Trans-Atlantic Trade and Investment Partnership: an opportunity or a threat to the EU textile and apparel industry?

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ABSTRACT

This study quantitatively evaluated how tariff elimination and reduction of non-tariff barriers under the Trans-Atlantic Trade and Investment Partnership (T-TIP) could affect the textile and apparel (T&A) industry in the European Union (EU). Based on the Global Trade Analysis Project (GTAP) model, the study finds that: first, T-TIP's trade creation effect will expand the EU-U.S. intra-industry trade for textiles. Meanwhile, T-TIP will significantly expand EU's apparel exports to the United States. Second, trade T-TIP's trade diversion effect will affect T&A exports from non-member suppliers to the T-TIP region negatively, including Asia's T&A exports to the U.S. and EU and Turkey's T&A exports to the EU. Third, T-TIP will affect the intra-region T&A trade in the EU region negatively but in a limited way. Findings of this study augment our understanding of the T&A-specific sectoral impact of T-TIP and provide valuable inputs supporting the T-TIP negotiation.

Introduction

The Trans-Atlantic Trade and Investment Partnership (T-TIP) is a comprehensive free trade agreement (FTA) currently under negotiation between the European Union (EU)[1] and the United States (U.S. Trade Representative Office, 2014). T-TIP intends to unlock market access opportunities for businesses on both sides of the Atlantic through the ambitious elimination of trade and investment barriers as well as enhanced regulatory coherence (Akhtar & Jones, 2014). Because the EU and the United States combined accounted for almost half of the world's gross domestic product (GDP), and nearly one-third of the global trade flows in 2015 (World Trade Organization [WTO], 2016a), the implementation of the T-TIP is expected to have a profound economic, social, and political impact on the world economy (Francois, Manchin, Norberg, Pindyuk, & Tomberger, 2013).

Textile and apparel (T&A) is a significant contributor to the EU economy and a critical component of the T-TIP negotiation (European Apparel and Textile Confederation [Euratex], 2015). As shown in Table 1, in 2015, the United States and the EU altogether exported $91 billion worth of textiles (31.2% of the world share) and $136 billion worth of apparel (30.7% of the world share). Over the same period, the T-TIP region imported as much as $117 billion textiles (40.5% of the world share) and $294 billion apparel (64.8% of the world share). The T&A sectoral negotiation under T-TIP is also of particular sensitivity and complexity because of T&A's unique market structure and historical rules that governed the global T&A trade. As shown in Table 2, although the United States and EU members had lowered their average applied tariff rate for non-agricultural products

to 4% in 2014, the import duty rate was still nearly as high as 7% for textiles and 12% for apparel (WTO, 2016b). Further, the transatlantic T&A trade currently is facing numerous non-tariff barriers (NTBs) such as onerous technical standards on labeling, product safety and rules of origin (European Commission, 2014). It is hopeful that T-TIP will substantially cut the high tariff and non-tariff barriers facing T&A products traded between its members. As a result, the implementation of T-TIP will affect the price competitiveness of related T&A exporters greatly and shift the current T&A trade patterns in the T-TIP region significantly.

The main purpose of this study is to provide quantitatively evaluate how the implementation of T-TIP will affect related T&A trade flows and consequently the EU T&A industry. Most existing studies have only assessed the macroeconomic impact of T-TIP (such as Pelkmans, Lejour, Schrefler & Timini, 2014; Welfens & Irawan, 2014). Results of this study instead will make a significant contribution to understanding the T&A specific sectoral impact of T-TIP, which has been studied little in the current literature. For the academia and the T&A business community, findings of this study will address their particular concerns regarding the new market environment and the possible scenarios after the implementation of T-TIP. For policy-makers, results of this study will also provide valuable inputs which could support the T&A sectoral negotiation under T-TIP as well as related trade policy-making in response to the implementation of the agreement.

The paper is composed of four parts. The second part provides an overview of related theories and literature that suggest the impact of T-TIP on related T&A trade flows in the transatlantic region. The third part is a detailed description of the research

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Table 1. Value of U.S. and EU textile and apparel trade flows from 2008 to 2015.

Unit: $billion USD

Trade flow/Year	2008	2010	2012	2013	2014	2015
Textile						
EU export	93.2	78.9	82.4	86.0	89.1	77.1
U.S. export	12.5	12.2	13.5	13.9	14.4	13.9
World share (%)	37.7	31.8	33.7	32.7	33.0	31.2
EU import	97.0	87.4	89.9	95.7	99.7	88.1
U.S. import	23.1	23.4	25.9	27.0	28.3	29.6
World share (%)	45.5	41.5	40.8	40.1	40.7	40.5
Apparel						
EU export	115.3	100.7	109.8	118.0	146.6	130.4
U.S. export	4.4	4.7	5.6	5.9	6.1	6.1
World share (%)	37.8	34.3	31.4	31.0	31.6	30.7
EU import	182.5	172.9	185.6	199.6	217.2	196.5
U.S. import	82.5	81.9	83.2	88.4	83.2	97.7
World share (%)	69.7	69.0	63.6	62.6	62.2	64.8

Note: (1) In the table above, 'EU' refers to 28 members of the European Union. (2) In the table above, 'world share (%)' refers to the combined market share of the United States and the European Union in the world T&A import/export.
Data Source: World Trade Organization, WTO (2016a).

