indicate a 6.61% decrease (increase) in the U.S./ROW made-up import ratio per 1% increase (decrease) in U.S. per capita GDP. Various factors may account for the unexpected negative effect of U.S. per capita GDP in this case. One possibility is that, despite the greater overall increase in the total value of U.S. than ROW made-up imports from 1995 to 2008 (see Table A2), the relatively high cost to ship the products may have discouraged U.S. companies from importing the products, but less so for ROW companies if the made-up imports of ROW countries came from bordering countries.

In addition, the relatively high capital intensity of the production of at least some made-up products (e.g., carpet) may have meant that more of the U.S. than ROW demand for made-up products was met by domestic manufacturers. Although ROW includes a number of countries with relatively high levels of economic development, it includes many with low levels of development that may lack the capability to produce the products. This also implies that much of the U.S. made-up imports came from exporting countries with relatively high levels of economic development, thus likely with production costs similar to those in the United States. The similarity to U.S. production costs may have reduced the incentive for U.S. companies to import the products. A further issue is that even though ROW includes many countries with low levels of economic development, several of these countries have rapidly rising levels of development so that consumers in the countries have experienced rising income levels, giving them the means to purchase more than basic necessities. Such may have increased demand in the countries for made-up products, including ones not produced domestically.

The variable in Model J with the next largest effect is distance, which is significant at p<.01 in both this model and Model K. It has the expected negative effect in both models, indicating that the less (more) the distances between the exporting countries and the United States, the more (less) was the U.S./ROW made-up import ratio, thus that the total value of U.S. made-up imports rose (fell) and that of ROW made-up imports either fell or rose less than that of the U.S. imports as the distances between the exporting countries and the United States decreased (increased). Specifically, the results in Table 18 for Model J indicate a 5.80% lower (higher) U.S./ROW made-up import ratio per 1% increase (decrease) in the distances between the exporting countries and the United States; those for Model K indicate a 2.11% lower (higher) U.S./ROW made-up import ratio per 1% increase (decrease) in those distances. Especially given the relatively high cost to ship at least some made-up products, it is reasonable that more U.S. imports of such products would come from countries near U.S. borders than from ones far from those borders. Similarly, ROW countries may have imported more made-up products from countries near them than from countries near the United States.

The variable with the next largest effect in Model J is the total GDPs of the exporting countries, which is significant at $p<.001$ in both this model and Model K. It has a negative effect in both models, indicating that the less (more) the total GDPs of the exporting countries, the more (less) was the U.S./ROW made-up import ratio, thus that the total value of U.S. made-up imports rose (fell) and that of ROW made-up imports either fell or rose less than that of the U.S. imports as the total GDPs of the exporting countries declined (increased). Negative effects of this variable were also found in apparel Models H and I and in yarn Model E. Specifically, the results in Table 18 for Models J and K indicate respectively a 5.03% and 3.48% lower (higher) U.S./ROW made-up import ratio per 1% increase (decrease) in the total GDPs of the exporting countries. The reason for the negative effect of the total GDPs of the exporting countries on the U.S./ROW made-up import ratio may be similar to one of those proposed for the negative effect of these total GDPs on the U.S./ROW apparel import ratio, that being high ROW demand for made-up imports given the large populations of some ROW countries and the larger ROW than U.S. population. However, such a reason may be more relevant to apparel than made-up products, unless possibly the sizes of the populations of ROW countries were positively related to the sizes of residences in such countries.

Finally, the English variable is significant in Model K. As in yarn Model E and apparel Model I, it has a negative effect in Model K, indicating a lower total value of U.S. than ROW made-up imports from exporting countries with English as an official language. Specifically, the results in Table 18 indicate exporting countries with English as an official language have the U.S./ROW yarn imports 10 times less than exporting countries without it. If these results reflect reality, they may suggest that English is commonly used in international made-up commerce, as in yarn and apparel commerce, and not just in U.S. firms' transactions with made-up product suppliers in other countries.

First-Stage Regression Statistics, and Result of the tests of Endogeneity and of Overidentifying Restrictions for Each Product Type

The IV regressions were performed because it was suspected that the variables on the quota and VER levels of the four product types were endogenous. After performing the two stages of the IV regression for each product type. First-stage regression statistics were calculated, and tests of endogeneity and of overidentifying restrictions were conducted (see the second page of Table 18). First, the first-stage regression statistics show whether or not the instrumental variables, including the excluded exogenous instruments (i.e., the year dummy variables in this study), are significantly correlated with the suspected endogenous variable (the quota and VER levels of each of the four product types in this study). If the instrumental variables were weakly correlated with the suspected endogenous variable, the IV regression would be biased. The *F*-values are significant ($p<.001$) for the first-stage regressions for yarn, fabric, apparel and made-ups, indicating rejection of the null hypothesis in each case that instrumental variables are weakly correlated with the suspected endogenous variable.

Second, the Sargan chi^2 and Basmann chi^2 scores were calculated to test the validity of the overidentifying restrictions in the IV regression for each product type (see Table 18). The degrees of freedom for the Sargan chi^2 and Basmann chi^2 tests for fabric, apparel, and made-ups are all, 12 but for yarn are 10 because U.S. yarn imports were not restricted by quotas or VERs over 2007-2008 but the imports of the other product types were restricted by these means during those years. The null hypothesis for each of these tests is that the overidentifying restrictions are valid (Sargan, 1988). To use IV regression, instrumental variables should be correlated with the endogenous variable, but uncorrelated with the error term. The *F*–value for the first-stage regression for each of the four product types was previously indicated to show that the instrumental variables are strongly correlated with the suspected endogenous variable. Sargan and Basmann chi^2 scores can indicate whether the instrumental variables are uncorrelated with the error term. The Sargan and Basmann chi^2 scores in Table 18 indicate that the null hypothesis that overidentifying restrictions are valid and the excluding instrumental variables (year dummy variables) are not correlated with the ratio of U.S. imports to ROW imports cannot be rejected for the yarn, fabric, and apparel product types (p>.10), but can be rejected for made-up products (p<.001). These results suggest that the instrumental variables for quota or VER levels of the yarn, fabric, and apparel product types are uncorrelated with the error term and are valid, but those for made-up products are correlated with the error term and are not valid. However, the error term in the IV regression for made-up products may be heteroskedastic. If the variance of the error term is not constant, the Sargan and Bassmann chi^2 scores may be invalid (Wooldridge, 2009). Due to the Sargan and Basmann chi^2 results for made-up products, made-up Model K was refitted with new standard errors that are "robust to heteroskedasticity of unknown form" (Wooldridge, 2009, p.839) and then the test of overidentifying restrictions for the new model obtained the Wooldridge's score of 4.70 and its new p-value of 0.97 (see Table

19). This Wooldridge score cannot reject the null that instrument are valid and they are not correlated with error term and indicates the instruments for made-up product type are valid and not correlated with error term. Model L are robust to heteroskedasticity and are different from those from these variables in Model K. Nevertheless, the coefficients on these variables are the same and are statistically significant at conventionally accepted levels ($p < .05$) in both models. Therefore, the interpretation of the coefficient on each variable in Model L is the same as Model K. Thus, the results of the tests of the validity of overidentifying restrictions indicate that all the instrumental variables are valid in the four product types.

