At the roots of China's striking performance in textile exports: A comparison with its main Asian competitors

At the roots of China's striking performance in textile exports: a comparison with its main Asian competitors*

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*Highlights (for review)

Highlights

- China's textile exports recorded an extraordinary and unexpected growth since 2001
- All its rivals, and especially Asian competitors, were outperformed or displaced
- We extend Lall & Albaladejo's analysis (World Devel., 2004) in a panel data context
- Three channels of trade competition are identified: price, quantity and quality
- China mainly competes in price and quantity, but is weak in quality improvement

Abstract

This paper analyzes the determinants of China's striking performance in textile exports in the time period 2001-2016. We integrate the analysis by Lall and Albaladejo (World Development, 2004), based only on China and its main Asian competitors' market share dynamics, by estimating an extended version of a traditional export function, derived from the imperfect substitute model, including a proxy of non-price competitiveness. The key long-run elasticities for each Asian exporter are thus computed and discussed in a panel-data framework, and the different export performances are examined taking into account the interaction between the estimated parameters and the growth rates of relative prices, foreign demand and product quality. Lastly, we decompose the textile export growth differences between China and its rivals into the three main channels of trade competition, i.e. price, quantity and quality. Our findings show that China is crowding out most of its rivals with a competitive strategy based on a mix of low and decreasing relative prices and non-price policies aiming at stimulating export volumes. However, certain weaknesses in the Chinese trade prospects emerge when quality improvement is considered.

Keywords: Textile exports, Outperformance, Displacement, Competitiveness, Cross-country comparisons, Panel data analysis.

JEL classification: C23, F14, F62, F63, L67, P52.

1 Introduction

According to the Heckscher-Ohlin theory, countries tend to specialize in the production and export of goods which use as inputs the factors of production that are relatively more abundant. Consequently, as economic development proceeds, countries are expected to specialize increasingly in capital-intensive products and abandon labor-intensive ones. This implies, in general, that developed economies shift their output and export composition toward more high-tech products, while developing countries tend to concentrate on traditional sectors. International competition is thus stronger in countries with similar factor endowments, and vice versa.

In recent decades, the implementation and gradual abolition of the Agreement on Textiles and Clothing (ATC) and China's subsequent accession to the World Trade Organization (WTO), leading to the dismantling of tariff and non-tariff barriers to exports, have triggered profound changes in the dynamics and composition of world trade,[1] with large effects on the international division of labor and the organization of production processes. China in fact became the first world exporter at the end of the 2010s, overtaking Germany and the USA.[2]

Literature on the impact of Chinese export performance on world trade has flourished, and a survey of its main findings would require an entire *ad hoc* paper (see, for example, Goldstein et al., 2006 and Winters and Yusuf, 2006). Focusing on empirical studies investigating the repercussions of China's export success on its neighboring Asian economies, which are the most exposed to the Chinese competitive threat because of their geographical proximity and output specialization,[3] Lall and Albaladejo (2004) find that Chinese Taipei, Hong Kong, Korea and Singapore suffered the greatest market share losses, with Japan also appearing as a vulnerable exporter. Similar conclusions are obtained by Greenaway et al. (2008), who find that China has crowded out many high-income Asian exporters, while Eichengreen et al. (2007) and, more recently, Kong and Kneller (2016) observe that the growth of Chinese exports has had a positive effect on high-income and middle-income Asian economies (Japan, Singapore and South Korea, and Malaysia and the Philippines, respectively), with negative effects confined to low-income Asian countries (Bangladesh, Cambodia, Pakistan and Sri Lanka).

Furthermore, when specific industries are considered, Pham et al. (2017) find that, in high-tech products, China displaced its developing competitors (India, Malaysia, Singapore, Thailand and Vietnam), with stronger effects especially in the period prior to the global financial crisis of 2008. With regard to textiles and clothing, Amman et al. (2009) find that higher-income Asian economies fared better than their lower-income counter-

[1] The ATC was a 10-year transitional trade agreement allowing for selective application of tariffs and quotas, which replaced the more restrictive Multi-Fibre Agreement signed in 1995.

[2] China's market share of total world merchandise exports increased from 4.30 per cent in 2001 to 13.09 per cent in 2016.

[3] A recent survey on this is provided by Amman et al. (2009).

parts in the time period 1990-2005.

In line with the Heckscher-Ohlin theory, the extraordinary rise of China's market share in world trade has been accompanied by a notable change in its export structure, shifting away from traditional to more sophisticated goods (Yue and Hua, 2002; Athukorala, 2009; Caporale et al., 2015; Pham et al., 2017). In fact, China has also become one of the top high-tech exporters since 2013.[4] However, and contrary to the implications of the Heckscher-Ohlin model, China has also become the top world exporter in a very traditional sector like textiles, where its world market share more than tripled in the period 2001-2016, rising from 10.66 to 36.22 per cent.[5,6] The clothing sector showed a similar performance, although at a lower rate, since the Chinese market share practically doubled in the same period (Baiardi et al., 2015a). The textile sector is thus a very interesting case study in order to investigate the reasons at the roots of China's striking success and its future prospects with regard to its competitors. In fact, despite the low incidence of world's textile exports on total merchandise trade (1.8 per cent in 2016), the sector is still an important source of output and employment in many countries, with positive effects in terms of growth performance and balance of payment equilibrium. In particular, this industry is fundamental for the Pakistani economy, where textile exports reach the astonishing figure of 37.58 per cent of total merchandise sales abroad.

The empirical analysis developed in this paper is original in many aspects. The country sample includes China and its main Asian competitors in the textile industry, selected according to their export performance in 2016. The time span investigated is the most recent period for which figures are available, 2001-2016, in order to capture the effects of China's extraordinary success after its accession to the WTO. The methodology proposed is an extension of the analysis made by Lall and Albaladejo (2004), who consider however only the dynamics of relative export market shares during the 1990s and use data in monetary values. Lall and Albaladejo (2004) thus overlook the behavior of quantities, absolute and relative prices and their interdependence with traded volumes. In fact, a change in the relative price of an exported good can have either a positive or a negative effect on the market share in value, depending on the price elasticity of its export function. If the export function is price-elastic, a variation in relative prices triggers a more than proportional change in quantities exported, with a consequent opposite repercussion on the dynamics of market shares in values. Hence a more accurate and thorough analysis

[4]Despite this extraordinary performance, the value added embodied in China's high-tech products is low, as documented by Athukorala (2009), Kuroiwa (2014), Pham et al. (2017) and Nguyen and Wu (2018). These studies also contest the frequent claim that the sophistication of China's export basket is rapidly approaching that of most advanced industrial countries. In fact, separating China's high-tech export data into final goods and components in the years 1992-2005, Athukorala (2009) finds that China is becoming a final assembler of East Asian production networks. China's concentration on final assembly reveals a persistent relative comparative advantage in labor-intensive products.

[5]China's textile exports were 105 USD billion in 2016, a value that is nearly seven times that of India, the second largest exporter, with 16 USD billion.

[6]Germany was the leading exporter in this industry until 1999, when it was overtaken by China.

of China's export performance needs to consider the joint behavior of relative prices and quantities, together with their interdependence as formalized by an estimated export demand function.

Thus, after an introductory analysis of market share behavior, we proceed with a panel-data estimation of an extended version of the traditional export function derived from the imperfect substitute model, which, following recent indications of 'new trade theory', also includes a proxy of non-price competitiveness (Algieri, 2014; Athanasoglou and Bardaka, 2010). The estimated long-run elasticities for China and its main Asian competitors are discussed within a more general framework, which also considers their interaction with the growth rates of relative prices, foreign demand and quality content of exported goods. Finally, for the first time in the empirical literature, our approach decomposes the difference in growth between China and rival countries' textile exports into the three main channels in which trade competition occurs, i.e. price, quantity and quality. In particular, price competitiveness traditionally refers to the comparative level of relative prices, while non-price competitiveness depends on factors related to export composition and promotion, product specialization, market destination, trade barriers, as well as the quality level of exported products (Krugman, 1989; Schott 2004; Hallak, 2006, Bernard et al., 2006; Fu et al., 2012).

The rest of the paper proceeds as follows. Section 2 outlines the criteria chosen for the selection of China's competitors in world textile trade and briefly describes the main stylized facts related to this trade. Section 3 presents the empirical framework adopted and outlines the three channels through which export competition can occur and the conditions for testing China's export performance *vis à vis* its competitors. Section 4 describes the data used in the subsequent analysis together with their relevant statistics. Section 5 discusses the empirical results and their main implications for interpreting the observed events. Section 6 complements the previous results with an additional investigation of the similarity between China's textile exports and those of its competitors. Finally, Section 7 briefly concludes.

2 A general overview of textile industry developments

2.1 Selection of China's competitors in world textile trade

China's textile export competitors investigated in this empirical analysis are selected among the top world traders whose market share was greater than 1 per cent in 2016, the last year for which disaggregated data are currently available.

Table 1 about here

As shown in Table 1, the top exporter is China, with an export value of 104,663 million USD and a corresponding market share of 36.22 per cent, followed by India, Germany and the USA, with market shares of 5.61, 4.63 and 4.47 per cent respectively. Indonesia, the United Kingdom and Thailand are the bottom countries, with market shares of 1.42, 1.26 and 1.17 per cent, respectively. Focusing on Asian exporters, the selected competitors, in alphabetical order, are thus Chinese Taipei, Hong Kong, India, Indonesia, Japan, Korea, Pakistan, Thailand, Turkey, and Vietnam. These countries, together with China, can be grouped into two distinct clusters according to their stage of economic development. We distinguish between developing Asian economies (China, India, Pakistan, Thailand, Turkey and Vietnam) and developed Asian economies (Chinese Taipei, Hong Kong, Japan, Korea and Taiwan). The former group records a total export value of 153,228 million USD and a market share of 53.02 per cent, while the latter shows a lower total export value of 33,331 million USD and a market share of 11.53 per cent. Asian countries as a whole account for an export value of 186,559 million USD and a market share of 64.56 per cent, and play a key role in textile exports.

2.2 The textile industry: some stylized facts

According to growth theory, as economic development proceeds, countries tend to shift their productive activities from agriculture to industry, and then from industry to services. This implies a change in the composition of output from labor-intensive towards capital-intensive products. This process also affects exports. Since the textile sector is a labor-intensive industry, this shift is expected to be empirically observed mainly in advanced countries.

Figures 1 and 2 about here

Figures 1 and 2 show that for the top exporters reported in Table 1, the production specialization shift predicted by theory generally occurs in both Western and Asian developed economies. Their total sectoral market shares decrease on average by 2.02 and 3.33 percentage points, respectively, in the period 2001-2016. Figure 2 also shows China's spectacular increase in the textile export market share in the years after its accession to the WTO (25.56 per cent). Most of the other developing Asian countries show a similar rising trend, although at lower rates: 2.11, 1.94 and 1.28 per cent for India, Vietnam and Turkey, respectively. Indonesia, Pakistan and Thailand are the only exceptions, showing a generally oscillating market share.

The case of China is very interesting from various points of view. First, the outstanding growth of market share suggests that China's exports are not only eroding market shares of its regional neighbors, but are also detrimental to Western exporters (Lall and Albaladejo, 2004 and Roland-Holst and Weiss, 2005). Secondly, Chinese export growth is clearly linked to the fact that the General Agreement on Tariffs and Trade (GATT) Uruguay Round came into effect in 1995, bringing the textile and clothing sectors under the jurisdiction of the World Trade Organization (WTO), which China joined in 2001. Moreover, the

Agreement on Textile and Clothing (ATC) established a gradual dismantling process of the quotas that existed under the Multi Fibre Arrangement (MFA), which ended in 2005.[7]

As predicted by trade theory, China's economic development process has produced a shift in its export composition away from conventional labor-intensive goods to more sophisticated product lines, well documented in the recent literature (see, among others, Athukorala, 2009; Yue and Hua, 2002; Caporale et al., 2015; Pham et al., 2017). China has in fact become the world's leading exporter of high-tech products since 2013. Its outstanding performance in the textile sector shown in Figure 2 may however appear surprising, and it is interesting to take a closer look at these changes in the composition of international trade.

A preliminary analysis can be made using the Balassa index, a very popular indicator in international economics for measuring the Relative Comparative Advantage (RCA) of a given country in a specific industry or type of goods.[8] The RCA is here computed for the textile sector and high-tech industries, identified following Pham et al. (2017).[9] The results of these computations are shown in Figure 3.

Figure 3 about here

It is interesting to note that China shows the highest comparative advantage in textiles as well as in electronics-telecommunications; the Balassa indices of these sectors are equal to 2.77 and 2.58-2.74 respectively in 2016. In all other high-tech sectors, the RCA is significantly lower, especially in the case of scientific instruments (1.08), chemicals (0.51) and pharmaceuticals (0.19). It is also interesting to note that, in the period 2001-2016, the Balassa index in the textile sector increases from 2.48 to 2.77. On the other hand, in the case of clothing, which is a similar industry, the sectoral RCA falls from 4.16 to 2.64.

Furthermore, with regard to the textile sector, the average RCA index in the period 2001-2016 is greater than 1 for all Asian exporters, with Japan as the only exception.[10] After China's accession to the WTO, it is significant that the only two economies where the RCA index increases slightly over time are China and Pakistan. Pakistan has a very high specialization in textile exports, with a share on total exports of 37.58 per cent in 2016, and an RCA index equal to 20.64. Turkey and India also show RCA values higher

[7]The last twenty years have been also turning points for Turkey and Indonesia. Turkey, in particular, after the shift from an import substituting to an export-led growth strategy in the 1980s, strengthened its association with the European Union in the 1990s, obtaining 'preferential supplier status'. Similarly, export-oriented policies have been implemented in Indonesia starting from the mid-1980s.