Table 2. Applied simple average MFN tariff by T-TIP members on T&A in 2014.

Unit: %

Country	Textiles	Apparel	All non-agricultural products
United States	7.94	11.99	3.24
European Union	6.55	11.44	4.19

Note: MFN tariff rate applies to all members of the World Trade Organization.
Data Source: WTO (2016b).

Table 3. Value of output in the U.S. and EU textile and apparel industries: 2008–2015.

Product/Year	2008	2010	2012	2013	2014	2015
U.S. textile and apparel industry (Unit: $billion)						
Textile manufacturing (NAICS 313 &314)	17.8	15.6	16.3	16.8	17.3	18.0
Apparel manufacturing (NAICS 315)	11.6	10.5	10.3	10.4	10.8	10.9
EU(28) textile and apparel industry (Unit: € billion)						
Manufacturing of textiles (NACE 13)	81.8	71.6	71.5	71.8	73.6	75.3
Share of Eastern EU (%)	7.2	7.6	8.4	8.9	9.3	9.7
Share of Northern EU (%)	13.7	12.2	12.8	11.8	12.6	13.6
Share of Southern EU (%)	45.9	44.1	42.5	43.2	41.7	40.5
Share of Western EU (%)	33.3	36.2	36.3	36.1	36.4	36.2
Manufacturing of apparel (NACE 14)	82.2	80.6	64.7	63.4	66.8	64.9
Share of Eastern EU (%)	8.9	9.5	9.4	9.9	9.7	10.4
Share of Northern EU (%)	8.1	6.8	6.2	7.2	7.7	8.7
Share of Southern EU (%)	55.5	58.0	59.9	60.8	55.4	56.0
Share of Western EU (%)	27.5	25.7	24.5	22.1	27.1	24.9

Note: NAICS refers to the North American Industry Classification System; NACE refers to the Statistical Classification of Economic Activities in the EU. Classification of Eastern, Northern, Southern, and Western EU countries are based on United Nations Statistics Division (2015).
Data Source: U.S. Census Bureau (2016); Eurostat (2016).

methods and data source of this study. The fourth part presents empirical results and discussion of them. And the last part includes key findings and discussion of future research agendas.

Literature review

To holistically evaluate how T-TIP might shift related T&A trade flows and consequently affect the EU T&A industry, we need to examine the following three aspects critically: first, what is the state of the T&A industry in the United States and the EU? Second, what is the current pattern of T&A trade in the T-TIP region and who are the stakeholders of T-TIP, including both members and non-members of the agreement? Third, how will T-TIP change 'rules of the game' and consequentially affect related T&A trade flows and the EU T&A industry? The following sections will address each of these three aspects accordingly.

State of the U.S. and EU textile and apparel industries

The pattern of T&A trade in a country, including what is being imported and exported, is closely connected with the state of T&A industry in that country. According to the stage of development theory proposed by Toyne, Arpan, Barnett, Ricks, and Shimp (1984), a country's T&A industry, in general, will evolve through six development stages, each of which is with distinct patterns of T&A output and trade. Specifically, in the process moving from early to more advanced stage of development, textile products, especially articles in manufactured fiber content, will gradually account for an increasing share of a country's total T&A output whereas the share of apparel will shrink substantially (Dickerson, 1999). Correspondingly, when gradually advancing through the six development stages, a country will turn itself from a net importer of textiles and a net exporter of apparel to become a net importer of apparel and a net exporter of textiles (Kilduff & Chi, 2006).

Moreover, the development stage of a country's T&A industry is in parallel with that country's overall economic advancement level as well as its accumulation of capitals (Dickerson, 1999). This interesting phenomenon is in large part because of the heterogeneity of textile and apparel production. In general, the textile industry, which mainly involves the spinning, weaving and fabric finishing processes, relies heavily on sophisticated machinery for production. Therefore, manufacturing of textiles is relatively capital and technology intensive in nature and mostly happens in developed countries where capital and technology are relatively abundant (Nordås, 2004). In comparison, the apparel industry, which mainly involves the cloth cutting and sewing processes, requires a lot of labor inputs with low technology and skill entry barriers (Dickerson, 1999). Even today in the twenty-first century, manufacturing of apparel is still highly labor intensive in nature and mostly happens in developing countries where cheap labor is a relatively more abundant production factor (Dicken, 2015).

The stage of development theory provides a valuable theoretical framework to explain the state of the T&A industry in the United States and the EU. Because the United States is one of the most advanced economies in the world, the U.S. T&A industry also has reached an advanced stage of development (Dickerson, 1999; Lu & Dickerson, 2012). As shown in Table 3, capital and technology intensive textile products have accounted for the lion's share of the output in the U.S. T&A industry. For example, measured by value, around 41% of the U.S. fiber production was used to produce technology and capital intensive technical textiles in 2008 (U.S. Census Bureau, 2011; Platzer, 2016). Because of the high labor cost and the rising competition from imports, apparel manufacturing (NAICS 315) has been shrinking

steadily in the United States, accounting for only 37% of the U.S. T&A industry output in 2015, down from approximately 45% in the 2000s (U.S. Census Bureau, 2016). The majority of apparel consumed in the United States today come from overseas (Lu, 2016). From January 2008 to December 2016, the U.S. apparel manufacturing sector (NAICS 315) lost another 93,500 jobs (or down 42%), reflecting a continuous shrinkage of the industry (U.S. Bureau of Labor Statistics, 2017).