Third, the Durbin score and the Wu-Hausman *F* test show the result of the test of endogeneity of the variable suspected of being endogenous (the variables on the quota or VER levels in this study). According to Wooldridge (2009), the ordinary least squares (OLS) estimator is more efficient than an instrumental variable estimator when a suspected endogenous variable can be treated as exogenous. The results of tests of the endogeneity in Table 18 indicate that the null hypotheses that the ${}^{k}Lnqrestrict_{jt}$ and other variables are exogenous can be rejected for the yarn ($p<.10$), apparel ($p<.05$), and made-up products ($p<.01$) but cannot be rejected for fabric products ($p=.88$). These results indicate that the ${}^{k}Lnqrestrict_{jt}$ variable is exogenous for the fabric product type, but is endogenous for yarn, apparel, and made-up products. Therefore, the IV regression is preferred over the random effects regression in yarn, apparel, and made-up product types because the random effects estimates cannot be consistent if the ${}^{k}Lnqrestrict_{jt}$ variables are in fact endogenous. For the fabric model, the result shows the random effects regression is preferred over the IV regression because the random effects regression is

Table 19

Revised Results for the Third Gravity Equation for Made-up Products, with Standard Errors Robust to Heteroskedasticity : Effects of Quota or VER Levels and Other Independent Variables on the Ratio of the Total Value of U.S. Imports to the Total Value of ROW Imports of the Made-up Products over1995-2008

Independent variables	Model L
Ln U.S. GDP per capita ($LnUSGDP_t$)	-6.93
	(4.79)
Ln Exporting country GDPs per capita ($LnGDP_{jt}$)	.61
	(.39)
Ln Distance ($Lndist_j$)	-2.11*
	(.85)
Ln Exchange rates ($Lnexchange_{jt}$)	.19
	(.22)
Landlocked or not ($landlocked_j$)	-8.42**
	(3.23)
English or not ($English_j$)	-2.30*
	(1.08)
Ln Exporting country total GDPs	-3.48**
($LnTGDP_j$)	(1.06)
Ln Quota or VER levels ($^kLnqrestrict_{jt}$,	1.87**
$^k\widehat{Lnqrestrict}_{jt}$)	(.68)
_cons	143.12***
	(54.47)
N	*N*=200 (23 countries)
R^2	.35
Wald chi^2 (8)	34.91
p value	0.00
First-stage regression	
F (12,180)	F=1683.59
Prob>*F*	.00
R^2	.65
Test of endogeneity	
Robust score chi^2(1)	1.80
p value	.18
Robust regression *F* (1,190)	4.70
p value	.03
Test of overidentifying restrictions	
Score chi^2(12)	4.70
p value	.97

Note. Robust standard errors are in parentheses under the estimated parameters; †p<.10. *p<.05. **p< .01. ***p< .001.

more efficient than the IV regression and the $^{k}Lnqrestrict_{jt}$ variable can be treated as exogenous for fabric. However, the Wald chi^2 score for the random effects regression for fabric indicates the independent variables cannot explain the U.S./ROW fabric imports (p=0.1). Therefore, the IV regression is preferred over the random effects even in fabric model.

The R^2 is higher for the IV than the random effects regression for the yarn, fabric, and made-up product types, but not for apparel. However, the Wald chi^2 results indicate that the independent variables in both the random effects and IV regressions for yarn, apparel, and made-up products, do explain the U.S./ROW import ratio for the respective product type; therefore, it can be concluded that the IV regression for each of these product types sufficiently explains the U.S./ROW import ratio in spite of the lower R^2 for IV than the random effects regression for apparel. However, the Wald chi^2 results for fabric indicate that only in the IV regression the independent variables explain the U.S./ROW fabric import ratio.

Lastly, more variables are statistically significant at conventionally accepted levels in the IV than the random effects regressions for the yarn, fabric, and apparel product types, although not for made-up products for which five variables are significant in both the IV and random effects regressions. Overall, these results suggest that the IV regression is preferable to the random effects regression for each product type.

Summary of the Estimation Results for the Three Gravity Equations

The first gravity equation was estimated for two purposes: (a) to assess the effects of seven of the basic independent variables commonly included in gravity models on the total value of U.S. textile and apparel imports over 1995-2010 from all the exporting countries for which complete data were available, out of the 225 in total that supplied the imports; and (b) to determine whether the dependent variables in the other two gravity equations in the study should be specified as the natural logarithm of the total annual value of the imports (M_{it}) or as that of the total import value plus 0.001 (i.e., with application of the scaled dependent variable scenario). Two variants of the first gravity equation were estimated, one with and one without application of the scaled dependent variable scenario (Models A and B respectively). Four variables are significant in Model A. They are distance and the per capita GDPs of the exporting countries, each having the expected negative sign, and exchange rates and the total GDPs of the exporting countries, each having the expected positive sign. Three variables are significant in Model B at conventionally accepted levels ((p<.01 or p<.001 in these cases). They include U.S. GDP per capita and the total GDPs of the exporting countries, each having the expected positive sign. The third is exchange rates, which has an unexpected negative sign. The R^2 of Model A is .22 and that of Model B is .14. The Wald chi^2 results for Models A and B indicate that the independent variables in each model explain the total value of U.S. textile and apparel imports.

A factor that may account for the better performance of Model A than B is biased parameter estimates in Model B due to sample selection bias, specifically a biased sample of U.S. imports for the dependent variable in Model B. The application of the scaled dependent variable scenario to the dependent variable in Model A, but not B meant that the zero-value U.S. import observations were included in the sample for the dependent variable in Model A and 0.001 was added to each import observation before taking its natural logarithm, but the zero-value import observations were omitted from the sample for Model B. This led to the use of 2,735 observations and data on U.S. imports from 187 exporting countries in estimating Model A, but 2,408 observations and data on U.S. imports from 177 exporting countries in estimating Model B (see Table 16). In light of the results for these two models, Model A with application of the scaled dependent variable scenario to the observations for the dependent variable is preferable to Model B without application of this scenario due to the seemingly greater potential for sample selection bias involving the import data for the dependent variable when this scenario is not applied than when it is. It was therefore decided to apply the scaled dependent variable scenario to the import data for the dependent variables in the second and third gravity equations.

The second gravity equation in the study was estimated to assess the overall effect of the presence or absence of quotas and VERs on U.S. textile and apparel imports over 1995-2010 on the total annual SME quantity of these imports while controlling for the same set of independent variables as in the first equation in the study. To help accomplish this purpose, the second gravity equation includes a dummy independent variable for the presence or absence of quotas or VERs on any U.S. textile and apparel imports from each of the 187 exporting countries that was also considered for Model A for each year over 1995-2010. The dependent variable in the equation was specified as the total annual quantity of U.S. imports from each exporting country, with two variants: (a) the quantity of the imports from country *j* that were limited by quotas or VERs and (b) the quantity of the imports from country *j* that were not limited by quotas or VERs. Thus, the dependent variable in the second gravity equation was specified to include two observations of U.S.

imports from each exporting country for each year over 1995-2010. However, two factors obviated the inclusion of data for these two observations of U.S. textile and apparel imports from every one of the 187 exporting countries for every year over 1995-2010.