[8]The Balassa index is the ratio between any country's share of exported goods in total exports and the corresponding world share. An exporter has a comparative advantage in a particular industry or good if its RCA index is greater than unity. The data used for the RCA computations are retrieved from the WTO Statistics Database - Time Series on International Trade.

[9]These high-tech industries are: chemistry, computer-office machinery, electrical and non-electrical machinery, electronics-telecommunications, pharmacy and scientific instruments.

[10]In this case, the average index is equal to 0.60, with a further reduction to 0.55 in 2016.

than China (4.20 and 3.37 in 2016), although their decrease in the time period 2001-2016 is considerable, and particularly marked for India (2 percentage points). The RCA decrease is also high for Korea and Hong Kong, with percentage reductions close to that of India.

The dynamics of the RCA index also make it possible to compare the evolution of any country's market share of textile exports (s^v_{Tj}) with that of the overall share of total exports in merchandise trade (s^v_j). In fact, given the definition of the index, a few algebraic manipulations yield the following Identity (1),[11]

$$s^v_{Tj} = RCA_{Tj} s^v_j \tag{1}$$

which shows that the market share of textile exports can be decomposed into the product of the Balassa sectoral index (RCA_{Tj}) and of the total merchandise market share of exporter j. Thus, focusing on the case of China in 2001-2016, Identity (1) shows that the spectacular increase in market share of textile exports (at a rate of 8.5 yearly percentage points) may be attributed mostly to the increase in China's general competitiveness. This led to a similar increase in overall export share (7.7 yearly percentage points), but also to an increase in relative comparative advantage (0.8 per cent annually). Thus, although China's development process has led a reduction in the ratio of textile exports to total merchandise exports (from 6.32 in 2001 to 4.99 per cent in 2016), in line with international trade theory, the increase in the textile RCA has enabled the country to increase its sectoral market share (from 10.66 to 36.21 per cent) at a rate faster than that of total export share (from 4.30 to 13.09 per cent).[12] These figures suggest that it is important to investigate the forces behind China's striking performance in textile exports.

3 The testing framework

3.1 China's competitive strategies: a preliminary analysis based on market share dynamics

Traditionally, the empirical literature uses the terms '*crowding out*' or '*displacement*' to indicate the consequences of China's extraordinary export growth at the expense of its competitors. To the best of our knowledge, a key contribution on this topic is the paper by Lall and Albaladejo (2004), one of the first studies on the potential '*export threat*' posed by China on international markets.[13]

[11] For details, see Appendix A.

[12] The increase in China's textile RCA index implies that the country's reduction in the ratio between textile and total exports was smaller that that of the whole world in the period under consideration.

[13] Other popular contributions on this issue, investigated according to different methodologies, are those by Eichengreen et al. (2007), Greenaway et al. (2008), Athukorala (2009), and, more recently, Pham et al. (2017).

Given the dynamics of China's exports relative to those of its competitors, and the resulting impact on market shares, Lall and Albaladejo (2004) identify five possible outcomes as follows:

1. '*Partial Threat*', when both China and its competitors exhibit a positive world market share dynamics, but China's exports grow *faster* than those of its competitors;
2. '*No Threat*', when both China and its competitors exhibit a positive world market share dynamics, but China's exports grow *slower* than those of its competitors;
3. '*Direct Threat*', when China gains market shares and its competitors lose;
4. '*China under Threat*', when China loses market shares and its competitors gain;
5. '*Mutual Withdrawal*', when both China and its competitors lose market shares.

Lall and Albaladejo (2004) consider all types of exported goods, classified according to their technological content, in the period 1990-2000. Their focus is on China's competitive threat to its East Asian neighbors, and they benchmark performance by technology and market. As noted above, their study does not take into consideration the most interesting recent period, characterized by an extraordinary growth of Chinese exports in general, and textile goods in particular. In fact, the Chinese market share in manufactured exports increased by 2.1 percentage points in the 1990s compared to 8.8 points in the period 2001-2016. In the textile industry this trend was even stronger, and China's market share increase rose from 3.9 to 25.6 points in the two sub-periods.

Furthermore, in evaluating the potential for China's competitive threat, Lall and Albaladejo (2004) consider only the dynamics of relative export market shares using data in monetary value, thus overlooking the behavior of quantities and that of absolute and relative prices. Actually, market shares in terms of monetary values are equal to the product of market shares in quantities and relative prices. In fact, at the aggregate level, for any country j and any year t,[14] we have that

$$s_j^v = \frac{p_j x_j}{p_w x_w} = \frac{p_j}{p_w} \cdot \frac{x_j}{x_w} = rp_j \cdot s_j^q \tag{2}$$

where x_j and x_w are the volumes exported by country j and all world exporters, respectively, p_j and p_w their absolute prices, rp_j the consequent relative prices of country j and s_j^q its market share in quantity. It follows that if the relative price increases, the market share in monetary value will show more favorable dynamics than in quantity, because the rising relative price will reinforce the volume effect. However, at the same time, the market share in quantity depends on relative prices, because exports in turn also depend on relative prices among other variables. So, on the one hand, given Identity (2), a relative

[14] For the sake of simplicity, we omit the time subscript t.

price increase directly improves s_j^v, but, on the other hand, the indirect negative effect on exported quantities reduces both s_j^q and s_j^v.

In particular, a change in the relative price of an exported good can have either a positive or a negative effect on the market share in value, depending on the price elasticity of its export function. In fact, if the export function is price-elastic, a variation in relative prices triggers a more than proportional change in exported quantities, with a consequent opposite repercussion on the dynamics of market shares measured in monetary values. An accurate analysis of China's export performance therefore needs to consider the joint behavior of relative prices and quantities, and their interdependence as formalized by an estimated export demand function.

China's performance can be compared with its competitors' performance in the following way. Consider textile exports in volumes for China (x_c) and those of any trade competitor (x_z), from now on expressed in logarithmic terms: the difference in export dynamics is thus given by $\dot{x_c} - \dot{x_z}$, which may be either positive or negative. [15] By adding and subtracting from this difference the growth rate of world exports ($\dot{x_w}$), $\dot{x_c} - \dot{x_z}$ can be rewritten as $\dot{s}_c^q - \dot{s}_z^q$, where $\dot{s}_c^q = (\dot{x_c} - \dot{x_w})$ and $\dot{s}_z^q = (\dot{x_z} - \dot{x_w})$ are the growth rates of the textile export world share in volumes for China and any one of its rivals z, respectively.

Furthermore, given that $\dot{s}_c^q > 0$ is always verified, as it is equal to 9.53 annual percentage points in the period under consideration, three distinct outcomes can occur:

1. if $\dot{s}_z^q > 0$ and $\dot{s}_c^q > \dot{s}_z^q$, the difference $\dot{s}_c^q - \dot{s}_z^q$ is positive. In this case, China *outperforms* its competitor z;

2. if $\dot{s}_z^q > 0$ and $\dot{s}_c^q < \dot{s}_z^q$, the difference $\dot{s}_c^q - \dot{s}_z^q$ is negative. In this case, China *underperforms* its competitor z;

3. if $\dot{s}_z^q < 0$, the difference $\dot{s}_c^q - \dot{s}_z^q$ is positive. In this case, China *displaces* its competitor z. In particular, the displacement is *relative* when the average growth rate of the exported volumes of competitor z increases ($\dot{x}_z > 0$), and is *absolute* when it decreases ($\dot{x}_z < 0$).

So outperformance occurs when China's textile exports grow faster than its competitor's, while displacement occurs when there is outperformance and, at the same time, the competitor's export share decreases in time. Underperformance, on the other hand, is a situation where both countries exhibit a positive export performance but China's exports grow more slowly.[16]

Table 2 about here

[15] Thanks to the log properties, $\dot{x}$ approximates the percentage rate of change of export volumes.

[16] It is worth noticing the close parallel between these three cases and the *Partial Threat*, *No Threat* and *Direct Threat* outcomes identified by Lall and Albaladejo (2004) and noted at the beginning of this section. In our analysis, however, market shares and trade performances are defined and analyzed in terms of volumes and not of monetary values.

Table 2 reports the average annual growth rate of each exporter's textile market shares (in quantities) in the time period 2001-2016 (first column), together with the differences between China and its main Asian competitors (second column), the average annual textile export rate of growth for each country (third column), and the consequent relative performance according to the three-point classification proposed above (fourth column). Note that Chinese Taipei and Vietnam have been excluded from this analysis, since, as we explain in Subsection 4.1.1 in more detail, export data measured in quantities are not available for these two exporters.

Besides China, textile market share dynamics are positive only for India and Turkey, and are negative for all other developing Asian countries (Indonesia, Pakistan, Thailand), and for all developed Asian economies as well. Since China's exports grow faster than any of its competitors', *underperformance* never occurs, while there is *outperformance* compared to India and Turkey and *displacement* at the expense of all other exporters. In particular, the displacement is *relative* with respect to emerging economies (Indonesia, Pakistan and Thailand), because of their positive performance in terms of average textile export growth, while it is *absolute* with regard to all developed Asian competitors. This type of displacement is particularly strong in the case of Hong Kong (23.91 difference points in market share dynamics and 24.56 difference points in export growth). Note that, as underlined by Lall and Albaladejo (2004), when displacement occurs, it does not necessary imply a positive gain for China. In fact, '*Chinese exports may be undertaken by firms relocating from the neighbor losing market share: its enterprises extend their competitive advantage and benefit the home country by promoting exports of intermediates and related design and marketing activities and remitting dividends*' (Lall and Albaladejo, 2004, p.1443).

To summarize the above discussion, in order to investigate the causes of China's successful textile export performance compared with its competitors, it is not enough to focus on the evolution of market shares in terms of monetary values as in Lall and Albaladejo (2004). It is instead necessary to analyze the joint dynamics of prices and quantities, and their interaction, especially in a period of great changes both in production costs and in the institutional environment governing tariffs and quotas. This makes it necessary to study the main features of the textile export function of each country, together with the evolution of the variables affecting it.

3.2 Export function specification

Modelling export dynamics is a widely debated issue in the literature, and various aspects, such as the characteristics of the goods (i.e. homogeneous or differentiated products), their end-use, the level of disaggregation of available data, all need to be taken into account.[17] In the traditional framework, any country's export flows are determined by two key factors: price competitiveness and foreign demand.[18]

However, empirical evidence appears to indicate that these two variables alone cannot entirely explain export performance, and that an additional non-price competitiveness factor, related to the quality content of products, needs to be explicitly considered (Murata et al., 2000; Pain et al., 2005). Including this variable into the export equation should thus '*contribute to better gauge export demand and ameliorate the estimations of price elasticities*' (Algieri, 2014), and at the same time, reduce the potential bias in estimating the income elasticity of export demand, which reflects a failure to account for changing product quality (Krugman, 1989).[19] Moreover, this additional variable explicitly introduces supply-side factors into trade models, which are particularly relevant especially in the light of the '45-degree rule' (Krugman, 1989; Caporale and Chui, 1999).[20] Our empirical analysis is thus based on this extended version of the traditional export function.

Therefore, for each country j in our sample the following export equation is considered:

$$x_j = \omega + \alpha rp_j + \beta y_j^* + \gamma q_j + \epsilon \tag{3}$$

where x_j, rp_j, y_j^* and q_j are the natural logarithms of yearly exported volumes, of annual relative export prices, of foreign demand, and of the non-price competitiveness factor; the latter mirrors quality, variety and technological content of exported goods.

Coefficient α is the export price elasticity for the textile industry, and is expected to be negative. Coefficient β is the income elasticity, which, when the export function is estimated at the *aggregate* level, is expected to be positive. However, when the export function is estimated at a *sectoral* level, income elasticities can also be *negative*. In fact, in this case, export performance depends on the profitability of production and exports, which influences the industrial choices taken by domestic producers, in the context of the

[17]When goods are imperfect substitutes, products are generally geographically differentiated, and domestic and foreign goods may differ in real or perceived characteristics due to differences in the place of production (Armington, 1969; Goldstein and Khan, 1985; Crozet and Erkel-Rousse, 2004). Moreover, many studies find that the 'law of one price' does not hold either across or within countries for differentiable goods, which may be diverse from each other in terms of variety or quality, and consequently in terms of price.

[18]Existing studies are generally based on exports at the aggregate level (see Goldstein and Khan, 1985; Athukorala and Riedel, 1991; Panagariya et al., 2001; Bussière et al., 2013 and Algieri 2011, 2014), while only few are conducted at the industry level (Coşar, 2002; Baiardi et al., 2015a,b).

[19]In the empirical literature, the role of the non-price competitiveness factor in the export function has only recently been formalized. Algieri (2011) introduces an unobserved component in the form of a time-varying trend into the traditional equation, in order to capture stochastic unobserved patterns. Athanasoglou and Bardaka (2010) find that the non-price competitiveness factor is crucial for the export performance of manufactured goods in Greece. Furthermore, Algieri (2014) provides a micro-foundation of the extended specification of the export function in the case of imperfect substitute goods, which she applies to investigating the export dynamics of the GIIPS countries at the aggregate level.