The state of the EU T&A industry, in general, also follows the pattern suggested by the stage of development theory (Dicken, 2015; Toyne et al., 1984). As shown in Table 3, EU members remain the world's largest textile and apparel producers and exporters today. The value of industry output totaled €140 billion in 2015 (Statistical Classification of Economic Activities or NACE, sectors 13 and 14), which were divided evenly between textile manufacturing (€75 billion) and apparel manufacturing (€65 billion) (Eurostat, 2016). Specifically, Southern and Western Europe[2] which include most developed EU members, such as Germany, France, and Italy, accounted for more than 76% of EU's textile manufacturing in 2015. Compared with the U.S. textile industry, however, the value of textile products used for apparel assembling purposes still accounted for 34% of EU's total textile output in 2015, whereas the value of technical textiles accounted for 27% (Eurostat, 2016). Apparel manufacturing in EU generally includes two categories: one is the production of low to medium-priced products for the mass market. With relatively abundant cheap labor, developing countries in Eastern and Southern Europe, such as Poland, Hungary, Romania, and Portugal, are the primary suppliers of this type of apparel (Taplin,

2006). The other category is the high-end luxury apparel made by developed EU members, such as Italy, France, and Germany (Dicken, 2015; Lee, Karpova, & Lee, 2014). Premium priced luxury apparel and the strong culture elements involved in the products allow these developed EU countries to continue apparel manufacturing despite their relatively high labor cost (Dunford, Dunford, Barbu, & Liu, 2016).

Pattern of textile and apparel trade in the T-TIP region

In correspondence with the state of the T&A industry in the United States and the EU, T&A trade in the T-TIP region also follows some distinct patterns as illustrated in Figure 1.

First, intra-region trade, i.e. EU members importing and exporting T&A with each other, is an important feature of EU's T&A trade (Dicken, 2015). Statistics show that intra-region trade accounted for 63.5% of EU's total $88 billion textile imports and 53.8% of EU's total $196 billion apparel imports in 2015 (WTO, 2016a). Two factors support EU's intra-region trade for T&A: one is EU's relatively complete T&A supply chain. Specifically, developed countries in Southern and Western Europe, such as Italy and Germany, are the leading textile suppliers for the EU region. Meanwhile, developing countries in Southern and Eastern Europe, such as Poland and Romania, can manufacture apparel for EU's mass market, whereas Southern and Western European countries, such as Italy and France, can make apparel for the luxury market (Taplin & Winterton, 2004; Textile Outlook International, 2015). Moreover, developed EU members, such as UK, Germany, France, and Italy, are the leading apparel import
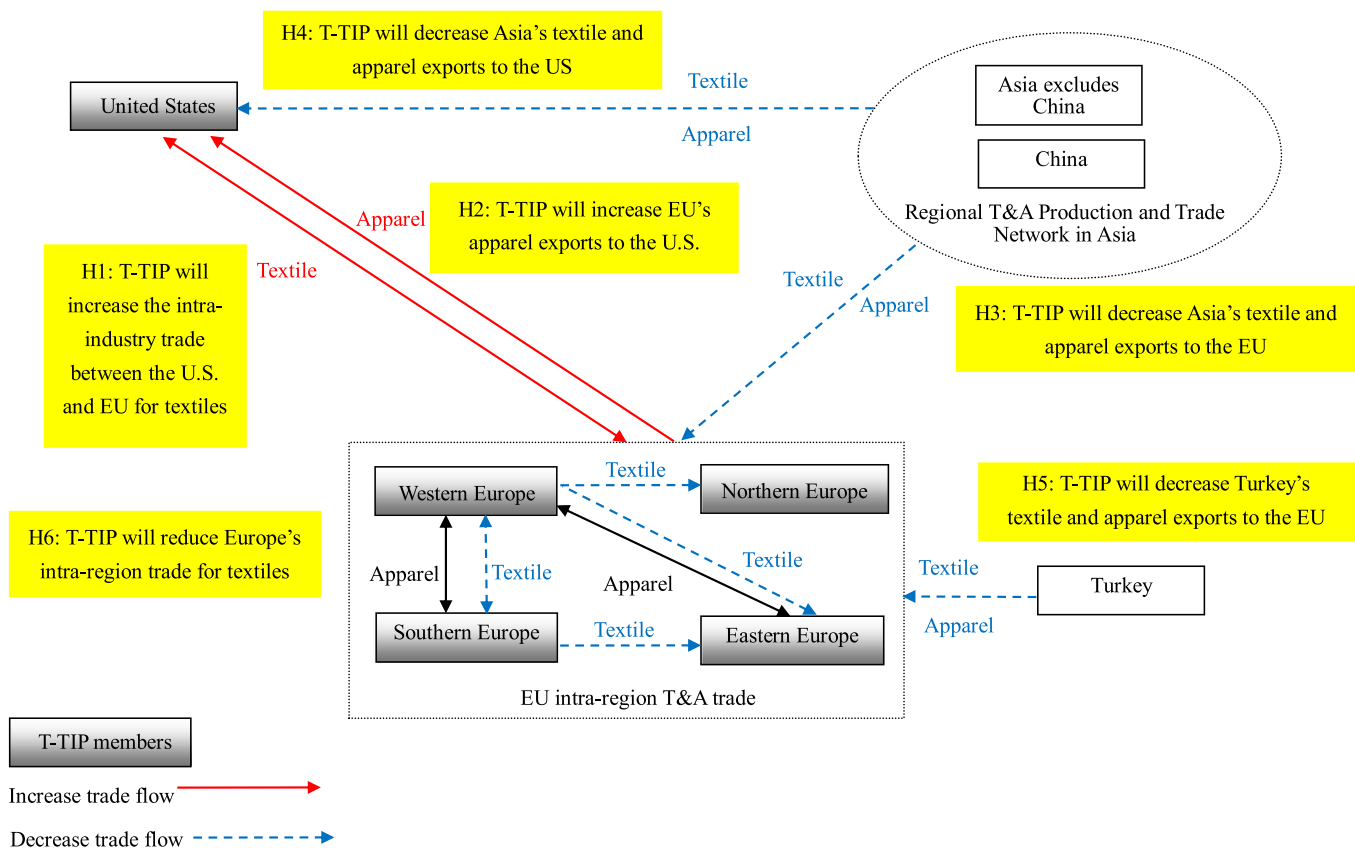