One factor is that the United States imported either zero or small amounts of textiles and apparel from some exporting countries in some or all years over 1995-2010, and, likely for this reason, it imposed no quotas or VERs on the imports from those countries. Given the decision to apply the scaled dependent variable scenario to the U.S. import data for estimating the second gravity equation, the addition of .001 to the zero quantity of U.S. textile and apparel imports from any such country for any observation of U.S. imports from it that were controlled by quotas or VERs would indicate incorrectly that quotas or VERs severely restricted the import quantity from the country to only .001 SME. For this reason, the sample for the second gravity equation includes, for each year over 1995-2010, only one observation of U.S. textile and apparel imports from any exporting country that supplied such imports without quotas or VERs on them over that period. The data on the quantity of restricted U.S. imports from each of these exporting countries were therefore treated as missing.

The second factor that obviated the inclusion of two observations of the U.S. textile and apparel import quantity from every one of the 187 countries in the analysis for every year over 1995-2010 is that the imports from some countries were limited by quotas or VERs in some, but not all years over that period. The sample for the second gravity equation therefore includes data on the total quantity of both U.S. imports from each relevant exporting country that were limited by quotas or VERs and U.S. imports from the country that were not limited by quotas or VERs for each year when such restraints were in place on any U.S. textile and apparel imports from the country; however, the sample includes data on only the total U.S. import quantity from the exporting country for each year when none of its textile and apparel exports to the United States were limited by quotas or VERs. The data on the total quantity of restricted U.S. imports from any relevant exporting country for each year over 1995-2010 when no quotas or VERs were imposed on U.S. textile and apparel imports from the country were treated as missing.

Due to dropping some observations from the import data for the reasons explained, the total number of observations in the sample for the second gravity equation declined from 5,470 to 3,006. The resulting number of observations is still greater than the total number of observations for either Model A or B for the first gravity equation because the sample for the second equation includes two observations of U.S. imports from some countries for some years over 1995-2010, but only one observation of U.S. imports from some countries for either all or some years over that period.

Given the two observations of the total annual U.S. import quantity from each of several exporting countries for each year over much of the 1995-2010 period, a new variable, specified as id, was added to each such pair of observations in the panel data for estimating the second gravity equation and therefore the STATA group command was applied to each of these pairs of observations. The purpose of adding the id variable and applying the STATA group command was to identify each pair of observations of U.S. imports from each relevant country *j* for each relevant year, with each pair including the total quantity of both U.S. imports that year from country *j* that were limited by quotas or VERs and those that year from country *j* that were not limited by quotas or VERs. The id variable indicates in the STATA program that the two observations in any one of these pairs for each relevant year are separate observations for that year.

The second gravity equation is denoted by Model C. Only three variables in this model are significant at conventionally accepted levels (p<.01 or p<.001 in these cases) They are the annual total and per capita GDPs of the exporting countries, which are also significant in Model A, and the restrict variable, the dummy variable for the presence or absence of quotas or VERs on any U.S. textile and apparel imports from each exporting country in each year. The total and per capita GDPs of the exporting countries have the expected positive and negative signs respectively, but the restrict variable has an unexpected positive sign, Despite only three significant variables in Model C, the R^2 of .27 for this model is slightly higher than that of .22 for Model A, and the Wald chi^2 results for Model C indicate that the independent variables explain the total annual SME quantity of U.S. textile and apparel imports.

The restrict variable is the independent variable of primary interest in Model C. The results for this variable indicate that the total SME quantity of U.S. textile and apparel imports was 2.69% greater in the presence than in the absence of quotas or VERs. If the total U.S. textile and apparel import quantity were actually greater in the presence than in the absence of these restrictions, this may be because the United States tended to impose quotas and VERs on textile and apparel products that it imported in large amounts, especially those with relatively high market shares in the domestic U.S. market (Cline, 1990; Dean, 1995).

Although the total and per capita GDPs of the exporting countries are significant in both Models A and C, the magnitude of the coefficient on each of these variables is smaller in Model C than A, with the difference greater for the per capita than the total GDPs of the exporting countries. Nevertheless, the significance of these two variables in not only Model A, but also Model C in the midst of the seemingly great importance of the restrict variable suggests that the total and per capita GDPs of the exporting countries were themselves important in determining the annual U.S. textile; and apparel import quantity over 1995-2010 or that these variables are related to or indicative of others, such as wage rates and production capacities in exporting countries, that were important in determining the import amounts.

The main purpose for estimating the third gravity equation was to assess trade creation and trade diversion effects of the quota and VER levels of U.S. textile and apparel imports over 1995-2008 while controlling for the same independent variables as in the first gravity equation in the study. Unlike either of the first two gravity equations in the study, the third is focused on imports of yarn, fabric, apparel, and made-up products, not textile and apparel imports in aggregate. And unlike in the second gravity equation, the quotas and VERs in the third equation are specified as the total annual SME levels of these restraints on U.S. imports of each of the four product types, not merely the presence or absence of these restraints on U.S. textile and apparel imports. With application of the scaled dependent variable scenario, the dependent variable in the third gravity equation is specified as the annual ratio of the total value plus .001 of U.S. imports of *k* product type (yarn, fabric, apparel, or made up) to the total value plus .001 of ROW imports of the same product type, both from each of the exporting countries, out of the total of 50 in the overall analysis, that was subject to quotas or VERs on its exports of the *k* product type to the United States at some point over 1995-2008. The 50 exporting countries in the overall analysis for the third gravity equation are the grand total of the exporting countries with quotas or VERs on their textile and apparel exports to the United States at some point over that period, although not all these countries had such restraints on their exports of all four product types. The described specifications of the dependent variable and the independent variable on quotas and VERs in the third gravity equation enabled examination of the effects on trade creation and trade diversion of the quota and VER levels.

Eight models for the third gravity equation were estimated, one by random effects regression and one by IV regression, for each of the four product types. Among the 50 exporting countries in the overall analysis for this equation, the number of such countries considered in estimating each model for each product types is as follows; 26 for yarn, 28 for fabric, 50 for apparel, and 23 for made-up products. The R^2 is higher for the IV than random effects regression for the yarn, fabric, and made-up product types, but not for apparel. However, the results of the Wald chi^2 tests indicate that the independent variables explain the U.S./ROW import ratio in both the random effects and IV regressions for yarn, apparel, and made-up products, but only in the IV regression for fabric. More variables are significant in the IV than the random effects regression for the yarn, fabric, and apparel product types, but equal numbers of variables are significant in the IV and random effects regressions for made-up products. The ${}^{k}Lnqrestrict_{jt}$ and ${}^{k}Ln\widehat{qrestrict}_{jt}$ variables are the main variables of interest in the models estimated for the third gravity equation. Neither is significant in the yarn models, but both are significant in the two models for apparel and for made-up products (p<.001). The ${}^{k}Ln\widehat{qrestrict}_{jt}$

variable is significant (*p*<.01) in the IV regression model, but not the random effects model for fabric (*p*=.07).

The models for the third gravity equation vary by whether the variables that are also included in the first gravity equation are significant. The total GDPs of the exporting countries are significant in five of these models, specifically the yarn IV model and both the IV and random effects models for both apparel and made-up products. No directional sign was hypothesized for this variable for the third gravity equation. The sign is positive in the yarn IV model, but negative in the two models for apparel and for made-up products. The positive effect of the total GDPs of the exporting countries on the U.S./ROW yarn import ratio may suggest that such countries that supplied U.S. yarn imports had larger yarn production capacities than did those that supplied yarn to ROW countries.