[20]Krugman (1989) uses the term '45-degree rule' for the empirical regularity observed between the estimated elasticities of foreign activity in export equations and the growth rate of domestic output.

international division of labor and its evolution over time. As is well known, according to the traditional international trade literature, every country is expected to specialize in the production and export of goods where it has a relative competitive advantage. Thus, advanced countries tend to specialize in capital-intensive goods and abandon the production and export of labor-intensive products. This process implies that the production and exports of traditional goods, like textiles, will decrease over time.[21] From an econometric point of view, this specialization trend is reflected in a negative income elasticity of the estimated sectoral export functions. Lastly, Coefficient γ is the non-price competitiveness component elasticity, and is expected to be positive. Parameter ω is the intercept, and ϵ is the error term.

If Equation (3) is differentiated with respect to time, the following condition is obtained:

$$\dot{x_j} = \alpha \dot{rp_j} + \beta \dot{y_j^*} + \gamma \dot{q_j} \tag{4}$$

where, thanks to log properties, $\dot{x_j}$, $\dot{rp_j}$, $\dot{y_j^*}$ and $\dot{q_j}$ are the approximated rates of change of exports, relative prices, foreign demand and quality for each exporter j. Equation (4) shows that the growth rate of textile exports in each country thus depends on three components, which capture the effects of changes in relative prices, foreign demand and product quality on export dynamics. The three terms on the right-hand side of Equation (4) can thus be labeled as the price effect, the quantity effect and the quality effect. More precisely, the price effect depends on the interaction between the price elasticity and the growth rate of relative prices; the quantity effect depends on the interaction between the income elasticity and the growth rate of foreign demand, and the quality effect depends on the interaction between the quality elasticity and the growth rate of the non-price competitiveness proxy.

The next subsection provides clear indications about the main channels through which China outperforms or displaces its competitors. This is important in order to identify the competitive strategies adopted by textile exporters, and particularly to formulate recommendations for industrial and trade policy measures.

3.3 China's export competition: the main channels

Starting from Equation (4), the difference in export performance between China and any one of its rivals $\dot{x_c} - \dot{x_z}$ depends on three factors as follows:

$$\dot{x_c} - \dot{x_z} = (\alpha_c \dot{rp_c} - \alpha_z \dot{rp_z}) + \left(\beta_c \dot{y_c^*} - \beta_z \dot{y_z^*}\right) + (\gamma_c \dot{q_c} - \gamma_z \dot{q_z}) \tag{5}$$

The right-hand side of Equation (5) indicates that there are three main channels through which export competition can occur, i.e. prices, quantities and quality. More precisely, if

[21]Note that, in the most extreme version of Ricardo's theory of absolute specialization, production and exports ultimately fall to zero.

the difference $\dot{x_c} - \dot{x_z}$ is positive, and the following condition holds

$$\alpha_c r\dot{p}_c - \alpha_z r\dot{p}_z > 0 \quad (6)$$

then price competitiveness is one strategy implemented by China in order to outperform or displace its competitors on international markets. As Equation (6) shows, both price elasticities, obtained by estimating Equation (3), and the growth rates of relative prices matter when competition is based on prices. Moreover, if the two exporters exhibit the same, or similar, price elasticities, but the relative price dynamics are different, then the country with higher price dynamics will lose market shares the greater the absolute value of the price elasticity.

The second term on the right-hand side of Equation (5) captures the difference in quantity effects between exporters, and China's performance is better if the following condition holds

$$\beta_c \dot{y_c^*} - \beta_z \dot{y_z^*} > 0 \quad (7)$$

In this case, China successfully competes in terms of exported volumes (and its underlying motivations). For each country, Condition (7) depends both on income elasticities and the growth rates of foreign demands. Since however foreign demand growth rates are very similar across countries, then differences in quantity effects are mainly due to the different values of income elasticities.

Lastly, the quality effect difference is captured by the last term in the right-hand side of Equation (5), and is verified if the following condition holds

$$\gamma_c \dot{q}_c - \gamma_z \dot{q}_z > 0 \quad (8)$$

In this case, China outperforms or displaces its rival z by means of competition based on product quality. Similarly to previous differences, Condition (8) depends both on quality elasticities, obtained by estimating Equation (3) for each exporter, and on growth rates of quality levels.

These three effects can be either opposite or complementary, and provide useful information about the different industrial strategies pursued by China and the other top exporters. Under the assumption of imperfect competition, countries are price-makers, rather than price-takers, in international markets. In this context, prices will be set as a mark-up over production costs. A high price may reflect either a high level of costs or profit margins (or both), and, more in general, is connected with the market power of the exporter. Thus, price competition is realized in different ways. Developing countries base their trade policies mainly on price differentials given their competitive advantage in terms of lower labor costs, while advanced economies can delocalize production to emerging countries, where labor is cheaper, which allows them to continue to compete on world markets by re-exporting the goods produced abroad at lower prices.

However, international trade competition is based not only on relative prices but also on other non-price factors, such as export composition and promotion, geographical market destination, trade terms and arrangements, technological content and efficiency improvement (Fagerberg, 2000; Fu and Gong, 2011), and Conditions (7) and (8) capture all these relevant aspects. More specifically, Condition (7) reflects mismatches between demand and supply nationally, consumer desire for diversity internationally, and production specialization choices in the international division of labor. Condition (8) reflects the importance of improving the quality, variety and technological content of exports, or, more generally, the sophistication of exported goods (Krugman, 1989; Schott 2004 and Hallak, 2006, Bernard et al., 2006; Fu et al., 2012).

Summing up, textiles is an industry still characterized by a low technology and a high labor content, and a rapidly industrializing country such as China might have been expected to gradually abandon it. Instead, especially since 2001, Chinese exports have grown at an extraordinarily high rate, outperforming or displacing all competitors on international markets. Our approach makes it possible to identify the factors at the root of China's success.

4 Data

4.1 Data description

4.1.1 The dependent variable

The export data used in our econometric estimations are at the 4-digit disaggregated level, according to the Standard International Trade Classification (Rev. 3), retrieved from UN Comtrade database. These data are measured in terms of 'weight in kilograms' for all countries and the final sample covers the period 2001-2016.[22] Raw export data have been carefully checked before proceeding with the estimates, as reported in detail in Appendix B.

Chinese Taipei and Vietnam have been however excluded from the final analysis. Specific export data for Chinese Taipei are not provided by the UN Comtrade database and, to the best of our knowledge, other alternative compatible data are not available. In the case of Vietnam, exports in quantity are missing for 23 out of 59 goods.

The available database is therefore organized to form nine distinct panel datasets, one for each Asian country selected. Every balanced panel for each exporter is characterized by 59 cross-sections (the selected goods) for the period 2001-2016, with the exception of Indonesia and Pakistan, where, because of missing data, the total number of cross-

[22]It is worth noticing that especially in most developing Asian countries, export data are either incomplete or measured in terms of 'Area in square metres' before the year 2000. This is the case of China for the following goods: 6522-6529, 6532, 6533, 6544, 6576, 6584; of Pakistan for goods 6511, 6519, 6522, 6523, 6525, 6531-6535, 6538-6544, 6572, 6578, 6585, 6594; of Thailand for goods from 6521 to 6541; and of Turkey for goods 6531 and 6532. This is another reason, besides the stylized facts highlighted in Section 2, behind our choice of concentrating our econometric analysis in the years after 2001.

sections is 55 and 54 respectively. A complete list of the selected goods is also provided in Appendix B (Table B1).

4.1.2 On the use and misuse of unit value data

Measuring product quality has always been a challenging task from an empirical point of view, since export quality cannot be directly observed. Unit values (i.e., average trade prices for each product category) are easily observable, so they have been sometimes used for this purpose (see, among others, Dulleck et al., 2005; Fontagné et al., 2008; Schott, 2008). However, Fontagné et al. (2006) state that '*there are numerous reasons leading to slight departures from a strict association of prices with quality. Trade economists are accustomed to this simplification*'. In fact, unit values are at best a noisy proxy for export quality, since they are also driven by other factors, and mostly by production costs and profit margins (see Atkeson and Burstein, 2008).

In general, the most recent empirical literature shows that there are three serious shortcomings in using average unit values (AUVs) as a measure of product quality. First, AUVs may reflect pricing strategies, i.e., firms' choice of mark-up (Atkeson and Burstein, 2008; Henn et al., 2013). Secondly, Henn et al. (2013, p.3) state that '*changes over time in unit values may reflect changes in quality-adjusted prices (owing to supply or demand shocks), rather than changes in quality*' and '*if the composition of goods within a given product category varies across exporters, then cross-country differences in unit values may reflect these differences in composition, rather than quality differences*'. Caution in this regard is also suggested by Lüthje and Nielsen (2002). Thirdly, Szczygielski and Grabowski (2012) demonstrate both theoretically and empirically that '*prices might not follow quality closely if goods are differentiated [...]. This might benefit some producers allowing for markups higher than those of competitors selling similar quality goods. Moreover, [...] prices might not follow qualities one-for-one due to consumers' 'love of variety*'' (Szczygielski and Grabowski, 2012, p. 1190). As a consequence, there is no theoretically robust link between AUV dynamics and the quality and variety content of exported goods.

4.1.3 The proxy of export prices

Under the assumption of imperfect competition with variable markups and international trade costs, and given that, as discussed in Subsection 3.2, our framework explicitly considers the presence of a 'non-price competitiveness component' among the key explanatory variables, AUVs can be properly considered as a proxy of prices and not of quality, especially in the case of highly disaggregated data, as in our setting. Therefore, the relative price series rp for every good i at time t, with $i = 1, ..., 59$ and $t = 2001, ..., 2016$, is computed as the ratio between the export unit value of each good in any selected country j, with $j = 1, ..., 9$, and the average export unit value of all top exporters considered in Table (1) for which data are available.

For the sake of completeness, the most popular and alternative variable used to proxy price dynamics in the export function is the real exchange rate. This indicator is generally available only at the aggregate level, and for this reason, it is normally used in estimating the aggregate export function, as in Aziz and Li (2008) or Algeri (2014, 2015). However, in the case of sectoral export function, this indicator would be misleading since industry-specific relative prices may be very different from the aggregate real exchange rates.

Moreover, data on industry-specific exchange rates are complex to compute (Dai and Xu, 2013), and, when available, they are calculated only at the aggregate sectoral level and limited in terms of country coverage. In fact, for the textile sector, these indexes are only provided by the Research Institute of Economy, Trade and Industry (RIETI), and are available only for five out of the nine Asian economies investigated in the empirical analysis (China, Korea, Japan, Taiwan, Thailand, and Indonesia).[23] Given these limitations, these data have been used only to check the robustness of our general results.

4.1.4 The proxy of foreign demand

Foreign demand is proxied with the difference between the chained-volume index of world GDP and each country's GDP. Both these variables are in constant 2010 US dollars and are retrieved from the International Monetary Fund database (World Economic Outlook Database, October 2018 Edition) and, because of their nature, are invariant for each cross-section of goods. The different values of the key parameters of each country's export function are thus estimated adopting a within-country approach, overlooking differences in specific destination markets.

4.1.5 The proxy of product quality

Product differentiation, and thus quality, can be measured either directly or indirectly. Unit values are very often used as a direct measure, especially when highly disaggregated export data are considered. As noted in Subsection 4.1.2, however, this approach has many limits, which render the use of unit values undesirable. With regard to indirect measures of product quality, real capital stocks and R&D expenditure are the most common proxies.

Data on real capital stocks are available only at the aggregate level, and are thus inconsistent with our analysis at a sectoral level. Data on R&D expenditure are available at the industrial level and are provided by the OECD STAN and ANBERT databases, but country coverage is very limited for Asian economies.[24] An alternative useful database on export quality is that proposed by Henn et al. (2013). Although it covers 178 countries over the period 1962-2010 and considers goods at different levels of disaggregation, 4-digit quality data are available only for China, India and Korea, while 3-digit quality data are

[23] Data are freely downloadable from the RIETI website: https://www.rieti.go.jp/users/eeri/en/index.html.

[24] Complete time series for the textile industry R&D expenditure are available only for Japan, Korea and Turkey. For China, data start from 2000, but records are missing in the period 2001-2007.

available only for China, Korea and Hong Kong, and 2-digit quality data are available only for China.[25] This dataset is thus too incomplete to be used to proxy the non-price competitiveness factor.

The proxy for product quality (q) used in our empirical analysis is therefore EXPY, a quantitative index originally proposed by Rodrik (2006) and Hausmann et al. (2007), which is quite popular in the empirical literature as the indicator of the 'sophistication level of exports' (Lall et al., 2006; Xu, 2010; Zhu and Fu, 2013). For each product, this variable is a weighted average of the per capita GDPs of textile exporters, where the weights reflect the revealed comparative advantage of each exporter in that product. EXPY is thus considered as a general measure of the productivity level associated with a country's specialization pattern. A good is considered more sophisticated if it is exported more intensively by high-income countries, and less sophisticated if it is exported more intensively by low-income countries. Thus, the sophistication of a country's exports is revealed by the 'income content' of the exports. It is worthwhile to note that, as in the seminal papers by Rodrik (2006) and Hausmann et al. (2007), our EXPY variable is computed at a disaggregated level, only with regard to the textile sector and not to all the traded goods of a country. For details see Appendix C.

4.2 Variable analysis

Before estimating Equation (3), a preliminary analysis of the variables of interest is performed. The order of integration of these series is investigated by means of the panel unit root test proposed by Pesaran (2007), whose null hypothesis is that all series contain a unit root, while the alternative is that some time series do not have a unit root.[26] This test is applied to the following variables: export volumes, relative prices and the non-price competitiveness indicator, given that foreign demand is a time series invariant across cross-sections. For this reason, the stationarity of foreign demand is assessed by means of the widely used time series unit root Augmented Dickey-Fuller (ADF) test (Said and Dickey, 1984) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test (Kwiatkowski et al., 1992).