Figure 1. Potential impact of T-TIP on related T&A trade flows.

Table 4. U.S.-EU textile and apparel trade: 2008–2015.

Product/Year	2008	2010	2011	2012	2013	2014	2015
U.S. textile and apparel exports to the European Union (Unit: $million)							
Total exports	2279.0	2230.4	2413.7	2389.7	2508.3	2609.1	2607.9
Share of yarns (%)	22.8	21.4	23.2	21.6	21.2	22.3	25.3
Share of fabrics (%)	40.0	38.7	36.0	36.1	36.3	36.3	33.6
Share of apparel (%)	21.3	25.0	26.1	28.6	29.2	27.6	27.3
Share of made-up textiles (%)	16.0	14.9	14.7	13.7	13.3	13.8	13.8
U.S. textile and apparel imports from the European Union (Unit: $million)							
Total imports	4236.6	3134.1	3594.5	3792.5	4000.2	4368.4	4294.5
Share of yarns (%)	5.2	6.4	6.2	6.1	5.7	5.5	5.6
Share of fabrics (%)	26.4	27.1	25.8	25.4	25.9	25.4	26.6
Share of apparel (%)	49.1	47.2	50.2	51.1	52.1	52.7	51.6
Share of made-up textiles (%)	19.3	19.3	17.9	17.4	16.3	16.4	16.1

Note: 'Made-up textiles' refer to nonapparel textile products, such as sheets, towels, and carpets.
Data source: Office of Textiles and Apparel (2017a, 2017b).

and retail markets in the region because of their relatively high GDP per capita (Dicken, 2015). In addition to the supply chain factor, EU's common market policy also contributes to the formation of the intra-region T&A trade among EU countries. Through lowered tariff and non-tariff barriers, the common market policy allows EU members to source products at a lower cost from other EU partners than from the outside, which significantly boosts trade flows within the EU region, in particular for price-sensitive items like T&A (Archick, 2015).

Second, the United States and the EU are mutually important T&A trading partners. For example, the United States is EU's largest extra-region export market for textiles, and EU's fifth largest extra-region supplier of textiles in 2015 (European Apparel & Textile Confederation, Euratex, 2016). Meanwhile, the EU is one of the leading export markets for U.S.-made technical textiles as well as an important source of high-end apparel products for U.S. consumers (Office of Textiles & Apparel (OTEXA), 2017a, 2017b). Specifically, in 2015, U.S. T&A exports to the European Union totaled $2607.9 million, of which 72.7% were textile products, such as specialty & industrial fabrics, felts & other non-woven fabrics and filament yarns. In comparison, EU's T&A exports to the United States totaled $4294.5 million in 2015, among which textiles and apparel evenly accounted for 48.4% and 51.6%, respectively (Table 4).

Third, because T&A is a global business, U.S. and EU T&A products also face intense market competition from suppliers outside the T-TIP region. For example, Asian countries altogether supplied over 60% of the total value of U.S. T&A imports and more than 70% of the value of EU's extra-region T&A imports in 2015 (Lu, 2016; OTEXA, 2017a; WTO, 2016a). Particularly, Asia includes both developing countries (such as China, Vietnam, and Bangladesh) which can supply low to medium-priced T&A products and developed economies (such as Japan and South Korea), which are competitive producers and exporters of high-end fiber and technical textiles (Dicken, 2015; Dickerson, 1999). Asia's across-the-broad T&A manufacturing capacity implies that except branded luxury apparel, U.S. and EU T&A producers and exporters more or less will compete with 'Made in Asia' in the T-TIP region. Other than Asia, Turkey is another leading T&A supplier, particularly for the EU market. In 2015, Turkey accounted for 16.7% of the total value of EU's extra-region T&A imports, second only to China (Textile Outlook International, 2016). In the EU market, local T&A manufacturers compete with

imports from Turkey mostly for medium-priced made-up textiles (such as sheets, towels, and carpets), cotton fibers and yarns, woven fabrics and apparel products (Karaalp & Yilmaz, 2012).