The negative effect of the total GDPs of the exporting countries on the U.S./ROW apparel import ratio may suggest that more ROW than U.S. apparel imports came from exporting countries with large apparel production capacities, given that ROW includes some of the world’s most populous countries (e.g., China, India) which may therefore had more demand than the United States for apparel imports, not to mention that the population of ROW is larger than that of the United States. Another factor may be that, depending on how individual countries categorize their imports, some apparel imports of ROW countries, especially those of low-income countries, may actually have been cut fabric pieces that were imported to be assembled into garments. In the case of U.S. companies, the cut fabric pieces have gone mainly to Mexico and other Latin American countries; in the case of EU companies, the cut fabric has gone largely to Eastern

European countries. Companies in developed countries may have exported the cut fabric pieces to countries with relatively large apparel production capacities, thus with relatively large total GDPs. The reason for the negative effect of the total GDPs of the exporting countries on the U.S./ROW made-up import ratio may be similar to one of those proposed for the negative effect of these total GDPs on the U.S./ROW apparel import ratio, that being the high demand for made-up imports given the large populations of some ROW countries and the larger ROW than U.S. population.

The English variable is significant and has an unexpected negative sign in the IV regression for yarn, apparel, and made-up product types. This negative effect indicates a lower the ratio of total value of U.S. to ROW imports from exporting countries with English as an official language. This result may suggest that English is a common language in international trade in yarn, apparel, and made-up products, not just in the transactions of U.S. companies with suppliers of U.S. imports of such products in exporting countries.

The landlocked variable is significant in both the random effects and IV regressions for only made-ups and is not significant in other model for the third gravity equation. Although no directional hypothesis was proposed for this variable for this equation, the negative effects of the variable in the two made-up models are consistent with the intuition in the rationales for the hypotheses for the variable in the first and second gravity equations in the study. The results for the landlocked variable in the two made-up models indicate a much lower total value of U.S. than ROW made-up imports from landlocked countries. These results may be related to the relatively high weight and bulk per unit of at least some made-up products such as carpet, rugs, and luggage. Adding increased shipping cost onto the already relatively high shipping cost for relatively heavy and bulky made-up products may have discouraged U.S. companies from importing such products from landlocked countries. Some ROW countries may share land borders with exporting countries that supply their made-up imports, which may mean that the total value of their imports of made-up products may have been affected little by whether or not the exporting countries are landlocked.

Exchange rates are significant on the U.S./ROW import ratio in random effects regression for only yarn but not for other product types. The effects of exchange rates are positive, as expected. These effects indicate that appreciation of the U.S. dollar against the currencies of the exporting countries led to an increase in the U.S./ROW import ratio, such that the total value of U.S. yarn imports rose and that of ROW yarn imports declined or rose less than that of U.S. yarn imports.

Distance has significant and expected negative effects on the U.S./ROW import ratio in both the random effects and IV regressions for made-ups, but is not significant in any other model for the third gravity equation. Especially given the relatively high cost to ship at least some made-up products, it is reasonable that more U.S. imports of such products would come from countries near U.S. borders than from ones far from those borders. Similarly, ROW countries may have imported more made-up products from countries near them than from countries near the United States.

The per capita GDPs of the exporting countries have significant positive effects on the U.S./ROW import ratios in the IV regressions for fabric and apparel, indicating that the total value of U.S. imports of these product types rose (fell) and that of ROW imports of such product types either fell (rose) or rose (fell) less than that of the U.S.

imports as the per capita GDPs of the exporting countries increased (declined). U.S. fabric imports may have come mainly from exporting countries with relatively high levels of economic development, thus with high per capita GDPs, given the relatively high intensity of fabric production in capital and engineering knowledge to meet the quality standards of U.S. companies. Although no directional hypothesis was proposed for the per capita GDPs of the exporting countries in the third gravity equation, an increase (decrease) in the U.S./ROW apparel import ratio as these per capita GDPs rose (fell) would be inconsistent with the intuition in the rationale for the hypothesis for the per capita GDPs of the exporting countries for the first and second gravity equations in the study. Based on the results for the apparel IV regression Model I and the first and second gravity equations, it seems likely that rising (declining) per capita GDPs of the exporting countries led to a decline (increase) in the total value of both U.S. and ROW apparel imports, but with a greater decline in that of ROW than U.S. apparel imports.

U.S. per capita GDP has a significant negative effect on the U.S./ROW import the ratio in random effects regression for made-up products. Despite the greater overall increase in the total value of U.S. made-up imports than in that of ROW made-up imports from 1995 to 2008 (see Table A2), the relatively high cost to ship at least some made-up products may have discouraged U.S. companies from importing such products, but less so for ROW companies if the made-up imports of ROW countries came from bordering countries. In addition, the relatively high capital intensity of the production of at least some made-up products (e.g., carpet) may have meant that more of the U.S. than ROW demand for made-up products was met by domestic manufacturers.

CHAPTER 5

CONCLUSIONS, IMPLICATIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

Conclusions

The overall purpose of this research is to examine the effects on U.S. textile and apparel imports of the quantitative restrictions imposed on such imports on such imports under the Agreement on Textiles and Clothing (ATC) (1995-2005), the post-ATC safeguard quotas on 21 categories of U.S. textile and apparel imports from China (2006-2008), and the lack of quantitative restrictions on U.S. textile and apparel imports (2009-2010). This study employed the basic independent variables in the first gravity equation and added the presence of a quantitative restriction variable as an independent variable in the second gravity equation. To examine the effect of the allowed quota and VER levels on trade diversion and trade creation between countries and account for different features for each product type, the third gravity equation separated trade data into four product types (yarn, fabric, apparel, and made-ups), employed the ratio of U.S. textile and apparel imports to ROW textile and apparel imports as a dependent variable, and added the allowed quota and VER levels as an independent variable, which is the most primary independent variable in this study.

From the third gravity equation, this study found that the total SME quota or VER levels of U.S. imports of each of the four products (yarn, fabric, apparel and made-ups) was positively related to the ratio of the total value of U.S. imports to the total value of ROW imports for the respective product types. The coefficients on the variable are statistically significant in all product types except for yarn product. These findings suggest that textile and apparel exports to the United States from exporting countries subject to quantitative restriction on their textile and apparel exports to the United States increased more than those exports from those countries to the ROW as quota and VER levels on U.S. imports increased. In other words, U.S. imports from the exporting countries subject to quotas and VERs on U.S. textile and apparel imports increased more than ROW imports from those countries as the quotas and VER levels on U.S textile and apparel imports increased. Therefore, trade creation occurred between the United States and the exporting countries, while a trade diversion occurred between ROW countries and the exporting countries as the total SME quota or VER levels increased during the ATC and safeguard period. Even if the total SEM quota or VER levels are positively related to the U.S./ROW yarn import ratio, this is not statistically significant at conventionally accepted level. Generally yarn is used as intermediates to produce fabric, apparel, and made-ups. Recently the United States imports most of apparel and made-ups rather than produces in domestic factories. This might cause the demand of yarn as intermediates to decrease. Therefore, the increase of the total yarn quota or VER levels makes less effect on the yarn imports than other product types. Table 15 also showed the insignificant correlation between the total yarn import value and the total SME or VER levels for yarn.