Tables 3 and 4 about here

The results of the unit root tests are reported in Tables 3 and 4. They all clearly indicate the non-stationarity of the variables of interest, since the null hypothesis is only rejected when the variables are transformed into their first differences (Δx_j, Δrp_j, Δy_j^* and Δq_j respectively).

[25]Moreover, in the case of 4-digit quality data, the typology of disaggregation is not consistent with that adopted in this paper.

[26]This panel unit root test relaxes the hypothesis of cross-sectional independence and takes into account any possible correlation among cross-sections. These features are particularly important with regard to the nature of our datasets, where cross-sections consist of similar goods belonging to the same industry.

Given the non-stationarity of the variables of interest, a panel cointegration test is run in order to verify the existence of a long-run relationship between them (Pedroni, 1999; 2004). This test is composed of two different groups of statistics. The first group consists of four tests (panel v, panel ρ, panel PP and panel ADF-statistics), which pool the residuals along the within-dimension of the panel (panel tests). The second group is composed of three other tests (group ρ, panel PP and panel ADF-statistics), which pool the residuals along the between-dimension of the panel (group tests). The cointegration results are shown in Table 5, where the Pedroni cointegration test is performed including the intercept in the testing equation.

Table 5 about here

It is common practice in the empirical literature to reject the null hypothesis of no-cointegration if at least four out of seven of these statistics are significant (see, among others, Bottazzi and Peri, 2007 and Bottasso et al., 2013). As shown in Table 5, following this 'rule of thumb', our results confirm the presence of cointegration. We can thus conclude that a long-run relationship between export volumes, relative prices, foreign demand and product quality exists, since the Pedroni test rejects the hypothesis of no cointegration for all countries.

Given these premises, Equation (3) is estimated by applying the panel mean group (PMG) estimator proposed by Pesaran and Smith (1995).[27] This estimator allows for heterogeneous slope coefficients across cross-sections, since it includes an intercept to capture fixed effects, and the estimated coefficients are subsequently averaged across panel members, computed as outlier-robust means (Hamilton, 1991). This is particularly appropriate in the case of non-stationary panels with 'small-T', where 'small' typically means about 15 time-series observations, which is exactly the case here.

5 Export competition in the textile sector

In this section, export competition in the textile sector is analyzed through different steps. We first proceed with estimating Equation (3),[28] in order to obtain the long-run elasticities (parameters α, β and γ) for each country in our sample. Next, using the framework described in Section 3, we analyze the main channels through which China competes in the textile international trade, and test and measure their relevance.

[27]Estimates are computed with Stata 14.0 using the routine provided by Eberhardt (2012).

[28]More precisely, in a panel data context, the estimated equation for each Asian country is

$$x_{it} = \omega_i + \alpha_i rp_{it} + \beta_i y_t^* + \gamma_i q_{it} + \epsilon_{it}$$

where the subscript i refers to each of the 59 textile goods (55 and 54 in the case of Indonesia and Pakistan).

5.1 Long-run elasticities

The starting point in analyzing export competition in the textile sector is the estimation of each country's export function expressed by Equation (3). Table 6 reports the key long-run elasticities (parameters α, β and γ).

Table 6 about here

Coefficient α captures the price-competitiveness factor, and is negative in a statistically significant way, as expected, for all exporters. China is the only country in our sample with a price elasticity greater than one in absolute value (1.19). With regard to China's competitors, Pakistan and Hong Kong are also characterized by high price elasticities, with estimated absolute values of 0.90 and 0.84 respectively. For all other Asian exporters, absolute price elasticities range from 0.75 to 0.42. The lowest values are observed for Korea (0.42), Turkey (0.47) and Japan (0.49).

Many papers, examining both aggregate and sectoral export functions, support the result that China's price elasticity is greater than one. In fact, with regard to aggregate export functions, Aziz and Li (2008) find that this parameter is equal to 1.55 in the time period 1995-2006, while Dai and Xu (2013) obtain a coefficient equal to 1.76 in the years 2000-2009 when estimating a panel data equation with industry-specific real effective exchange rates ($REERs$). Moreover, following Dai and Xu's recommendations about the importance of using this type of data, Equation (3) has also been estimated by using textile-specific $REERs$ instead of relative AUVs (for more details, see Subsection 4.1.3). These alternative estimates confirm the robustness of the results reported in Table 6.[29]

With regard to some specific Chinese sectoral export functions, Thorbecke and Zhang (2009) find a price elasticity ranging from 1.60 to 1.83 for labor-intensive manufactures in the period 1987-2006, with similar values for clothing and leather. More specifically, in some clusters of textile products (yarns & fabrics and carpets), this coefficient is equal to 1.31 and 1.37 respectively. In the case of the food industry, Baiardi et al. (2015b) find a Chinese price elasticity equal to 1.19 and 1.82 for unprocessed and commodity goods respectively in the years 1992-2012.

Furthermore, the evidence that only China exhibits a price elasticity greater than one (in absolute terms) can be related to the fact that under imperfect competition, when products are more homogeneous and thus more exposed to the law of one price, their price elasticity is higher than one, so that international competition is more intense. On the contrary, when goods are more differentiated, the higher the market power of the exporter and the lower this elasticity. This situation is coupled with the fact that China generally follows an exchange rate policy of maintaining an overly undervalued currency,

[29]Similar conclusions are also obtained in the case of Indonesia, Japan, Korea and Thailand, the other countries in the sample for which industry-specific $REERs$ are available. For the sake of brevity, these additional estimates are not reported in the paper, but can be requested to the authors.

with important repercussions on the dynamics of export price differentials. According to a recent strand of empirical literature (see, among others, Dunaway and Li, 2005 and Goldstein and Lardy, 2009), this policy directly or indirectly fosters Chinese export growth.[30]

With reference to income elasticities, these results can be better discussed and interpreted by considering Figure 4, which reports the export volume performance of each sample country (indices 2001=100).

Figure 4 about here

In particular, Figure 4 highlights the very satisfactory dynamics characterizing China, India and Turkey, i.e. the exporters with the highest income elasticities in the sample (2.55, 1.22 and 0.74, respectively), while a positive but less strong performance is observed for Pakistan and Thailand, in line with their lower values of this parameter (0.33 and 0.18 respectively).

Indonesia and developed Asian economies are very interesting cases. Indonesia is the only country with an income elasticity which is positive but not statistically different from zero. Figure 4 in fact shows that Indonesia's export volumes are generally stationary and fluctuating in the time period under consideration, with a slight growth starting since 2011. This positive performance, however, appears only in the last years of the sample, and therefore it is not captured by our estimated parameter. With reference instead to the developed Asian economies, the estimated income elasticities are negative and highly statistically significant, reflecting their declining export performances shown in Figure 4.[31]

These findings show that, when there is *relative displacement*, China's exports grow more than its competitors, whose income elasticities are positive, even though small (and not statistically different from zero in the case of Indonesia). On the other hand, when there is *absolute displacement*, the income elasticities of the involved countries (all the advanced ones) are negative. This evidence also reveals the different industrial strategies followed by our sample countries: while China and its developing Asian competitors still rely their production and export on this traditional sector, the developed Asian exporters abandoned it, even though their imports continue to increase, thus contributing to the expansion of the sectoral world demand. Consequently, this demand, and thus world textile exports, as shown by the blue dashed line in Figure 4, continue to increase, at a rate given by the product of world GDP growth and its income elasticity, which is historically equal to 0.7 in the period 2001-2016.

[30] The consequences of China's exchange rate policy on its export price elasticity can be better understood by comparing, for example, the estimated coefficients of the two top exporters in our sample: China and India (-1.19 and -0.75, respectively). The former is characterized by an adjustable peg policy, while the latter follows a relatively flexible exchange rate policy, with contrasting repercussions on the price setting behavior of the two countries.

[31] The same result also holds for all the top exporting Western countries reported in Table 1.

Lastly, the non-price competitiveness factor, proxied in this paper with the variable EXPY, is always positive and highly significant, as expected. This result is in line with the main findings of the empirical literature (Helpman and Krugman, 1989; Krugman, 1989).[32] In particular, the highest quality elasticities are observed in Pakistan, Turkey and Thailand, with estimated coefficients of 1.01, 0.93 and 0.91, respectively. Moreover, in line with Algieri (2014), the variable EXPY shows higher levels than the price competitiveness elasticity with the sole exceptions of China and Hong Kong. Turkey, for example, is an exporter which exhibits one of the lowest absolute price elasticities (0.47) in the sample and, at the same time, one of the highest quality elasticities (0.93). These values imply that a 1 per cent increase in Turkish relative export prices prompts a reduction in export volumes by 0.47 per cent, while a 1 per cent fall in quality levels triggers a reduction in export volumes more than double (0.93 per cent).

5.2 Export performance decomposition

When Equation (3) is differentiated with respect to time, Equation (4) is obtained. Equation (4) decomposes the dynamics of textile exports into the price effect, the quantity effect and the quality effect, which depend on the interaction between the price, income and quality elasticities reported in Table 6, and the growth rates of relative prices, foreign demand and quality levels reported in Table 7.

Table 7 about here

As far as the price effect is concerned, it is worth noting that relative prices fall in China, Indonesia and Turkey (and also Japan among developed Asian economies), so that the price effect on export dynamics is positive for these countries.[33] The effect is particularly strong for China because of its high price elasticity noted above, which implies an incidence on total export performance of about 12 per cent. Among developing economies, it is however Indonesia the country where the price effect is strongest, mainly due to the big fall in relative prices, with an incidence of about 66 per cent on total textile export growth. With regard to Turkey, the price effect is not very pronounced, despite the big relative price reduction, because of the country's low price elasticity. Among developed Asian exporters, the price effect is positive only for Japan, although at a very reduced rate given both its low reduction in relative prices and its low price elasticity. In Hong Kong, on the other hand, the negative price effect on export performance is very

[32] Athanasoglou and Bardaka (2010) find that this variable has a strong direct positive effect on export performance and also an indirect effect on it by reducing export prices and increasing price competitiveness (see also Algieri, 2014).

[33] It should be remembered that relative prices fall not because absolute prices (i.e. AUVs) decrease, but because their increase in these countries at the time under consideration is lower than the world AUV increase. For instance, absolute prices in China rise at an annual growth rate of 0.42 per cent in the period under consideration, while world prices rise by 1.71 per cent.

large (about 60 per cent of total textile export reduction) because of the very high relative price increase combined with the relatively high price elasticity. Lastly, in Korea the price effect is practically nil, given that its relative prices are practically stationary.

It is worth recalling that, as highlighted in Subsection 3.1, the dynamics of the market shares in monetary value depend on both relative price behavior and export volume performance. In our sample, the countries having a positive relative price growth in the period under consideration are Hong Kong, with a very high annual increase (8.62 per cent), Pakistan (1.52 per cent) and also India, Thailand and Korea, but with increases of less than 0.10 per cent. On the other hand, China, Indonesia, Turkey and Japan show opposite dynamics, with relative prices falling on average in the considered period (-1.27, -0.83, -0.74 and -0.30 per cent, respectively), so that for these countries the accounting dynamics of market shares in value are less favorable than dynamics of shares in quantities. In any case, however, changes in market shares in values and quantities go in the same direction. This implies that the quantity performance effect is *stronger* than the possible opposite effect of relative price dynamics, partly because of the feedback effect of relative prices on quantities exported. These observations highlight the importance of measuring export performance in terms of quantities and studying the values of the key parameters of the export function.

Furthermore, since in the period under consideration in China relative prices fall and, at the same time, the price elasticity is greater than one, exported quantities increase *ceteris paribus* more than proportionally, so that the effect on the market share in value is positive. This is despite the fact that, from a statistical point of view, relative prices and exports move in the opposite direction, so that the accounting dynamics of market shares are less favorable than the dynamics of shares in quantities. For all the other countries where the price elasticity is less than one, the effect of relative price changes on exported volumes is less than proportional. So, if relative prices increase, market shares in monetary value show more favorable dynamics than dynamics of quantities, even though the statistical record incorporates the negative effect of prices on quantities. The opposite holds true in the presence of a price elasticity less than one when relative prices fall.

Looking now at the quantity effects, the recorded values for every country are substantially a consequence of their income elasticities, given that the growth rates of foreign demand are very similar. China is thus characterized by the highest quantity effect (8.62 per cent, which accounts for 69 per cent of its total export performance), followed by India (4.61 per cent, which accounts however for 88 per cent of its total export growth), Turkey (2.85 per cent, amounting to 47 per cent of its total export increase), Pakistan and Thailand (1.29 and 0.71 per cent, accounting for 322 and 33 per cent of its total export increase, respectively).[34] For developed Asian countries, the quantity effect is

[34]In the case of Pakistan the very high incidence of the quantity effect on total export performance is due to the fact that the negative price effect is very consistent, accounting for 340 per cent of total export growth.

always negative.[35] In more detail, Hong Kong records the worst result (-7.12 per cent, with an incidence of 59 per cent on its total export performance), followed by Korea and Japan. In these two countries, however, the incidence of the quantity effect on export dynamics is sizable (203 per cent and 246 per cent, respectively) because of the positive and compensating influence of the quality effect and the small impact of the price effect.