Impact of T-TIP on the T&A sector: a theoretical view

Some studies have quantitatively evaluated the potential economic impact of T-TIP (such as Welfens & Irawan, 2014; Berden & Francois, 2015; Rojas-Romagosa, 2016). Consistent with the conclusions of standard trade theories, most of these studies suggest that the implementation of T-TIP will benefit the overall economic welfare of its members and increase the trade volume within the T-TIP region (Raza, Grumiller, Taylor, Tröster &Von Arnim, 2014; Pelkmans et al., 2014; Berden & Francois, 2015). However, because of different research design and source of data, researchers couldn't reach a consensus about the potential trade diversion effect of the agreement. For example, while Raza et al. (2014) and Aslan, Kutuk, and Oduncu (2015) found that T-TIP will affect exports of some developing and least developed countries (LDC) to the EU and the United States adversely, Rojas-Romagosa (2016) suggested that T-TIP's trade diversion effect on third-parties would be relatively small because of the pattern of intra-region trade already existed among EU countries.

In comparison, few studies have empirically explored the T&A-specific economic impact of T-TIP. But both the EU and U.S. T&A industries agree that T-TIP, if implemented, will significantly alter the current pattern of T&A trade in the T-TIP region (National Council of Textile Organizations [NCTO], 2014; Euratex, 2015). Notably, T-TIP aims to eliminate both the tariffs and non-tariff trade barriers (NTBs) for T&A products traded between T-TIP members (European Commission, 2014). The lowered tarde barriers exclustive to T-TIP members will help EU and U.S. T&A products increase their price competitiveness in each other's market, at the same time discriminate against products from countries that are not members of the agreement (Akhtar & Jones, 2014; Fugazza & Maur, 2008).

From a theoretical perspective, because most T&A products are with a particuarly high price elasticity of substitution (Nordås, 2004), the price change as a result of the implementation of T-TIP will encourage EU countries and the United States to trade more T&A with each other products, or the so-called trade creation effect (Krueger, 1999). Based on the particular pattern of T&A trade in the T-TIP region, this study proposes that:

H1: T-TIP's trade creation effect will increase the intra-industry trade between the United States and the European Union for textiles.

H2: T-TIP's trade creation effect will increase EU's apparel exports to the United States.

On the other hand, the discriminatory tariff and non-tariff cut under T-TIP will make T&A coming from non-members of the agreement become relatively less price attractive in the EU and U.S. markets. Consequently, T&A suppliers from third-party countries, such as Asia and Turkey, could see a decline of their T&A exports to the T-TIP region, or the so-called trade diversion effect (Krueger, 1999). Based on the particular pattern of T&A trade in the T-TIP region, this study further proposes that:

H3: T-TIP's trade diversion effect will reduce Asia's T&A exports to the European Union.

H4: T-TIP's trade diversion effect will reduce Asia's T&A exports to the United States.

H5: T-TIP's trade diversion effect will decrease Turkey's T&A exports to the European Union.

Additionally, because both the United States and the EU are leading producers of textiles, as a result of lowered tariff and NTBs, it is likely that EU's intra-region trade for textiles will face more competition from increased imports from their competing U.S. producers after the implementation of T-TIP. With that, this study proposes that:

H6: T-TIP will reduce EU's intra-region trade for textiles.

Method and data

Measuring the economic impact of T-TIP

The computable general equilibrium (CGE) model developed by the Global Trade Analysis Project (GTAP) was adopted in this study to evaluate the potential impact of T-TIP on related T&A trade flows and the EU T&A industry. The GTAP CGE model is one of the most popular analysis tools for assessing the economic impact of FTAs (Adams, 2005). Compared with a single-equation econometric model or the partial equilibrium analysis method, the GTAP CGE model puts into consideration the input-output relationship between the T&A industry and other sectors in the setting of an open global economy. Therefore, the CGE model can provide a more systematic evaluation of the economic impact of a shift in trade policy (such as the implementation of T-TIP) and generate estimation results that are closer to the reality of the economy. Many quantitative studies that assessed the macroeconomic impact of T-TIP also adopted the CGE method (such as Francois et al., 2013; Pelkmans et al., 2014; Rojas-Romagosa, 2016).

The GTAP CGE model assumes that in a perfectly competitive market, the production follows the principle of constant returns of scale (Hertel, 1999). The model establishes a multi-country and multi-sector framework of production, trade, and consumption by using a series of behavioral equations and parameters. Values of the endogenous variables are determined when both the product markets and the factor markets of all sectors in all countries covered by the model reach their equilibrium status (i.e. the status of market clearance) based on the aggregate demand and supply (Adams, 2005; Dixon & Jorgenson, 2012).

In the GTAP CGE model, we can use the following behavioral equations to describe a country's decision in production and trade:

First, regarding the supply of product both for the domestic and international market, the value of industry output of product i in country $r[qo(i, r)]$ can be expressed as:

$$qo(i, r) = \text{SHRDM}(i, r) \times qds(i, r) + \sum_{k \in r} \text{SHRXMD}(i, k, s) \times qxs(i, k, s) \quad (1)$$

where: $\text{SHRDM}(i, r)$ denotes the share of domestic sales of product i in country r; $qds(i, r)$ denotes the value of domestic sale of product i produced in country r; $\text{SHRXMD}(i, k, s)$ denotes the share of export sale of product i supplied by country k to region s and there are r number of regions in total; $qxs(i, k, s)$ denotes the value of export sale of product i supplied by country k to region s; r refers to the set of regions.