The next important independent variable to allowed quota and VER levels in this study is the presence of quantitative restrictions in the second gravity model. From the second gravity equation, this study found that the presence of quantitative restrictions is positively related to U.S. textile and apparel imports. This result is different from the hypothesis that the total quantity of U.S. textile and apparel imports was lower in the presence of quotas or VERs on the imports than in the absence of quotas and VERs. This is because policy makers in importing countries, including the United States, tend to impose quantitative restrictions on categories or groups that have a large amount of imports, while they do not need to impose the restrictions on categories or groups that have fewer imports.

There are many studies that analyze trade flows in the gravity models with independent variables commonly used such as the first gravity equation in this dissertation; however, there are not many studies that used quantitative restriction in the gravity model for the second gravity equation and the allowed quota and/or VER quantity as an independent variable for the third gravity equation. Liping (2010) found that trade protection is positively related to trade like the second gravity equation of this study. In addition, the third gravity equation used the ratio of U.S. imports to ROW imports as a dependent variable to measure trade creation and diversion, but after extensive literature search, no existing studies that used the same method were found; however, this research is a good attempt at using the newly developed independent variables regarding the quantitative restrictions and the allowed quota and VER levels.

Other basic independent variables in the first and the second gravity equations mostly show the same directional sign as expected in the hypotheses. The first gravity model compared differences between the scaled dependent variable scenario and the original dependent variable and showed how many observations increased when the scaled dependent variable scenario was used. Most findings of the first gravity equation in this study are consistent with the findings in existing literature except for the per capita GDP of exporting countries. This study found that the per capita GDP of exporting countries is negatively related to their exports suggesting that exporting countries with a low wage rate are attractive to textile and apparel buyers in importing countries to save labor cost. This relationship agrees with those found by Chan & Au (2007), but not those found by most researchers including Amponsah & Ofori-Boadu (2006), Chi (2010), Eichengreen et al. (2007), Grossrieder (2007) and Liping (2010). Datta & Kouliavtsev (2009) found a positive coefficient on the per capita GDP of low income exporting countries and a negative sign on that of high income exporting countries. Unlike these results about the basic independent variable in the first and the second gravity equations, the signs of the coefficient of the basic independent variables in the third gravity equations vary for the four product types. Therefore, the separation by product type in the third gravity equation help analyze regression results for each product type. The coefficients of U.S. GDP per capita have positive signs in the first and the second gravity equation (Model A and Model C) while the seven models in the third gravity equation show that the coefficients of U.S. GDP per capita have negative signs. Among them, the coefficients are statistically significant in Model J for made-up products. These findings show that U.S. GDP per capita is negatively related to the ratio of U.S. imports to ROW imports in made-up products. This study does not include per capita GDP of the ROW. The ROW is also importing countries so it probably affects the ratio of U.S. imports to ROW imports. Future study might include per capita GDP of the ROW as an independent variable. The hypotheses of GDP per capita of exporting countries in the third equation, have not developed expected signs; however, two models; IV regressions in fabric and apparel product types have statistically significant and positive signs. Total GDP of exporting countries is negatively related to the ratio of U.S. imports to ROW imports in apparel and made-up products. From the result of the coefficients on GDP per capita and total GDP of exporting countries in apparel and made-ups, this study found that ROW countries import apparel and made-ups from exporting countries with lower GDP per capita and higher total GDP than the United States does even though this study found that the United States imports textiles and apparel from countries with low GDP per capita and high total GDP in the first and the second equation. Distance has negative signs in the first, the second, and the third equation for made-up products suggesting that shipping cost is important in the textile and apparel trade. The coefficients of exchange rates have expected signs in the scaled dependent variable in the first and the second gravity equation and six models of the third gravity equation even if some are not statistically significant among them, suggesting that exchange rate is an important factor in the yarn trade. This study found that U.S. textile and apparel imports and the ratio of U.S. textile and apparel imports to ROW textile and apparel imports were less from landlocked exporting countries than non-landlocked countries having negative signs even though some are not statistically significant. Only both random effects and IV regression for apparel products in the third gravity equation have positive signs, but they are not statistically significant. This study also found that the exporting countries' use of English as an official language have positive signs from the first and the second equation but mostly decreases the ratio of U.S. imports to ROW imports in all four product types, suggesting that ROW countries also prefer to import textile and apparel products from exporting countries that use English.

Implications

This study can contribute to helping policy makers change their trade policies. For example, the increases of allowed quotas and VER levels between an importing and an exporting countries influence trade of not only the trading partners but also other countries that are not involved in the policy changes. Therefore, when they create or abolish their trade policies, they should account for the expected effect on the trading partners involved in policy changes as well as other countries not involved in the policy changes.

Manufacturers or contractors in the 50 exporting countries should pay attention to policy changes to keep up with the fast changing market. ROW buyers also should concentrate on the change of trade policies. The 50 exporting countries are also important suppliers for ROW countries. Even though ROW countries imports from the 50 exporting countries increase over time, the results shows that U.S. imports from these 50 exporting countries increased faster than ROW imports from the exporting countries. Some manufacturers might maintain their facilities and labor even though their orders from the United States and ROW countries rise. If so, buyers in the United States and ROW countries might wait for a long time to get finished products from the exporting countries or they might get products that have lower quality than expected. These manufacturers in exporting countries might get left behind from other manufacturers which can cope with fast changes because they have larger facilities and more labor. Buyers of importing countries also search for manufacturers and contractors in exporting countries which have enough capacity for the increased orders. In addition to capacity, based on the test results, U.S. buyers prefer exporting countries which use English but buyers in the ROW want more to import textile and apparel from exporting countries which use English. To raise competitiveness in the world market, exporting countries should improve their communication skills.

Limitations

There are several limitations in this research. In the second equation, the result showed unexpected direction of the coefficient for the presence or absence of quantitative restriction. This is because the policy makers tended to impose quantitative restriction on products imported in large amount. However, the role of quantitative restriction is to restrict imports so this study does not well capture the effects of quota vs. no quota. The future studies might use the annual increase in the total imports or quantity with and without quantitative restriction instead of just using total value or quantity of imports as the dependent variable in the present study.

In addition, the dummy variable on presence or absence of quantitative restriction is not good measure of the restraints because some exporting countries had more restriction than others. Also the quota or VER levels vary among exporting countries. Future studies should come up with the measure that captures the relative restrictiveness of the quotas or VERs for different exporting countries.

The gravity equations in this study did not capture all observations from 1995 to 2008 of the 50 exporting countries because quotas and VERs on most of product categories were gone after 2004. Future studies might separate the periods into the ATC period and the safeguard quota period to capture all observations.

In the third gravity equation, some groups contained multiple product types and were inseparable into the four product types. Due to this problem, a procedure was developed to separate allowed VER and quota levels into four product types. This procedure is not perfect because actual share is not available with this method. Future study might develop a better procedure to find percentages closer to actual share.

This study considered only quantitative restrictions, not tariff rates. Even though quantitative restrictions were phased-out, tariffs still exist on U.S. textile and apparel imports, and they might have major effects on U.S. textiles and apparel. Future studies might include tariffs as an independent variable in the gravity model. This study might use weighted average tariff rates, which consider magnitude of categories' volume of products instead of just using average tariff rates.