Looking finally at the quality effect, which is always positive for all countries, the highest values are registered for Turkey (2.37 per cent), Thailand (2.13 per cent) and China (1.99 per cent), among emerging economies, and for Hong Kong (1.98 per cent) among developed economies. These results are substantially in line with quality growth rates, since quality elasticities are similar across countries. Thailand, Indonesia and Pakistan are three interesting cases. For Indonesia and Thailand, the quality effect accounts for 270 and 99 per cent of the country's total export performance respectively, so that quality improvement is the main driver of textile export growth. Pakistan exhibits an opposite experience, since, despite the highest quality elasticity (1.01), it records the lowest quality effect in the sample (0.57) due to the very low quality upgrading (0.56).

This suggests that on markets which are increasingly integrated, and characterized by intra-industry resource reallocation and inter-industry structural change, quality improvement and product differentiation play a key role in export competition (Fagerberg, 2000; Fu et al., 2012; Algieri, 2014). Therefore, structural policies aimed at encouraging innovation and technological progress to secure inclusive and sustainable development need to be adopted especially for manufacturing, as recently underlined by UNIDO (2018). Recent experience in the textile industry indicates that many efforts are made in this direction, mainly for stimulating the churning of production towards 'technical' textiles. These are textile products for non-aesthetic purposes, which incorporate a high level of technological sophistication and a continuous flow of new and innovative applications.

5.3 How has China outperformed or displaced its Asian competitors?

The findings reported in Tables 6 and 7 can be used to identify the main channels through which China has outperformed or displaced its main Asian competitors in textile exports (Table 2). In particular, Table 8 shows the results of Conditions (6), (7) and (8), which decompose the difference between China and its rivals' textile exports into the three main channels of trade competition, i.e. price, quantity and quality. These channels may have opposite or complementary effects, and they provide useful information about the different industrial strategies pursued by China and the other top exporters on world markets.

Table 8 about here

[35] This result, as we noted previously in Subsection 5.1, is a consequence of the shift in the output and export composition away from low-tech and high-labor content goods towards more sophisticated products.

With regard to the price effect difference, Condition (6) is always positive and statistically significant, with particularly high values in the case of Hong Kong and Pakistan (8.75 and 2.87 percentage points, respectively). As discussed in detail in Subsections 5.1 and 5.2, this result is due to the fact that China has the highest price elasticity in the sample and relative prices follow different dynamics, with a decrease in China and an increase in Hong Kong and Pakistan. In all other cases, the price effect difference is also very relevant, which implies that China successfully competes on international markets by means of a low-price competitive strategy, despite the efforts made by other exporters in setting prices and controlling costs, especially after China's accession to the WTO (Bernard et al., 2006; Fu et al., 2012).

With regard to the quantity effect difference, Condition (7) is also always positive and statistically significant. Obviously, this result is closely connected to China's outstanding performance in textile exports described in previous sections, and it is interesting to note that this channel explains most of the total export difference shown in the last column of Table 8.[36] In particular, the quantity effect difference is very wide with respect to the countries whose income elasticity is negative (Table 6). Note also that India and Turkey are the two exporters which compete most strongly with China in terms of export volumes (4.02 and 5.78 per cent, respectively). In fact, as shown in Table 2, these two countries are the only ones outperformed but not displaced by China in the period under consideration.

This result is in line with the conclusions of the trade literature based on gravity equation models, where however the displacement effect is identified by looking only at the sign and significance of the key explanatory variable 'volume of exports by China to the importer j' in a particular time period (Greenaway et al., 2008; Amann et al., 2009; Kong and Kneller, 2016; Pham et al., 2017). In this context, if China and any of its competitor's exports are substitutes, China is predicted to displace its rival j. Our model is more general, since the quantity effect is only one of the main channels through which export competition takes place. According to an alternative interpretation, the quantity effect difference may be linked to the so-called the 'flying geese' paradigm, whereby Chinese growth triggers output, investment and export opportunities for all other Asian economies (Ahearne et al., 2006). In this framework, China's export performance is not necessarily at the expense of its competitors, but is the precondition for their economic growth.

Lastly, with regard to Condition (8), China successfully competes in terms of quality improvement of exports only when its performance is compared with that of India and mainly Pakistan, where, as we noted in the previous subsection, quality improvements are the weakest of the sample. In all other cases, Condition (8) is either not statistically different from zero or negative, as for Turkey, which is the only country to show a quality improvement strategy successful against China.

To sum up, our results show that China crowds out most of its rivals with a com-

[36]This result is in line with Bingzhan's (2011) findings, whereby China's extraordinary export performance is mainly due to its very high quantity effect.

petitive strategy based on a mix of low-price policies and non-price factors aiming at increasing exported volumes. However, weaknesses in the Chinese performance emerge when competitiveness is examined in terms of quality improvement. As a consequence, in order to ensure long term dominance in international markets, quality needs to be made an explicit aim in China. The recent 'Made in China 2025 Program', in fact, recognizes that quality is at the core of the manufacturing leadership for the future. More in general, this recommendation is in line with Rodrik (2006), who demonstrates that what really matters for a country's economic growth in the long run is not *how much* it exports, but the *quality* of its exports.

5.4 Price, quantity and quality effect difference decomposition

In this subsection, differences in the export performances are further decomposed in order to investigate the determinants of China's export success in greater detail. With regard to the price effect differences, Condition (6), by means of simple algebraic manipulations,[37] can be decomposed into the sum of two terms as follows:

$$(r\dot{p}_c - r\dot{p}_z)\,\alpha_z + (\alpha_c - \alpha_z)\,r\dot{p}_c > 0 \tag{9}$$

or, in the same way,

$$(r\dot{p}_c - r\dot{p}_z)\,\alpha_c + (\alpha_c - \alpha_z)\,r\dot{p}_z > 0 \tag{10}$$

The first and second term in Conditions (9) and (10) can be defined as the relative-price and the price-elasticity components, respectively, of the overall price effect difference. Note that although they are algebraically diverse because of their different weights, the two determinants in Inequalities (9) and (10) are analogous, so that it is useful to compute the average values of the two components for the period under consideration. The results of these decompositions are shown in Table 9.

Table 9 about here

These computations highlight the different role and importance of the two factors in determining the recorded price effect difference. The relative-price component is always positive, because China's relative prices fall, while those of its rivals either fall at a lower rate or increase in the period under consideration (Table 7). The price-elasticity component is always positive in Condition (9), since China's price elasticity is the highest in the sample (in absolute terms) and its relative prices decrease, while it can be either positive or negative in Condition (10) according to whether the relative prices of China's competitors fall or rise. Therefore, the average price-elasticity component can be positive, as in the case of India, Indonesia, Thailand, Turkey, Japan and Korea, or negative, as in the case of Pakistan and Hong Kong.

[37] Condition (9) is obtained by adding and subtracting the term $\alpha_z r\dot{p}_c$ from Condition (6), while Condition (10) is obtained by adding and subtracting the term $\alpha_c r\dot{p}_z$ again from Condition (6).

The relative-price component generally dominates the price-elasticity component in determining the overall price effect difference. The exceptions are Turkey and Indonesia, where the impacts of the two components are reversed, because in these two countries relative prices decrease at a consistent rate (Table 7) and the price elasticities are some of the lowest in the sample in absolute terms (Table 6). With regard to Japan, the average relative-price component is only slightly higher than the equivalent price-elasticity component, because in Japan too relative prices fall, although at a lower rate, and the price elasticity of the export function is also very low.

In a similar way to what was done for the price effect differences, Condition (7) is decomposed into two factors, labeled as the relative-demand and the income-elasticity components, as shown by the following conditions:

$$\left(\dot{y_c^*} - \dot{y_z^*}\right) \beta_z + (\beta_c - \beta_z)\, \dot{y_c^*} > 0 \tag{11}$$

and

$$\left(\dot{y_c^*} - \dot{y_z^*}\right) \beta_c + (\beta_c - \beta_z)\, \dot{y_z^*} > 0 \tag{12}$$

As before, the relative-quantity and income-elasticity components correspond to the first and second terms of Conditions (11) and (12).[38] The results of this decomposition are reported in Table 10, together with the average values of the two factors in the period under consideration.

Table 10 about here

Given that the average foreign demand growth rate for China is the lowest in the sample, the relative-demand component in Condition (11) is positive only when developed exporters are considered, in the light of their negative income elasticities. The relative-demand component is instead negative in the case of developing Asian rivals, whose income elasticities are positive (although not statistically different from zero). Similarly, the relative-demand component is always negative in Condition (12), since China's foreign demand growth is the lowest and its income elasticity is positive (see Table 6). Because of China's highest income elasticity, the income-elasticity component of the quantity-effect difference is positive and dominates the relative-demand one.

Lastly, also Condition (8) can be decomposed into two determinants, defined, respectively, as the relative-quality and quality-elasticity components, which correspond to the first and second terms of the following two conditions:[39]

$$(\dot{q}_c - \dot{q}_z)\, \gamma_z + (\gamma_c - \gamma_z)\, \dot{q}_c > 0 \tag{13}$$

[38]Condition (11) is obtained by adding and subtracting the term $\beta_c \dot{y_z^*}$ from Condition (7). Similarly, Condition (12) is obtained by adding and subtracting the term $\beta_z \dot{y_c^*}$ again from Condition (7).

[39]Condition (13) is obtained by adding and subtracting the term $\gamma_c \dot{q}_z$ from Condition (8). Similarly, Condition (14) is obtained by adding and subtracting the term $\gamma_z \dot{q}_c$ again from Condition (8).

and

$$(\dot{q}_c - \dot{q}_z)\,\gamma_c + (\gamma_c - \gamma_z)\,\dot{q}_z > 0 \tag{14}$$

Table 11 reports the results of this decomposition, together with the average values of the two factors in the period under consideration.

Table 11 about here

Some interesting results emerge. In particular, in the case of India and Pakistan, for which the overall quality effect difference is positive and relevant, the relative-quality component dominates, partly because the quality-elasticity component is negative or really close to zero. With regard to Thailand and Turkey, the only countries where the quality effect difference is negative (Table 7), both these components are negative, with a slight prevalence of the quality-elasticity term. The reason is that these exporters record the highest quality improvements in the sample (Table 7) and their quality elasticities are also very high (Table 6). In the remaining cases, the quality-elasticity determinant is positive and dominates the relative-quality component, with the exception of Japan.

6 Challenges in competitiveness: an additional investigation of export similarity

The results discussed in the previous subsections show that China is outperforming or displacing all its Asian competitors in textile exports. Only Turkey, India and, to some extent, Thailand record high or satisfactory export growth rates. China's competitive threat has been mainly driven by price and quantity competition, and the threat is potentially higher the more similar the export structure of competitor countries is. It is thus interesting to conclude our empirical analysis with a further investigation of the textile export structure, in order to shed some light on the typology of China's exported goods *vis à vis* its competitors.

The indicator most commonly used in this context is the export similarity index (ESI), computed in this case only with regard to the textile sector (ESI^T), which captures the extent to which China's textile exports and those of its rivals overlap, as shown by the following condition (Pham et al., 2017):

$$ESI^T_{c,z} = \sum_{i=1}^{N} Min(s^q_{T,c,i}, s^q_{T,z,i}) \tag{15}$$

where $s^q_{T,c,i}$ and $s^q_{T,z,i}$ are the shares in quantity of China and country z's exports of any textile good i, respectively, over total textile exports in absolute values. The ESI^T index varies from 0 to 1, and a higher value of this indicator corresponds to a more overlapping pattern between China and its competitors' exports, i.e. when China's textile export structure is more similar to that of its rivals. Low ESI^T values, on the other hand, suggest that China's products are complementary to those of the rivals, so that traded goods are different in terms of structure. Table 12 reports the ESI^T index computations for our sample of exporters in the years 2001, 2008 and 2016.

Table 12 about here

Overall, it appears that China's export structure is fairly similar to that of its competitors, since almost all ESI^T values are around 0.5.[40] This implies that China's success on international markets is not due to any particular features of its exports, but rather to the competitive strategies discussed above. The most interesting case is however that of Pakistan, which has the lowest ESI^T index in the sample. The divergence with China indicates complementarity between the two countries' exports, but what has actually occurred is displacement, as a result of an increase in Pakistan's relative prices, its low product quality level (the lowest in the sample according to the EXPY index) and its low level of quality improvement over time. For developed Asian competitors, the ESI^T indexes show greater similarity with China, particularly in the case of Japan.

It is also interesting to note that the global financial crisis of 2008 appears to have impacted differently on the textile export structure of developing and developed Asian competitors. The ESI^T index of developing countries has clearly fallen over time, but for developed countries it has risen. Emerging countries, particularly India, have differentiated the composition of their textile exports in the attempt to counter the Chinese threat. Among developed rivals, Hong Kong has attempted to offset its ever-decreasing textile market share by changing the composition of traded goods. Korea's export structure, however, has become more similar to that of China, which partly explains its weak performance.

7 Conclusions

During recent decades, China has significantly changed its overall export composition, shifting from labor-intensive to capital-intensive products. Despite this, and contrary to the predictions of the Heckscher-Ohlin theory, textile exports have shown an unexpected extraordinary growth, especially since China's accession to the WTO in 2001. To evaluate the reasons for this striking performance, this study extends the analysis by Lall and Albaladejo (2004), examining trade competition in the textile sector through different steps.