Second, regarding the demand for imports, the value of imports for product i supplied by country r to region s can be expressed as:

$$qxs(i, r, s) = qim(i, s) - \sigma_M(i) \times [pms(i, r, s) - ams(i, r, s) - pim(i, s)] \quad (2)$$

where: in Equation 2, $qxs(i, r, s)$ denotes the import value of product i supplied by country r to region s; $qim(i, s)$ denotes the value of aggregate import demand for product i in region s; $ams(i, r, s)$ denotes the external price reduction factor for product i supplied by country r to region s; $pim(i, s)$ denotes the composite price of imports for product i in region s. $\sigma_M(i)$ denotes the elasticity of substitution between imports and domestically made commodity for product i in region s. The value of $\sigma_M(i)$ is usually positive, suggesting a competing relationship between imports and the domestically made commodity in an importing country.

Further, the variable $pim(i, s)$ in Equation 2 mathematically equals the weighted average price of imports from all import sources for product i, i.e.:

$$pim(i, s) = \sum_{k \in r} \text{MSHRS}(i, k, s) \times pms(i, k, s) \quad (3)$$

where: $MSHRS(i, k, s)$ denotes the share of product i supplied by country k to region s and $pms(i, k, s)$ denotes the import price of product i supplied by country k to region s. r refers to the set of regions.

Additionally, the variable $pms(i, r, s)$ in Equation 3 is affected by the tariff rate applied to product i supplied by country r to region s $[tms(i, r, s)]$ and the cost, insurance, and freight (CIF) price of product i supplied by country r in region s $[pcif(i, r, s)]$, i.e.:

$$pms(i, r, s) = tms(i, r, s) + pcif(i, r, s) \quad (4)$$

When using the CGE model to assess the economic impact of a policy shock (such as the elimination of tariff and NTBs) under the framework of a multi-country and multi-sector open economy, the exogenous variable representing the policy shock (such as $tms(i, r, s)$) will be assigned a corresponding new value. The CGE model will then calculate the new equilibrium status for both the product markets and the factor markets by solving Equations 1 to 4 simultaneously. The economic impact of the

policy shock is reflected by the value change of the endogenous variables $pms(i, r, s)$, $qxs(i, r, s)$, $qo(i, r)$, $qds(i, r)$, and $pim(i, s)$ at their initial and the new equilibrium status (Adams, 2005; Hertel, 1999).

Data source

The latest version of the GTAP9 database was used to run the CGE model in this study (Narayanan & Walmsley, 2015). According to the research objectives and proposed hypotheses, we categorize the 57 industry sectors included in the GTAP9 database into three groups: *Textile* (International Standard Industry Classification System, ISIC code 17 and code 243), *Apparel* (ISIC code 18), and *Others* (including all other 55 sectors). For the purpose of the study, we further categorize the 140 countries included in the GTAP9 database into five groups: *EU*, *US*, *Asia, Turkey,* and *Rest of the world*.

Because T-TIP intends to cut both tariff and NTBs on T&A traded between its members (Akhtar & Jones, 2014), to fully capture and compare the effects of these two types of policy changes, we estimated the following four scenarios in the study:

Scenario 1 (50% tariff reduction) assumes that import tariff rates for T&A traded between T-TIP members were reduced by 50% from their applied rate in 2014 (i.e. the value of exogenous variable $tms(i, r, s)$ in Equation 4 was reduced by half).

Scenario 2 (100% tariff reduction) assumes that import tariff rates for T&A traded between T-TIP members were reduced to zero from their applied rate in 2014 (i.e. the value of exogenous variable $tms(i, r, s)$ in Equation 4 was reduced to zero).

Scenario 3 (50% tariff + 10%NTB) assumes that in addition to 50% reduction of applied tariff rate in 2014, price of T&A exports from a T-TIP member to another T-TIP member were reduced by 10 percent as results of lowered NTBs (i.e. the value of exogenous variable $tms(i, r, s)$ in Equation 4 was reduced by half, plus the value of exogenous variable $ams(i, r, s)$ in Equation 2 was

set as 10%). Many GTAP-based studies adopt a similar approach when evaluating the economic impact of NTBs removal on trade flows and industry activities (such as Jensen & Sandrey, 2015).

Scenario 4 (100% tariff + 10%NTB) assumes that in addition to 100% reduction of applied tariff rate in 2014, price of T&A exports from a T-TIP member to another T-TIP member were reduced by 10 percent as results of lowered NTBs (i.e. the value of exogenous variable $tms(i, r, s)$ in Equation 4 was reduced to zero, plus the value of exogenous variable $ams(i, r, s)$ in Equation 2 was set as 10%).

Comparing the results in scenario 1 and scenario 2 can help reveal how different degree of tariff elimination under T-TIP might affect related T&A trade flows and the EU T&A industry. Whereas scenario 3 and 4 intend to specifically reveal the potential impact of NTB removal under T-TIP (Fugazza & Maur, 2008).

Results and discussions

As summarized in Table 5, results of the GTAP CGE model estimation show that the implementation of T-TIP will have a significant impact on related T&A trade flows in the T-TIP region and consequently affect the EU T&A industry.