This study used random effects rather than fixed effect. The random effects estimator should assumes zero correlation between error terms and any of the independent variables, which is a pretty strong assumption because some of the unobserved factors this study is trying to control for with the use of random effects may actually be correlated with the explanatory variables such as domestic policies, institutions, culture, and technical barriers. Fixed effects allow for some correlation between the error term and the explanatory variables. However, fixed effects absorb all time-invariant variables within the panel such as distance, the use of English, and landlocked or not, so fixed effect can't estimate those coefficients. Therefore, this study used random effects to estimate the time-invariant variables that are constant within the panel but future study might use both fixed and random effects and compare two different results.

Suggestions for Future Research

This study employed the ratio of U.S. import to ROW imports to measure trade creation and trade diversion effect in one equation. Future study might examine effects of elimination of quantitative restriction on trade creation and trade diversion in separate equations. To examine trade creation effect, the dependent variable could be U.S. imports from exporting countries limited by quotas or VER; while to examine diversion effect, the dependent variable could be ROW imports from those countries.

This study used year dummies as excluding instrumental variables to account for endogeneity of quota and VER level. Future study might include more excluding instrumental variables such as imports. Trefler (1993) found negative effects of nontariff barriers (NTB) on imports from the import equation and positive effects of imports on NTB from NBT equation in manufacturing. This is because the endogeneity of NTB. Future research might apply this estimation method to yarn, fabric, apparel, and made-ups.

In addition, future study might examine the effect of elimination of quantitative restriction on U.S. textile and apparel imports from world countries except exporting countries which had bilateral agreement with the United States. Elimination of quantitative restriction created trade between the United States and exporting countries that used to be limited by the restriction. This might reduce U.S. textile and apparel imports from exporting countries that had never been restricted by quotas and VER. Therefore, the dependent variable could be U.S. imports from world countries which have never quantitative restriction and independent variable could be U.S. imports from the exporting countries which had bilateral agreement with the United States.

This study used the total value of U.S. textile and apparel imports for the first gravity model; total quantity for the second gravity model; and total value of yarn, fabric, apparel, and made-ups of U.S. and ROW imports for the third gravity model. These aggregation methods are sufficient to examine the trade data of specific products as compared with existing studies, but future studies might use disaggregated data to examine trade flows of more specific products (e.g., cotton yarns, man-made fiber knit shirts, swimwear, and skirts).

Future studies might also include the PTAs between each importing country and each exporting country as dummy variables. Some exporting countries under the PTA with the United States could export textiles and apparel without any quantitative restriction and any tariff even during the ATC period. Therefore, the PTAs might be added on the gravity equations to examine the effect of the PTAs.

Future studies might examine the effects of the quantitative restriction on the textile and apparel imports of EU countries instead of the United States during the ATC period. The EU is also one of the largest textile and apparel importers and the EU imports from various regions such as Europe, Asia, and Africa. For this reason, one of the potentially useful research targets would be EU textile and apparel imports.

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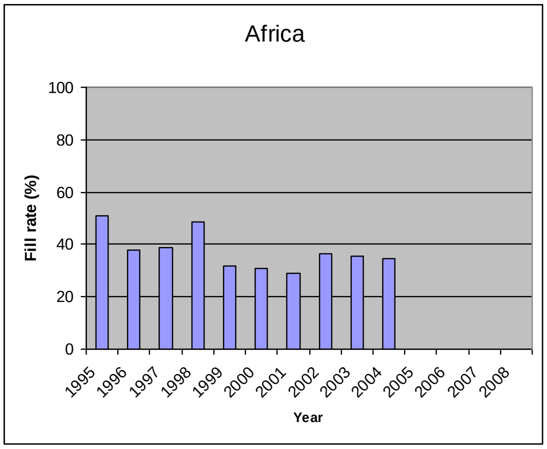
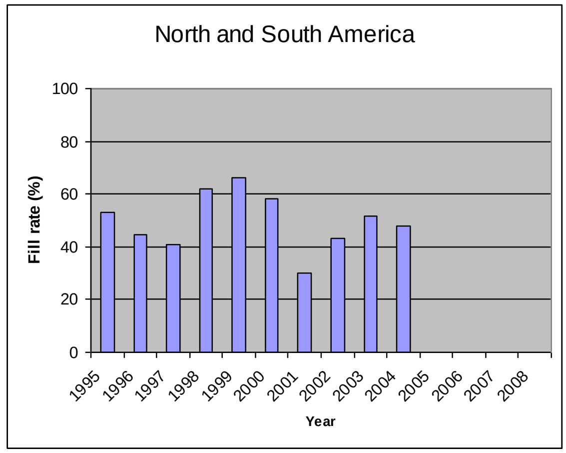
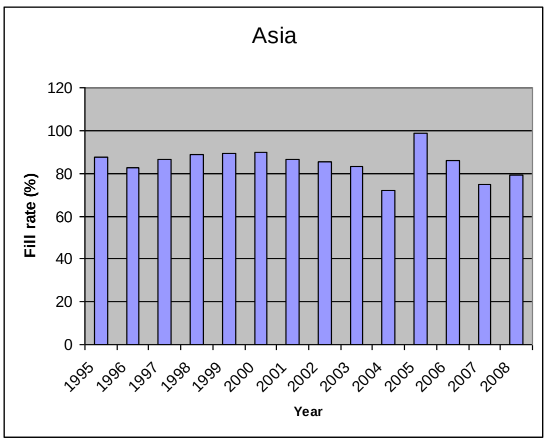
Appendix A. Supporting Information



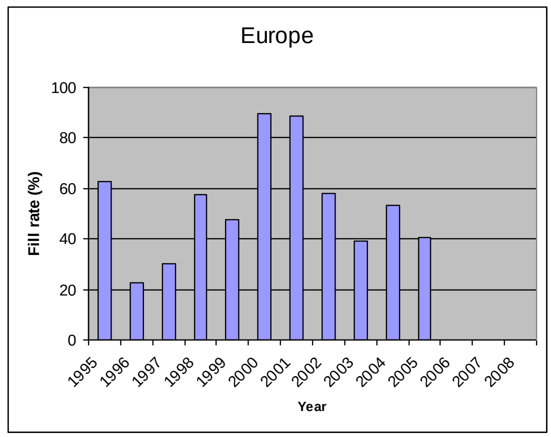
Egypt, Kenya, and Mauritius (3)



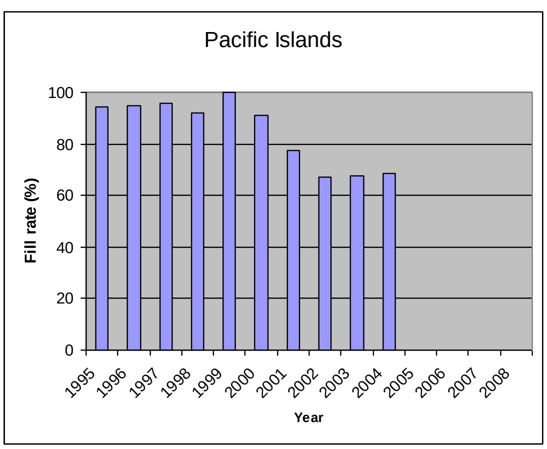
Brazil, Canada, Colombia, Costa Rica, Dominican Republic, Guatemala, Honduras, Jamaica, Mexico, El Salvador, and Uruguay (11)



Arab Emirates, Bahrain, Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, South Korea, Kuwait, Laos, Macau, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Russia, Singapore, Sri Lanka, Taiwan, Thailand, Turkey, and Vietnam (26)



Bulgaria, Republic of Belarus, Czech Republic, Hungary, Macedonia, Poland, Romania, Slovak Republic, and Ukraine (9)



Fiji (1)

Figure A1. Weighted Average VER or Quota Fill Rates by Continent, 1995-2008.