We first perform a preliminary investigation based on the market share dynamics of China and its main Asian competitors, selected among the top world traders in 2016. We then proceed by estimating an extended version of a traditional export function in

[40] Since the ESI^T index is computed at sectoral level, there is a general bias toward similarity compared to ESI indexes computed for the overall economy.

a panel-data framework, derived from the imperfect substitute model, including however a non-price competitiveness factor. The key long-run elasticities for each Asian exporter in the time period 2001-2016 are thus computed and discussed, and the different export performances are examined taking into account the interaction between the estimated parameters and the growth rates of relative prices, foreign demand and quality. Lastly, for the first time in the empirical literature, our approach decomposes the textile export growth difference between China and its rivals into the three main channels of trade competition, i.e. price, quantity and quality. These channels can have opposite or complementary effects on trade performance, and they provide useful information about the different industrial strategies adopted by top textile exporters on world markets.

Since China's exports grow faster than all its rivals, we find that there is an outperformance with respect to India and Turkey, while there is a displacement with regard to all other considered Asian competitors. Moreover, our results clearly show that China crowds out most of its rivals with a competitive strategy based on a mix of low-price policies and non-price factors aiming at stimulating exported volumes. However, certain weaknesses in Chinese trade prospects also emerge, as also witnessed by the reduced export dynamics in the most recent years. On the one hand, China has the highest absolute price elasticity in the sample, so that its exports are strongly dependent on favorable relative price behavior. On the other hand, unlike most of its rivals, including Thailand and Turkey, China is making comparatively small improvements in quality. Moreover, since China's export composition is not very different from that of its competitors, as shown by the sectoral values of the export similarity indexes, price and quality competition strategies are fundamental to ensure lasting success in textile exports. Given however that China is currently experiencing growing wages, quality improvement will be the most important policy to pursue in the future.

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Tables

Table 1: Top textile exporters in 2016

	Export values	**Market share (%)**
China	104,663	36.22
India	16,210	5.61
Germany	13,376	4.63
USA	12,904	4.47
Italy	11,707	4.05
Turkey	10,913	3.78
Korea	10,039	3.47
Chinese Taipei	8,973	3.11
Hong Kong	7,901	2.73
Pakistan	7,680	2.66
Japan	6,419	2.22
Vietnam	6,276	2.17
Belgium	5,398	1.87
Netherlands	4,801	1.66
France	4,678	1.62
Spain	4,127	1.43
Indonesia	4,105	1.42
United Kingdom	3,647	1.26
Thailand	3,382	1.17
All countries above	288,976	85.54
Developing Asian countries	153,228	53.02
Developed Asian countries	33,331	11.53
Total Asian Countries	186,559	64.56

Notes: The table reports the textile exporters whose export share is greater than 1 per cent in 2016. Exports are in monetary values (million USD). Authors' elaboration on WTO data.

Table 2: Textile market share dynamics and China's competitive export outcomes towards its Asian competitors in the time period 2001-2016

	Textile market share	**Textile market share difference between China and its Asian competitors**	**Textile export rate of growth**	**China's competitive export outcome**
China	9.53	-	12.48	-
Developing Asian competitors				
India	2.49	7.04	5.25	*Outperformance*
Indonesia	-1.97	11.50	0.67	*Relative Displacement*
Pakistan	-2.23	11.76	0.40	*Relative Displacement*
Thailand	-0.52	10.05	2.16	*Relative Displacement*
Turkey	3.23	6.30	6.00	*Outperformance*
Developed Asian competitors				
Hong Kong	-14.38	23.91	-12.08	*Absolute Displacement*
Japan	-3.76	13.29	-1.18	*Absolute Displacement*
Korea	-4.85	14.38	-2.29	*Absolute Displacement*

Notes: Authors' elaboration on Comtrade data. The data reported in the table refer to market shares measured in kilograms (yearly growth rates). The export outcomes do not change qualitatively if we compute the same statistics by considering data in values (US dollars).

Table 3: Panel unit root tests: exports, relative prices and non-price competitive factor

	Exports (x_j) *Levels*	Exports (Δx_j) *First differences*	Relative prices (rp_j) *Levels*	Relative prices (Δrp_j) *First differences*	Non-price competitive factor (q_j) *Levels*	Non-price competitive factor (Δq_j) *First differences*
China	-0.08 (0.47)	-2.20 (0.00)	1.19 (0.88)	-7.39 (0.00)	1.24 (0.89)	-6.49 (0.00)
Developing Asian competitors						
India	1.95 (0.97)	-8.25 (0.00)	0.96 (0.83)	-2.98 (0.00)	0.01 (0.50)	-4.27 (0.00)
Indonesia	0.28 (0.61)	-6.78 (0.00)	0.49* (0.69)	-9.63 (0.00)	1.69 (0.95)	-8.27 (0.00)
Pakistan	0.74 (0.77)	-8.25 (0.00)	-0.20* (0.42)	-10.46 (0.00)	-0.99 (0.16)	-8.06 (0.00)
Thailand	1.21 (0.89)	-7.05 (0.00)	1.89 (0.97)	-3.86 (0.00)	0.67 (0.75)	-1.73 (0.04)
Turkey	3.26 (0.99)	-8.28 (0.00)	0.30 (0.62)	-8.14 (0.00)	4.05 (0.99)	-5.64 (0.00)
Developed Asian competitors						
Honk Kong	0.95 (0.83)	-10.44 (0.00)	0.57 (0.72)	-3.91 (0.00)	4.06 (0.99)	-2.92 (0.00)
Japan	0.57 (0.72)	-6.97 (0.00)	-1.04 (0.15)	-2.17 (0.02)	2.21 (0.98)	-1.64 (0.05)
Korea	-0.89 (0.18)	-5.45 (0.00)	-0.65 (0.26)	-2.79 (0.00)	0.62 (0.73)	-7.30 (0.00)

Notes: Standardised Z-tbar are reported for the Pesaran (2007) unit roots test. p-values are shown in parentheses. Pesaran (2007) tests are calculated by including the intercept in the test equation. Maximum selected lag length is 2. A * indicates a lag length equal to 3. The null hypothesis for all tests is 'Panels contain unit roots'. Authors' elaboration on Comtrade data.

Table 4: Unit root tests: foreign demand

	ADF		KPSS	
	Foreign demand (y_j^*) *Levels*	Foreign demand (Δy_j^*) *First differences*	Foreign demand (y_j^*) *Levels*	Foreign demand (Δy_j^*) *First differences*
China	-0.02	-3.67	0.64	0.38
	(0.94)	(0.02)	[0.46]	[0.46]
Developing Asian competitors				
India	0.32	-3.73	0.52	0.43
	(0.97)	(0.02)	[0.46]	[0.46]
Indonesia	0.43	-3.71	0.52	0.44
	(0.98)	(0.02)	[0.46]	[0.46]
Pakistan	0.56	-3.90	0.52	0.44
	(0.98)	(0.01)	[0.46]	[0.46]
Thailand	0.48	-3.72	0.52	0.44
	(0.97)	(0.02)	[0.46]	[0.46]
Turkey	0.48	-3.72	0.52	0.41
	(0.98)	(0.02)	[0.46]	[0.46]
Developed Asian competitors				
Hong Kong	-1.18	-3.14	0.52	0.22
	(0.65)	(0.04)	[0.46]	[0.46]
Japan	-1.17	-3.13	0.52	0.21
	(0.66)	(0.04)	[0.46]	[0.46]
Korea	-1.19	-3.14	0.52	0.22
	(0.65)	(0.04)	[0.46]	[0.46]

Notes: T-statistic and LM-statistic are reported for the Augmented Dickey-Fuller test (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test. p-values and asymptotic critical values are in parentheses and brackets respectively. An asymptotic critical value of 0.46 corresponds to the 5 per cent significance level. ADF and KPSS unit root tests are calculated including the intercept in the test equation. The null hypothesis is 'y^* (or Δy^*) has a unit root' for the ADF test and 'y_j^* (or Δy_j^*) is stationary' for the KPSS test.

Table 5: Pedroni Panel Cointegration Tests

	Panel $v-$Statistic	Panel ρ-Statistic	Panel PP-Statistic	Panel ADF-Statistic	Group ρ-Statistic	Group PP-Statistic	Group ADF-Statistic
China	0.22 (0.51)	1.52 (0.98)	-4.32 (0.00)	-1.91 (0.00)	5.58 (0.99)	-4.67 (0.00)	-1.91 (0.02)
Developing Asian competitors							
India	-1.06 (0.85)	2.83 (0.99)	-2.43 (0.00)	-3.27 (0.00)	6.30 (0.99)	-2.33 (0.01)	-2.49 (0.01)
Indonesia	-2.0 (0.98)	-0.63 (0.81)	-8.23 (0.00)	-2.99 (0.00)	3.66 (0.99)	-9.34 (0.00)	-4.44 (0.00)
Pakistan	-1.07 (0.99)	2.37 (0.98)	-2.69 (0.00)	-3.70 (0.00)	5.19 (0.99)	-4.80 (0.00)	-3.80 (0.00)
Thailand	-2.32 (0.99)	2.90 (0.99)	-2.53 (0.00)	-7.40 (0.00)	6.13 (0.99)	-5.80 (0.00)	-8.21 (0.00)
Turkey	-1.59 (0.97)	2.28 (0.98)	-4.17 (0.00)	-7.17 (0.00)	5.13 (0.99)	-6.46 (0.00)	-6.13 (0.00)
Developed Asian competitors							
Hong Kong	-1.19 (0.99)	0.68 (0.90)	-7.98 (0.00)	-5.85 (0.00)	4.45 (0.99)	-9.06 (0.00)	-5.84 (0.00)
Japan	0.49 (0.63)	1.91 (0.97)	-5.43 (0.00)	-5.47 (0.00)	4.88 (0.99)	-9.42 (0.00)	-5.87 (0.00)
Korea	-1.08 (0.98)	2.75 (0.99)	-3.37 (0.00)	-4.48 (0.00)	5.90 (0.99)	-3.99 (0.00)	-2.41 (0.00)

Notes: Panel statistics are the within-dimension statistics, and group statistics are the between-dimension statistics. The null hypothesis is no cointegration. p-values in parentheses. User-specified lag length is equal to 1. Trend and intercept options: 'no deterministic trend' for all countries.

Table 6: Estimation results of Equation (3) in the period 2001-2016

		Developing Asian Competitors					*Developed Asian Competitors*		
	China	India	Indonesia	Pakistan	Thailand	Turkey	Hong Kong	Japan	Korea
Relative prices (α)	-1.19***	-0.75***	-0.53***	-0.90***	-0.68***	-0.47***	-0.84***	-0.49***	-0.42***
	(0.10)	(0.05)	(0.07)	(0.03)	(0.06)	(0.05)	(0.04)	(0.04)	(0.06)
Foreign demand (β)	2.55***	1.22***	0.18	0.33**	0.18*	0.74***	-1.85***	-0.70***	-1.21***
	(0.12)	(0.12)	(0.16)	(0.15)	(0.11)	(0.10)	(0.14)	(0.10)	(0.12)
Non-price competitiveness component (γ)	0.86***	0.85***	0.82***	1.01***	0.91***	0.93***	0.84***	0.82***	0.82***
	(0.07)	(0.04)	(0.03)	(0.01)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)
Constant	-15.32***	-1.23	8.98***	6.98***	8.84***	3.01***	32.28***	18.95***	25.41***
	(1.29)	(1.32)	(1.90)	(1.63)	(1.16)	(1.07)	(1.46)	(1.60)	(1.29)
Observations	944	944	880	864	944	944	944	944	944
Number of goods	59	59	55	54	59	59	59	59	59

Notes: PMG estimations with coefficient averages computed as outlier-robust means (Hamilton, 1991) for the time period 2001-2016. A *(**)[***] indicates significance at the 10(5)[1] per cent level. Standard errors are reported in parentheses. In the case of Indonesia, time dummies for the years 2001-2007 are included in the estimation. In the case of Pakistan, time dummies for the years 2008 and 2012-2016 are included in the estimation.

Table 7: Textile export performance, price effect, quantity effect and quality effect for each exporter

	Textile export rate of growth	Relative prices rate of growth	Foreign demand rate of growth	EXPY rate of growth	Price effect	Quantity effect	Quality effect
China	12.48	-1.27	3.38	2.30	1.51*** (0.12)	8.62*** (0.40)	1.99*** (0.16)
Developing Asian competitors							
India	5.25	0.08	3.77	1.81	-0.06*** (0.00)	4.61*** (0.45)	1.54*** (0.07)
Indonesia	0.67	-0.83	3.84	2.23	0.44*** (0.06)	0.70 (0.63)	1.81*** (0.08)
Pakistan	0.40	1.52	3.86	0.56	-1.36*** (0.05)	1.29** (0.58)	0.56*** (0.01)
Thailand	2.16	0.07	3.86	2.35	-0.05*** (0.00)	0.71* (0.41)	2.13*** (0.08)
Turkey	6.00	-0.74	3.84	2.56	0.35*** (0.04)	2.85*** (0.36)	2.37*** (0.09)
Developed Asian competitors							
Hong Kong	-12.08	8.62	3.86	2.35	-7.22*** (0.34)	-7.12*** (0.54)	1.98*** (0.11)
Japan	-1.18	-0.30	4.18	2.12	0.15*** (0.01)	-2.92*** (0.42)	1.75*** (0.08)
Korea	-2.29	0.07	3.86	2.32	-0.03*** (0.00)	-4.66*** (0.46)	1.91*** (0.08)

Notes: The first three columns report the yearly growth rates of textile exports, foreign demand and EXPY, respectively. Price effect, quantity effect and quality effect are computed by means of the estimates reported in Table 6 and the rates of growth reported in the first three columns of this table. A *(**)[***] indicates significance at the 10(5)[1] per cent level. Standard errors are reported in parentheses.