First, results of the CGE model estimation support *H1* that the implementation of T-TIP would expand the U.S.-EU intra-industry trade for textiles. Specifically, compared with the base-year level in 2011, the annual U.S. textile exports to the EU are suggested to increase by $375.5 million in the *50% tariff reduction scenario*, $751.0 million in the *100% tariff reduction scenario*, $1520.1 million in the *50% tariff + 10%NTB scenario*, and $1896.0 million in the *100% tariff + 10%NTB scenario*, when other factors remain constant. Likewise, T-TIP would also lead to the expansion of EU's annual textile exports to the United States by $673.2 million in the *50% tariff reduction scenario*, $1790.0 million in the *100% tariff reduction scenario*, $2757.0 million in the *50% tariff + 10%NTB scenario*, and $3430.0 million in the *100% tariff + 10%NTB scenario*, when other factors remain constant. Notably, technical textiles have accounted for the lion's share in the U.S.-EU bilateral textile trade in 2015 (OTEXA, 2017a, 2017b). Both the U.S. and the EU textile industry also has been shifting to make more high-value-added technical textiles in the total industry output (Chi, Kilduff, & Dyer, 2005; Textile Outlook International, 2015). Therefore, it is reasonable to expect that technical textiles could be among the categories of products that contribute the most to the expanded U.S.-EU trade in textiles after the implementation of T-TIP.

Second, results of the CGE model estimation support H2 that the implementation of T-TIP will expand EU's apparel exports to the United States. Specifically, compared with the base-year level in 2011, EU's annual apparel exports to the United States will increase by $895.3 million in the *50% tariff reduction scenario*, $1790.0 million in the *100% tariff reduction scenario*, $2234.2 million in the *50% tariff + 10%NTB scenario*, and $3129.9 million in the *100% tariff + 10%NTB scenario*, when other factors remain constant. Further, results show that countries located in Southern and Western EU, including Italy, Germany, and France, which concentrate on high-end luxury apparel production (Scheffer, 2012), will contribute the majority of EU's expanded apparel exports to the United States in all scenarios (i.e. 81.6% in the

Table 5. Impact of the T-TIP: volume change of related trade flows (Base year = 2011).

Unit: $million

Source of imports/scenarios	50% tariff reduction	100% tariff reduction	50% tariff + 10% NTB	100% tariff + 10% NTB
EU textile imports				
From the world	245.7	491.8	681.4	927.3
From EU	−63.2	−126.3	−413.1	−476.7
From US	375.5	751.0	1520.1	1896.0
From Asia	−46.9	−93.6	−297.5	−343.6
From Turkey	−11.8	−23.7	−73.1	−84.9
EU apparel imports				
From the world	111.0	221.8	255.5	366.3
From EU	−63.4	−126.7	−188.4	−251.5
From Asia	−80.1	−160.6	−297.5	−346.5
From Turkey	−11.0	−22.0	−35.4	−46.4
U.S. textile import				
From the world	814.0	600.0	1031.0	1331.0
From EU	673.2	1790.0	2757.0	3430.0
From Asia	−262.4	−526.8	−1218.0	−1481.0
U.S. apparel import				
From the world	407.0	814.0	884.0	1291.0
From EU	895.3	1790.0	2234.2	3129.9
From Asia	−377.0	−754.0	−1042.5	−1420.0

50% tariff reduction scenario, 81.0% in the *100% tariff reduction scenario,* 79.1% in the *50% tariff + 10%NTB scenario* and 79.6% in the *100% tariff + 10%NTB scenario).* This result is consistent with some industry assessments, which also expect T-TIP to lead to an expansion of EU's high-end luxury apparel exports to the United States (Euratex, 2017).

Third, results of the CGE model estimation support H3 and H4 that T-TIP's trade diversion effect would affect T&A exports from non-members of the agreement to the T-TIP region negatively. For example, as a result of T-TIP, compared with the base-year level in 2011, T&A exports from Asian countries to the EU will decrease annually by $127.0 million in the *50% tariff reduction scenario*, $254.2 million in the *100% tariff reduction scenario*, $595.0 million in the *50% tariff + 10%NTB scenario* and $690.1 million in the *100% tariff + 10%NTB scenario* when other factors remain constant.

Similarly, compared with the base-year level in 2011, Asia's T&A exports to the United States will decrease annually by $639.4 million in the *50% tariff reduction scenario*, 1280.8 million in the *100% tariff reduction scenario*, $2260.5 million in the *50% tariff + 10%NTB scenario* and $2901.0 million in the *100% tariff + 10%NTB scenario,* when other factors remain constant. Interesting enough, it seems T-TIP overall will affect Asia's T&A exports more negatively in the U.S. market than in the EU, although we need to explore the specific reasons further.

Additionally, after the implementation of T-TIP, compared with the base-year level in 2011, Turkey's T&A exports to the EU will decrease annually by $22.8 million in the *50% tariff reduction scenario*, $45.7 million in the *100% tariff reduction scenario*, $108.5 million in the *50% tariff + 10%NTB scenario* and $131.3 million in the *100% tariff + 10%NTB scenario*, when other factors remain constant. However, compared with their counterparts in Asia, T&A exporters in Turkey appear to be more resilient toward T-TIP's trade diversion effect. Because Turkey's T&A exports to the EU concentrate on a small number of product categories, the limited export capability somehow reduces Turkey's exposure to the market competition with T&A products originating from the T-TIP region (Textile Outlook International, 2015, 2016).