Table A1

The 50 Exporting Countries Subject to Quotas or VERs on their Textile and Apparel Exports to the United States at Some Point over 1995-2008 and Therefore Considered in Estimating the Third Gravity Equation

Country name	Country name
1. Arab Emirates	26. Kuwait
2. Bahrain	27. Laos
3. Bangladesh	28. Macau
4. Republic of Belarus	29. Macedonia
5. Brazil	30. Malaysia
6. Bulgaria	31. Mauritius
7. Cambodia	32. Mexico
8. Canada	33. Myanmar
9. China	34. Nepal
10. Colombia	35. Oman
11. Costa Rica	36. Pakistan
12. Czech Republic	37. Philippines
13. Dominican Republic	38. Poland
14. Egypt	39. Qatar
15. El Salvador	40. Romania
16. Fiji	41. Russia
17. Guatemala	42. Singapore
18. Honduras	43. Slovak Republic
19. Hong Kong	44. Sri Lanka
20. Hungary	45. Taiwan
21. India	46. Thailand
22. Indonesia	47. Turkey
23. Jamaica	48. Ukraine
24. Kenya	49. Uruguay
25. South Korea	50. Vietnam

Table A2

Data on Annual U.S. and ROW Textile and Apparel Imports, 1995-2010, and Annual Quota or VER Levels of U.S. Yarn, Fabric, Apparel, and Made-up Imports, 1995-2008

		1995	1996
(a)	Total value of U.S. textile and apparel imports, 1995-2010	43,952,864	45,915,494
(b)	Quantity of U.S. textile and apparel imports, 1995-2010	18,307,533	19,063,273
(c)	Total value of U.S. yarn imports, 1995-2008	895,402	979,395
(d)	Total value of U.S. fabric imports, 1995-2008	4,258,265	4,370,299
(e)	Total value of U.S. apparel imports, 1995-2008	34,648,598	36,388,800
(f)	Total value of U.S. made-up imports, 1995-2008	4,150,599	4,177,001
(g)	Total value of ROW yarn imports, 1995-2008	36,465,008	36,837,848
(h)	Total value of ROW fabric imports, 1995-2008	89,358,224	89,022,728
(i)	Total value of ROW apparel imports, 1995-2008	159,596,032	167,610,688
(j)	Total value of ROW made-up imports, 1995-2008	31,902,542	32,460,198
(k)	Total value of U.S. yarn imports as a percentage of the total value of U.S. textile and apparel imports, 1995-2008	2.04%	2.13%
(l)	Total value of U.S. fabric imports as a percentage of the total value of U.S. textile and apparel imports, 1995-2008	9.69%	9.52%
(m)	Total value of U.S. apparel imports as a percentage of the total value of U.S. textile and apparel imports, 1995-2008	78.83%	79.25%
(n)	Total value of U.S. made-up imports as a percentage of the total value of U.S. textile and apparel imports, 1995-2008	9.44%	9.10%
(o)	Total quota or VER level of U.S. yarn imports, 1995-2008	725,539	899,329
(p)	Total quota or VER level of U.S. fabric imports, 1995-2008	3,636,599	4,642,896
(q)	Total quota or VER level of U.S. apparel imports, 1995-2008	4,826,186	5,362,524
(r)	Total quota or VER level of U.S. made-up imports, 1995-2008	1,273,606	1,626,317
(s)	Sum total of the quota or VER levels of U.S. yarn, fabric, apparel, and made-up imports, 1995-2008	10,461,931	12,531,067
(t)	Total quota or VER level of U.S. yarn imports as a percentage of the sum total of all the quota or VER levels, 1995-2008.	6.94%	7.18%
(u)	Total quota or VER level of U.S. fabric imports as percentage of the sum total of all the quota or VER levels, 1995-2008.	34.76%	37.05%
(v)	Total quota or VER level of U.S. apparel imports as a percentage of the sum total of all the quota or VER levels, 1995-2008.	46.13%	42.79%
(w)	Total quota or VER level of U.S. made-up imports as a percentage of the sum total of all the quota or VER levels, 1995-2008.	12.17%	12.98%

Continued

Table A2 *(continued)*

	1997	1998	1999	2000	2001	2002
(a)	54,001,862	60,397,285	60,397,285	71,691,547	70,239,765	72,183,131
(b)	22,894,521	25,944,586	28,614,986	32,864,151	32,811,747	38,288,154
(c)	1,176,154	1,255,749	1,304,003	1,464,914	1,293,703	1,303,518
(d)	5,157,988	5,270,180	5,170,555	5,611,756	5,088,888	5,495,051
(e)	42,826,908	48,175,628	50,795,301	57,231,656	56,460,383	56,962,950
(f)	4,840,813	5,695,728	6,473,026	7,383,221	7,396,790	8,421,611
(g)	38,216,748	33,878,604	36,013,904	35,932,308	33,725,548	34,279,180
(h)	90,,836,288	85,711,024	89,128,408	89,350,648	85,647,832	88,900,368
(i)	178,864,960	185,316,304	195,584,512	196,153,824	196,681,728	203,907,856
(j)	33,909,940	34,153,448	35,468,856	35,370,684	35,719,124	38,237,492
(k)	2.18%	2.08%	2.05%	2.04%	1.84%	1.81%
(l)	9.55%	8.73%	8.11%	7.83%	7.25%	7.61%
(m)	79.31%	79.76%	79.69%	79.83%	80.38%	78.91%
(n)	8.96%	9.43%	10.15%	10.30%	10.53%	11.67%
(o)	1,242,512	954,081	1,143,910	1,050,871	1,188,530	1,246,524
(p)	5,407,931	5,212,340	5,289,367	5.750,091	5,740,735	6,086,138
(q)	5,801,176	4,975,273	5,131,435	5,207,278	5,151,661	4,226,062
(r)	1,997,663	1,721,451	1,773,634	1,811,699	1,824,191	1,221,953
(s)	14,449,281	12,863,145	13,338,345	13,819,939	13,905,117	12,780,677
(t)	8.60%	7.42%	8.58%	7.60%	8.55%	9.75%
(u)	37.43%	40.52%	39.66%	41.61%	41.29%	47.62%
(v)	40.15%	38.68%	38.47%	37.68%	37.05%	33.07%
(w)	13.83%	13.38%	13.30%	13.11%	13.12%	9.56%