Table 8: Difference *vis à vis* China in price effect, quantity effect, quality effect and total export performance in the textile industry: results and estimated conditions

	Price effect difference	Quantity effect difference	Quality effect difference	Total export difference
China versus its developing Asian competitors				
India	1.57*** (0.12)	4.02*** (0.40)	0.45*** (0.16)	6.03*** (0.44)
Indonesia	1.07*** (0.12)	7.93*** (0.40)	0.16 (0.16)	9.16*** (0.44)
Pakistan	2.87*** (0.12)	7.35*** (0.40)	1.42*** (0.16)	11.65*** (0.44)
Thailand	1.55*** (0.12)	7.92*** (0.40)	-0.15 (0.16)	9.33*** (0.44)
Turkey	1.16*** (0.12)	5.78*** (0.40)	-0.38*** (0.16)	6.56*** (0.44)
China versus its developed Asian competitors				
Hong Kong	8.75*** (0.12)	15.76*** (0.40)	0.01 (0.16)	24.53*** (0.44)
Japan	1.36*** (0.12)	11.55*** (0.40)	0.25 (0.16)	13.16*** (0.44)
Korea	1.54*** (0.12)	13.29*** (0.40)	0.08 (0.16)	14.92*** (0.44)

Notes: Total export performance difference, price effect, quantity effect and quality effect are obtained by testing Conditions (6), (7) and (8) starting from the estimates reported in Tables 6 and (7). Standard errors in parentheses. A *(**)[***] indicates significance at the 10(5)[1] per cent level.

Table 9: Price effect difference decomposition

	Relative-price component	Price-elasticity component
China versus its developing Asian competitors		
India		
Condition (9)	1.01	0.56
Condition (10)	1.60	-0.04
Average values	1.31	0.26
Indonesia		
Condition (9)	0.23	0.83
Condition (10)	0.52	0.54
Average values	0.38	0.68
Pakistan		
Condition (9)	2.50	0.37
Condition (10)	3.31	-0.44
Average values	2.91	-0.04
Thailand		
Condition (9)	0.90	0.64
Condition (10)	1.59	-0.03
Average values	1.25	0.30
Turkey		
Condition (9)	0.25	0.91
Condition (10)	0.63	0.53
Average values	0.44	0.72
China versus its developed Asian competitors		
Hong Kong		
Condition (9)	8.28	0.44
Condition (10)	11.73	-3.00
Average values	10.00	-1.28
Japan		
Condition (9)	0.47	0.89
Condition (10)	1.15	0.21
Average values	0.81	0.55
Korea		
Condition (9)	0.56	0.97
Condition (10)	1.59	-0.05
Average values	1.07	0.46

Notes: Relative-price and price-elasticity components correspond to the first and second terms of Conditions (9) and (10), respectively. The Table also reports their average values. Note that the sum (by row) of the values reported in the table corresponds to the price effect difference shown by Condition (6).

Table 10: Quantity effect difference decomposition

	Relative-demand component	Income-elasticity component
China versus its developing Asian competitors		
India		
Condition (11)	-0.48	4.49
Condition (12)	-0.99	5.01
Average values	-0.73	4.75
Indonesia		
Condition (11)	-0.08	8.01
Condition (12)	-1.17	9.10
Average values	-0.63	8.55
Pakistan		
Condition (11)	-0.16	7.50
Condition (12)	-1.22	8.56
Average values	-0.69	8.03
Thailand		
Condition (11)	-0.08	8.01
Condition (12)	-1.22	9.14
Average values	-0.66	8.57
Turkey		
Condition (11)	-0.34	6.11
Condition (12)	-1.17	6.94
Average values	-0.76	6.53
China versus its developed Asian competitors		
Hong Kong		
Condition (11)	0.88	14.86
Condition (12)	-1.22	16.97
Average values	-0.17	15.92
Japan		
Condition (11)	0.56	10.99
Condition (12)	-2.04	13.59
Average values	-0.74	12.29
Korea		
Condition (11)	0.58	12.71
Condition (12)	-1.22	14.51
Average values	-0.32	13.61

Notes: Relative-demand and income-elasticity components correspond to the first and second terms of Conditions (11) and (12), respectively. The Table also reports their average values. Note that the sum (by row) of the values reported in the table corresponds to the quantity effect difference shown by Condition (7).

Table 11: Quality effect difference decomposition

	Relative-quality component	Quality-elasticity component
China versus its developing Asian competitors		
India		
Condition (13)	0.40	0.03
Condition (14)	0.41	0.03
Average values	0.41	0.03
Indonesia		
Condition (13)	0.06	0.10
Condition (14)	0.06	0.10
Average values	0.06	0.10
Pakistan		
Condition (13)	1.76	-0.33
Condition (14)	1.50	-0.08
Average values	1.63	-0.21
Thailand		
Condition (13)	-0.04	-0.10
Condition (14)	-0.04	-0.10
Average values	-0.04	-0.10
Turkey		
Condition (13)	-0.23	-0.15
Condition (14)	-0.22	-0.17
Average values	-0.22	-0.16
China versus its developed Asian competitors		
Hong Kong		
Condition (13)	-0.04	0.05
Condition (14)	-0.04	0.05
Average values	-0.04	0.05
Japan		
Condition (13)	0.15	0.09
Condition (14)	0.16	0.09
Average values	0.15	0.09
Korea		
Condition (13)	-0.02	0.10
Condition (14)	-0.02	0.10
Average values	-0.02	0.10

Notes: Relative-quality and quality-elasticity components correspond to the first and second terms of Conditions (13) and (14), respectively. The Table also reports their average values. Note that the sum (by row) of the values reported in the table corresponds to the quality effect difference shown by Condition (8).

Table 12: The export similarity index in the years 2001, 2008 and 2016

	2001	2008	2016
China versus its developing Asian competitors			
India	0.52	0.56	0.45
Indonesia	0.45	0.45	0.42
Pakistan	0.37	0.29	0.28
Thailand	0.55	0.60	0.58
Turkey	0.58	0.60	0.58
Average developing Asian competitors	0.50	0.50	0.46
China versus its developed Asian competitors			
Kong Kong	0.50	0.47	0.44
Japan	0.42	0.56	0.56
Korea	0.44	0.49	0.55
Average developed Asian competitors	0.45	0.50	0.52
Average Asian competitors	0.48	0.50	0.48

Notes: Authors' elaboration on Comtrade data.

Appendix A

The world market share of any country's (j) textile exports expressed in monetary value terms ($s^{v}{}_{Tj}$) in any year is defined as the ratio between the value of its textile exports and that of the world's (X_{Tj} and X_{Tw}, respectively) as follows:

$$s^{v}_{Tj} = \frac{X_{Tj}}{X_{Tw}} \qquad \text{(A1)}$$

The Balassa *RCA* index is thus defined as

$$RCA_{Tj} = \frac{\dfrac{X_{Tj}}{X_j}}{\dfrac{X_{Tw}}{X_w}} \qquad \text{(A2)}$$

By rearranging the terms in Definition (A2), we can also write

$$RCA_{Tj} = \frac{X_{Tj}}{X_{Tw}} \cdot \frac{X_w}{X_j} = \frac{s^{v}{}_{Tj}}{s^{v}{}_{j}} \qquad \text{(A3)}$$

Hence, the market share of any country's j textile exports in value can be written as

$$s^{v}{}_{Tj} = RCA_{Tj} \cdot s^{v}{}_{j} \qquad \text{(A4)}$$

APPENDIX B

UN Comtrade export data have been carefully checked and corrected for obvious errors, especially concerning the position of the decimal point. We found raw data in particular to be affected by the following problems:

1) Export data in “kilograms” disaggregated at the 4-digit level according to the Standard International Trade Classification (Rev. 3) are not available for all textile goods or, when available, are very incomplete for most selected products. This is the case of Chinese Taipei and Vietnam;

2) Export data for some specific goods are measured in “kilograms” and/or “Area in square metres”, but few observations are available and most are missing. In this case, the series have been dropped from the final dataset. This problem occurs for goods 6536, 6545, 6546 and 6572 for Indonesia and 6529, 6536, 6546, 6576 and 6591 for Pakistan;

3) Most emerging countries have records missing for certain goods only for one year. In this case, we replaced the missing figures with the average values resulting from the observations available for the preceding and subsequent year;

4) Most emerging countries have records missing for certain goods for more than one consecutive year. In these cases, export data missing in kilograms are however available in “Area in square metres”. We were thus able to complete the figures using the conversion factor computable for the years where both units of measurement are available.

Table B1 – List of selected 4-digit textile products

Code	Description
651	**Textile yarn**
6511	Yarn of wool or animal hair (excluding wool tops)
6512	Cotton sewing thread, whether or not put up for retail sale
6513	Cotton yarn, other than sewing thread
6514	Sewing thread of man-made fibres, whether or not put up for retail sale
6515	Synthetic filament yarn (other than sewing thread), textured, not put up for retail sale, including monofilament of less than 67 decitex
6516	Other synthetic filament yarn (other than sewing thread), including monofilament of less than 67 decitex
6517	Artificial and man-made filament yarn (other than sewing thread); artificial monofilament, n.e.s.; strip and the like of artificial textile materials, n.e.s.
6518	Yarn (other than sewing thread) of staple fibres; synthetic monofilament, n.e.s.; strip and the like of synthetic textile materials of an apparent width not exceeding 5 mm
6519	Yarn of textile fibres, n.e.s. (including paper yarn and yarn, slivers and rovings of glass fibre)
652	**Cotton fabrics, woven (not including narrow or special fabrics)**
6521	Pile and chenille fabrics, woven
6522	Cotton fabrics, woven, unbleached (other than gauze and pile and chenille fabrics)
6523	Other woven fabrics, containing 85% or more by weight of cotton, bleached, dyed, printed or otherwise finished, weighing not more than 200 g/m2
6524	Other woven fabrics, containing 85% or more by weight of cotton, bleached, dyed, printed or otherwise finished, weighing more than 200 g/m2
6525	Other woven cotton fabrics, containing less than 85% by weight of cotton, mixed mainly or solely with man-made fibres, bleached, dyed, printed or otherwise finished, weighing not more than 200 g/m2
6526	Other woven cotton fabrics, containing less than 85% by weight of cotton, mixed mainly or solely with man-made fibres, bleached, dyed, printed or otherwise finished, weighing more than 200 g/m2
6529	Other woven fabrics of cotton
653	**Fabrics, woven, of man-made textile materials (not including narrow or special fabrics)**
6531	Fabrics, woven, of synthetic filament yarn (including woven fabrics obtained from materials of heading 651.88), other than pile and chenille fabrics
6532	Fabrics, woven, of synthetic staple fibres, containing 85% or more by weight of such fibres (other than pile and chenille fabrics)
6533	Fabrics, woven, of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton (other than pile and chenille fabrics)
6534	Fabrics, woven, of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with fibres other than cotton (other than pile and chenille fabrics)
6535	Fabrics, woven, of artificial filament yarn (including woven fabrics obtained from materials of heading 651.77)
6536	Fabrics, woven, containing 85%/more by weight of artificial staple fibres
6538	Fabrics, woven, of artificial staple fibres, containing less than 85% by weight of such fibres (other than pile and chenille fabrics)
6539	Pile fabrics and chenille fabrics, woven, of man-made fibres (other than fabrics of group 652 or 656)
654	**Other textile fabrics, woven**
6541	Fabrics, woven, of silk or of silk waste
6542	Fabrics, woven, containing 85% or more by weight of wool or of fine animal hair (other than pile and chenille fabrics)
6543	Fabrics, woven, of wool or of fine animal hair, n.e.s

6544 Fabrics, woven, of flax
6545 Fabrics, woven, of jute/of other textile bast fibres of group 264.
6546 Fabrics, woven, of glass fibres (including narrow fabrics)
6549 Fabrics, woven, n.e.s.

655 Knitted or crocheted fabrics (including tubular knit fabrics, n.e.s., pile fabrics and openwork fabrics), n.e.s.

6551 Pile fabrics (including "long pile" fabrics and terry fabrics), knitted or crocheted, whether or not impregnated, coated, covered or laminated
6552 Other knitted or crocheted fabrics, not impregnated, coated, covered or laminated

656 Tulles, lace, embroidery, ribbons, trimmings and other smallwares

6561 Narrow woven fabrics (other than goods of subgroup 656.2); narrow fabrics consisting of warp without weft assembled by means of an adhesive (bolducs)
6562 Labels, badges and similar articles of textile materials, in the piece, in strips or cut to shape or size, not embroidered.
6563 Gimped yarn, and strip and the like of heading 651.77 or 651.88, gimped (other than metallized yarn and gimped horsehair yarn); chenille yarn (including flock chenille yarn); loop-wale yarn; braids in the piece; ornamental trimmings in the piece, without embroidery, other than knitted or crocheted; tassels, pompons and similar articles
6564 Tulles and other net fabrics (not including woven, knitted or crocheted fabrics); lace in the piece, in strips or in motifs
6565 Embroidery in the piece, in strips or in motifs

657 Special yarns, special textile fabrics and related products

6571 Felt, whether or not impregnated, coated, covered or laminated, n.e.s.
6572 Non-wovens, whether/not impregnated, coated, covered/laminated, n.e.s.
6573 Coated or impregnated textile fabrics and products, n.e.s.
6574 Quilted textile products in the piece, composed of one/more layers of textile materials assembled with padding by stitching/othw., n.e.s.
6575 Twine, cordage, ropes and cables and manufactures thereof (e.g., fishing nets, ropemakers' wares)
6576 Hat shapes, hat forms, hat bodies and hoods
6577 Wadding, wicks, and textile fabrics and articles for use in machinery or plant
6578 Rubber thread and cord, textile-covered; textile yarn, and strip and the like of heading 651.77 or 651.88, impregnated, coated, covered or sheathed with rubber or plastics.
6579 Special products of textile materials

658 Made-up articles, wholly or chiefly of textile materials, n.e.s.

6581 Sacks and bags, of textile materials, of a kind used for the packing of goods.
6582 Tarpaulins, awnings and sun-blinds; tents; sails for boats, sailboards or landcraft; camping goods
6583 Blankets and travelling-rugs (other than electric)
6584 Bed linen, table linen, toilet linen and kitchen linen
6585 Curtains and other furnishing articles, n.e.s., of textile materials
6589 Made-up articles of textile materials, n.e.s.