Fourth, results of the CGE model estimation support H6 that the implementation of T-TIP will reduce the volume of EU's intra-region trade for T&A. Compared with the base-year level in 2011, T-TIP will result in the decline of EU's annual intra-region trade for T&A by $126.6 million in the *50% tariff reduction scenario*, $253.0 million in the *100% tariff reduction scenario*, $601.5 million in the *50% tariff + 10%NTB scenario* and $728.2 million in the *100% tariff + 10%NTB scenario*, when other factors remain constant. The most decline of EU's intra-region trade will occur in the textile sector, especially when we factored in the cut of NTB in the assessment. Nevertheless, this result is consistent with the current pattern of U.S.-EU T&A trade, i.e. the United States is a major supplier of textiles to the EU market but not for the apparel category (OTEXA, 2017b). Nevertheless, it seems that EU's intra-region trade for T&A will remain in good shape after the implementation of T-TIP. Even in the worse scenario (i.e. *100%tariff + 10%NTB*), T-TIP will only result in a 1.3% decline of EU's intra-region trade for textiles and a 0.9% decline for apparel.

Conclusions and future research agenda

This study provides a quantitative evaluation of the potential impact of the implementation of T-TIP on related T&A trade flows and the EU T&A industry, focusing on the effect of tariff elimination and reduction of non-tariff barriers under the agreement. By adopting the GTAP CGE model based on the GTAP9 database, major findings of the study include.

First, the trade creation effect of T-TIP will expand the intra-industry trade between the United States and the EU for textiles and significantly expand EU's apparel exports to the United States.

Second, the trade diversion effect of T-TIP will affect the T&A exports from non-members to the T-TIP region negatively, including Asia's T&A exports both to the U.S. and EU markets as well as Turkey's T&A exports to the EU market.

Third, T-TIP will reduce the trade flows of EU's intra-region trade for T&A, but in a limited way.

Findings of this study augment our understanding of the T&A-specific sectoral impact of T-TIP and shed light on the new market environment after the implementation of the agreement for T&A businesses on both sides of the Atlantic. For policy-makers, findings of this study also provide valuable inputs supporting the T&A sectoral negotiation under T-TIP and related policy-making in response to the implementation of the agreement. Additionally, the findings have two other important implications.

First, the results suggest that T-TIP overall means more of an opportunity than a threat to the EU T&A industry. Particularly, the EU T&A industry will benefit from the additional market access opportunities created by the agreement. One important factor is that the U.S. and EU T&A industries do not constitute a major competing relationship. For example, the United States is no longer a major apparel producer, and EU's apparel exports to the United States fulfill U.S. consumers' demand for high-end luxury products (Lee et al., 2014; Lu & Dickerson, 2012). T-TIP is also likely to create additional export opportunities for EU textile companies in the U.S. market, especially in the technical textiles area, which accounted for approximately 40% of EU's total textile exports to the United States in 2015 measured in value (Eurostat, 2017). Euratex, the largest association representing the EU T&A industry, also sees opening business opportunities in the U.S. technical textile market a prioritized objective in the T-TIP negotiation (Euratex, 2017).

Compared with traditional yarns and fabrics for apparel making purposes, technical textiles are with a greater variety in usage, which allows EU companies to be able to differentiate products and find their niche in the U.S. market (Chi et al., 2005).

The results also suggest that in addition to tariff elimination, we shall pay attention to the details of non-tariff barrier removal under T-TIP. As shown in Table 5, the scenario *50% tariff + 10%NTB* and scenario *100% tariff + 10%NTB* will exert a larger impact on trade flows than the other two scenarios which only considered the factor of tariff elimination. This finding is consistent with several existing studies which argue that the impact of T-TIP will be more reflected in the removal of NTBs and the achievement of regulatory coherence than tariff cut (Akhtar & Jones, 2014; Francois et al., 2013).

Despite the meaningful and interesting results, this study also has several limitations that future research might overcome. First, although this study applies the latest GTAP9 database to assess the impact of T-TIP, the database is only able to provide a base-year scenario based on economic activities going back to 2011. Because of the changing landscape of the world economy since 2011, the time lag could affect the accuracy of some parameters used in the GTAP model, such as the elasticity of substitution. Future studies might update values of these parameters based on more recent data available from other sources or adopt a dynamic GTAP model to include data of multiple years in the analysis. Second, assessment of the impact of T-TIP is limited to trade patterns and industry output in this study. Given the grave concerns about job losses in the U.S. and EU T&A industries after the implementation of the agreement, future studies can continue to investigate the employment impact of the agreement. Third, as of the time of analyzing the data for this paper, UK remained a member of the EU. However, as a result of the referendum took place in June 2016, the UK has announced to leave the European Union, i.e. the so-called 'Brexit' (Jessop, 2017). Because the UK is a major player in the EU T&A industry, future studies may further evaluate how the factor of Brexit will affect the economic impact of T-TIP, especially on the T&A sector.

Notes

1. Except otherwise explained, in this paper, 'EU' refers to the European Union (28 members), not the whole Europe.
2. The classification is based on the United Nations Statistics Division (2015): Eastern Europe includes Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovakia. Northern Europe includes Denmark, Estonia, Finland, Ireland, Latvia, Lithuania, Sweden, United Kingdom and Slovakia. Southern Europe includes Croatia, Greece, Italy, Malta, Portugal, Slovenia and Spain. Western Europe includes Austria, Belgium, France, Germany, Luxembourg, and Netherlands.

Disclosure statement

No potential conflict of interest was reported by the author.

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