Continued

Table A2 *(continued)*

	2003	2004	2005	2006	2007	2008
(a)	77,434,041	83,310,442	89,205,496	93,278,703	96,409,980	93,186,931
(b)	42,226,775	46,936,141	50,836,314	52,149,546	53,127,336	50,361,476
(c)	1,309,751	1,648,168	1,714,056	1,603,604	1,451,998	1,321,882
(d)	5,408,095	5,637,508	5,719,123	5,472,569	5,532,134	5,120,121
(e)	61,162,077	64,767,673	68,713,251	71,629,828	73,922,587	71,568,371
(f)	9,554,117	11,257,094	13,059,066	14,572,701	15,503,260	15,176,556
(g)	37,583,032	41,486,208	41,773,772	44,140,432	39,257,748	48,237,036
(h)	96,673,848	104,959,776	106,234,064	108,428,128	99,628,816	117,608,080
(i)	229,460,496	253,983,088	271,486,336	294,492,576	310,112,768	327,060,896
(j)	45,101,828	51,878,184	56,571,696	62,399,128	68,237,152	70,089,728
(k)	1.69%	1.98%	1.92%	1.72%	1.51%	1.42%
(l)	6.98%	6.77%	6.41%	5.87%	5.74%	5.49%
(m)	78.99%	77.74%	77.03%	76.79%	76.68%	76.80%
(n)	12.34%	13.51%	14.64%	15.62%	16.08%	16.29%
(o)	1,284,554	1,093,501	373	926	0	0
(p)	6,749,650	5,324,861	34,724	762,732	906,321	1,039,250
(q)	4,865,388	3,851,894	117,401	2,182,900	2,118,176	2,859,250
(r)	1,639,810	1,484,976	1,451	57,983	63,352	71,450
(s)	14,539,402	11,755,232	153,950	3,004,541	3,087,849	3,969,949
(t)	8.83%	9.30%	0.24%	0.03%	0.00%	0.00%
(u)	46.42%	45.30%	22.56%	25.39%	20.98%	26.18%
(v)	33.46%	32.77%	76.26%	72.65%	27.68%	72.02%
(w)	11.28%	12.63%	0.94%	1.93%	51.34%	1.80%

Continued

Table A2 *(continued)*

	2009	2010	Percent change from 1995 to 2008
(a)	81,005,556	93,279,246	112.02%
(b)	46,606,928	55,444,079	175.09%
(c)			47.63%
(d)			20.24%
(e)			106.55%
(f)			265.65%
(g)			32.28%
(h)			31.61%
(i)			104.93%
(j)			119.70%
(k)			
(l)			
(m)			
(n)			
(o)			
(p)			
(q)			
(r)			
(s)			
(t)			
(u)			
(v)			
(w)			

Note. Each import value is in U.S. $1,000. Each import quantity is in 1,000 SME. Compiled from data provided by the U.S. Department of Commerce, Office of Textile and Apparel and included in United Nations Comtrade data.

Table A3

Exporting Countries Subject to Quotas or VERs on Groups Containing Multiple Product Types and the Group Names, 1995-2008

Year	Country	Group name	Number of groups
1995	Brazil	Aggregation	1
	Canada	Chapter 60,63pt; Chapter 52-55, 58, 63pt	2
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	12 countries		18
1996	Brazil	Aggregation	1
	Canada	Chapter 60,63pt; Chapter 52-55, 58, 63pt	2
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	12 countries		18
1997	Brazil	Aggregation	1
	Canada	Chapter 60,63pt; Chapter 52-55, 58, 63pt	2
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2

Continued

Table A3 *(continued)*

Year	Country	Group name	Number of groups
1997	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	12 countries		18
1998	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	11 countries		16
1999	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	11 countries		16
2000	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1

Continued

Table A3 *(continued)*

Year	Country	Group name	Number of groups
2000	Philippines	Group II	1
	Romania	Cotton Group	1
Total	11 countries		16
2001	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	11 countries		16
2002	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	12 countries		16
2003	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	11 countries		16

Continued

Table A3 *(continued)*

Year	Country	Group name	Number of groups
2004	Brazil	Aggregation	1
	China	Group I; Group III	2
	China Taiwan	Group I; Group I subgroup	2
	Hong Kong	Group I; Group I subgroup	2
	India	Group II	1
	Indonesia	Group II; Group II subgroup	2
	Korea	Group I; Group II	2
	Macau	Group II	1
	Malaysia	Group II	1
	Philippines	Group II	1
	Romania	Cotton Group	1
Total	12 countries		16
2005			0
Total	0 countries		0
2006			0
Total	0 countries		0
2007			0
Total	0 countries		0
2008			0
Total	0 countries		0

Table A4

The Percentage of the Total Allowed SME Export Quantity of Textile and Apparel Products that was Included in Quota or VER Groups Containing Multiple Product Types for Each Country Subject to such Quotas or VERs Each Year over 1995-2008

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Arab Emirates	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Bahrain	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Bangladesh	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Republic of Belarus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brazil	69.7%	70.6%	70.4%	72.7%	70.5%	70.6%	70.6%	69.1%	69.0%	69.4%	0.0%	0.0%	0.0%	0.0%
Bulgaria	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cambodia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Canada	23.7%	23.8%	23.8%	24.3%	24.0%	24.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
China	61.4%	61.4%	61.9%	71.9%	70.9%	71.1%	70.6%	69.4%	67.4%	69.3%	0.0%	0.0%	0.0%	0.0%
Colombia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Costa Rica	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Czech Republic	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dominican Republic	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Egypt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
El Salvador	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fiji	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Guatemala	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Honduras	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hong Kong	19.8%	19.8%	19.9%	20.6%	20.7%	20.7%	20.9%	17.6%	27.1%	17.8%	0.0%	0.0%	0.0%	0.0%
Hungary	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Continued

Table A4 *(continued)*

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
India	32.9%	30.4%	31.3%	32.8%	35.0%	37.2%	35.0%	35.0%	35.7%	32.0%	0.0%	0.0%	0.0%	0.0%
Indonesia	30.0%	27.2%	30.9%	29.0%	34.9%	33.0%	26.8%	26.8%	28.1%	29.7%	0.0%	0.0%	0.0%	0.0%
Jamaica	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Kenya	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
South Korea	69.9%	69.8%	69.7%	68.5%	68.4%	68.5%	68.6%	21.3%	68.5%	67.7%	0.0%	0.0%	0.0%	0.0%
Kuwait	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Laos	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Macau	7.6%	5.7%	6.1%	6.0%	5.5%	5.3%	4.9%	4.4%	5.0%	4.4%	0.0%	0.0%	0.0%	0.0%
Macedonia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Malaysia	7.7%	9.5%	9.5%	7.6%	7.7%	7.1%	9.4%	2.9%	4.1%	4.5%	0.0%	0.0%	0.0%	0.0%
Mauritius	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mexico	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Myanmar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nepal	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Oman	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pakistan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Philippines	69.7%	73.8%	79.6%	83.4%	84.1%	84.5%	81.2%	85.4%	79.7%	82.9%	0.0%	0.0%	0.0%	0.0%
Poland	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Qatar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Romania	43.5%	40.0%	39.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Russia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Singapore	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Continued

Table A4 *(continued)*

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Slovak Republic	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sri Lanka	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Taiwan	30.0%	37.9%	38.0%	38.1%	7.3%	37.2%	30.9%	26.6%	27.1%	28.0%	0.0%	0.0%	0.0%	0.0%
Thailand	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Turkey	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ukraine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Uruguay	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Vietnam	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%