659 Floor coverings, etc.

6591 Linoleum, whether/not cut to shape; floor coverings consisting of a coating/covering applied on a textile backing, whether/not cut to shape
6592 Carpets and other textile floor coverings, knotted, whether or not made up.
6593 Kelem, Schumacks, Karamanie and similar hand-woven rugs
6594 Carpets and other textile floor coverings, tufted, whether or not made up.

6595 Carpets and other textile floor coverings, not tufted or flocked, whether or not made up
6596 Carpets and other textile floor coverings, n.e.s.

Appendix C

The variable used to proxy the textile product quality is a sectoral EXPY, which, according to Rodrik (2006) and Hausmann et al. (2007), is computed, for every year *t*, as follows:

$$EXPY_{ij} = \frac{PRODY_i \cdot s_{ij}^v}{\sum_{i=1}^{N} s_{ij}^v} \qquad \text{(C1)}$$

where

$$PRODY_i = \frac{\sum_{j=1}^{M} s_{ij}^v \cdot y_j}{\sum_{j=1}^{M} s_{ij}^v} \quad . \qquad \text{(C2)}$$

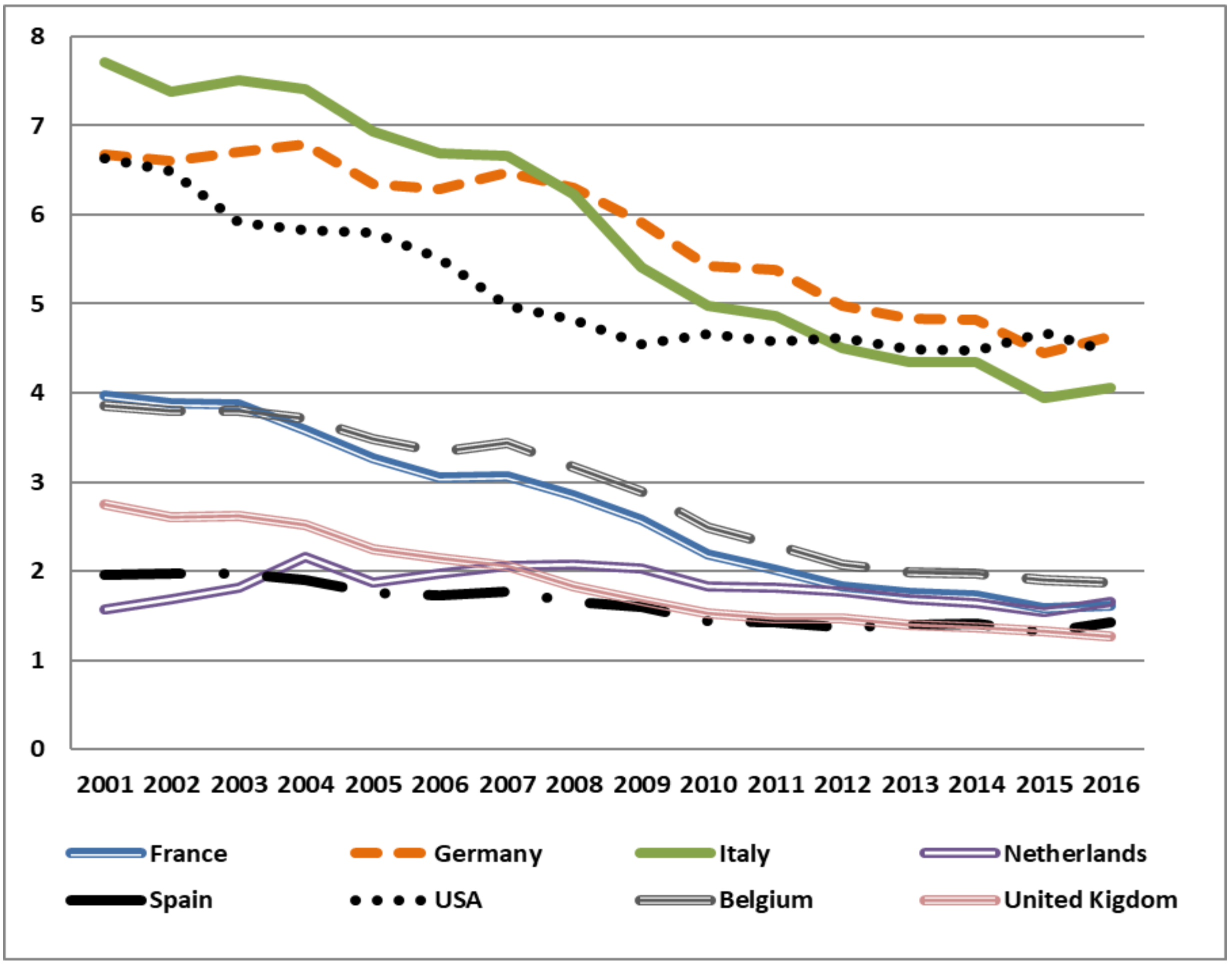
$s_{ij}^v = \frac{X_{ij}}{X_j}$ is the share (in monetary value terms) of good *i* exports on total exports in country *j* (in absolute terms) and y_j is the per capita GDP of country *j* at constant prices in 2011 international USD (PPP), with $i = 1,...,N$, $j = 1,...,M$.

Therefore, the variable EXPY is, for every product *i* in country *j*, a fraction of the overall PRODY index, which is the same for every good and country, where the reduction coefficient is equal to the ratio between the share of exports of every textile product on total exports and the sum of all these shares. Unlike most of the literature, where the EXPY index is computed at the aggregate level, it is calculated here for every product of the textile sector only. This explains the presence of the sum of product textile shares in the denominator of Definition (C1).

Figure

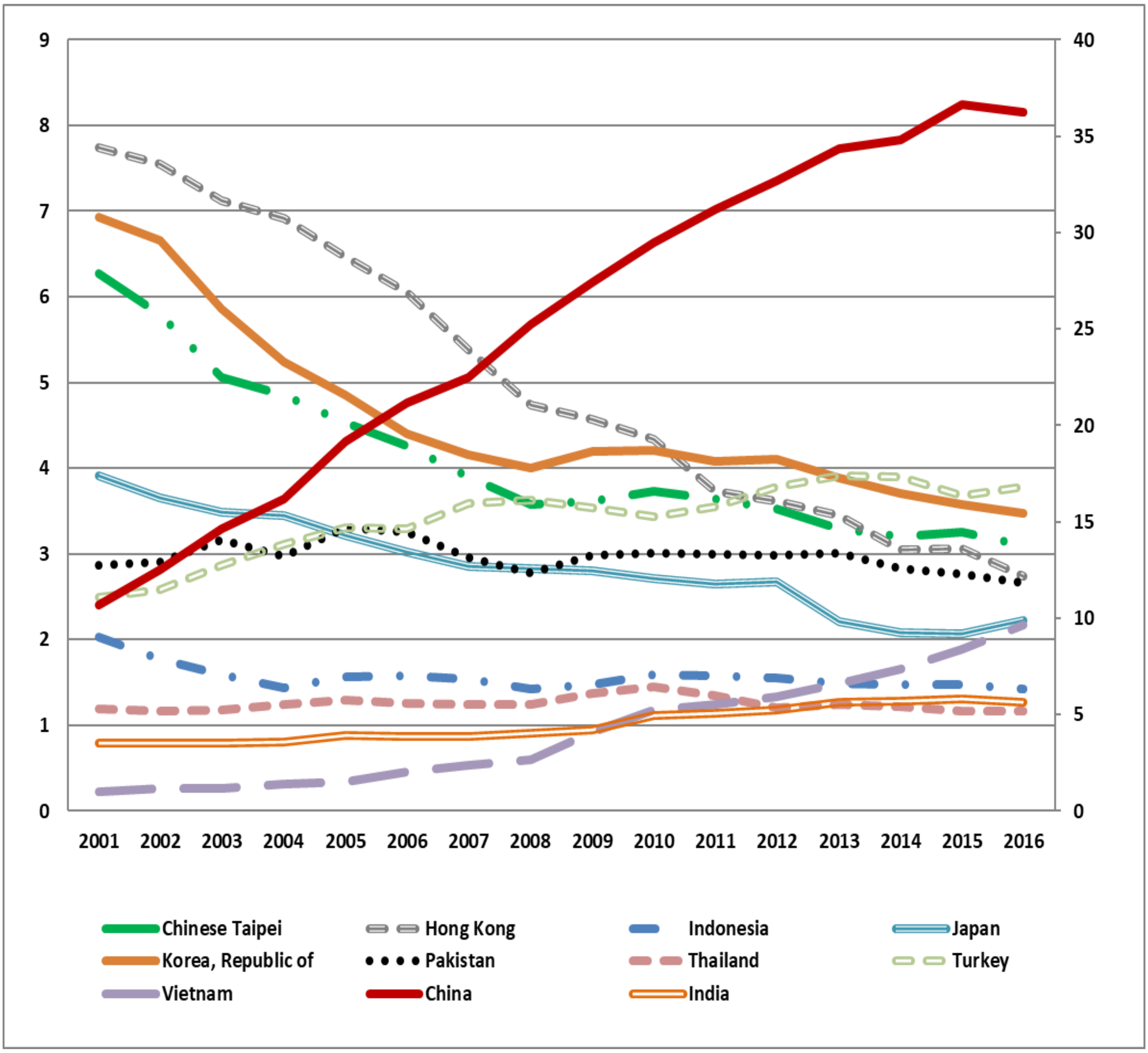
FIGURES

Figure 1: Textile export market shares in advanced Western countries: 2001-2016



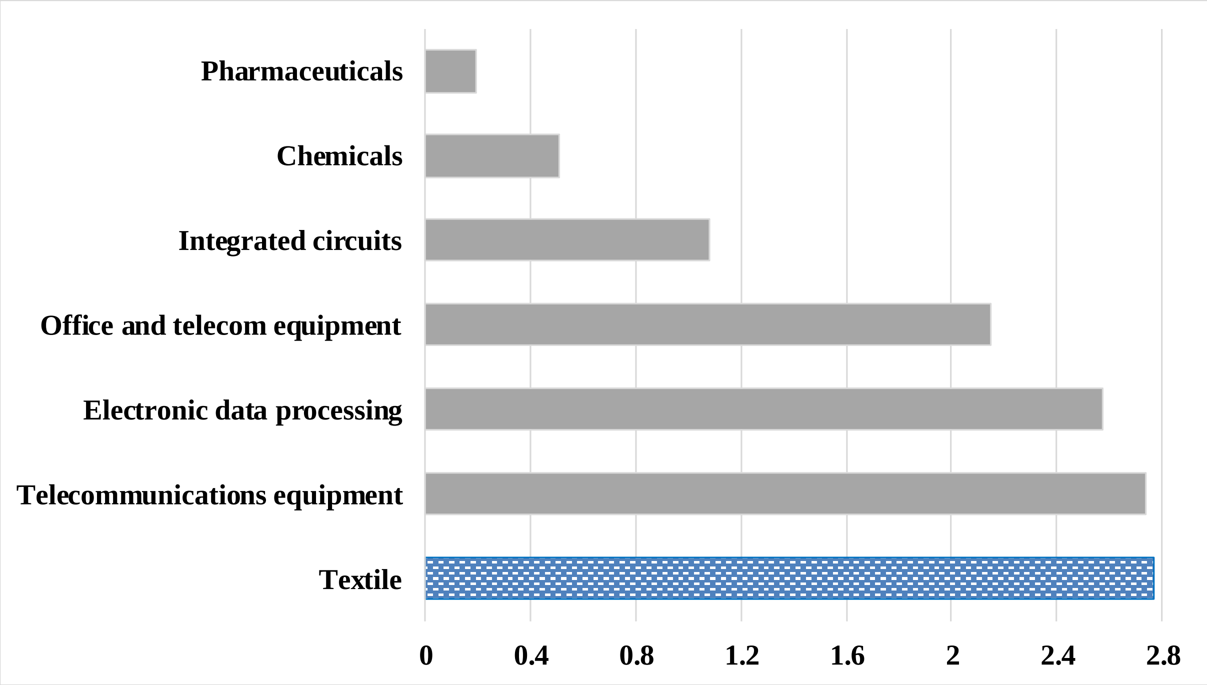
Notes: Authors' elaboration on WTO data.

Figure 2: Textile export market shares in Asian countries: 2001-2016



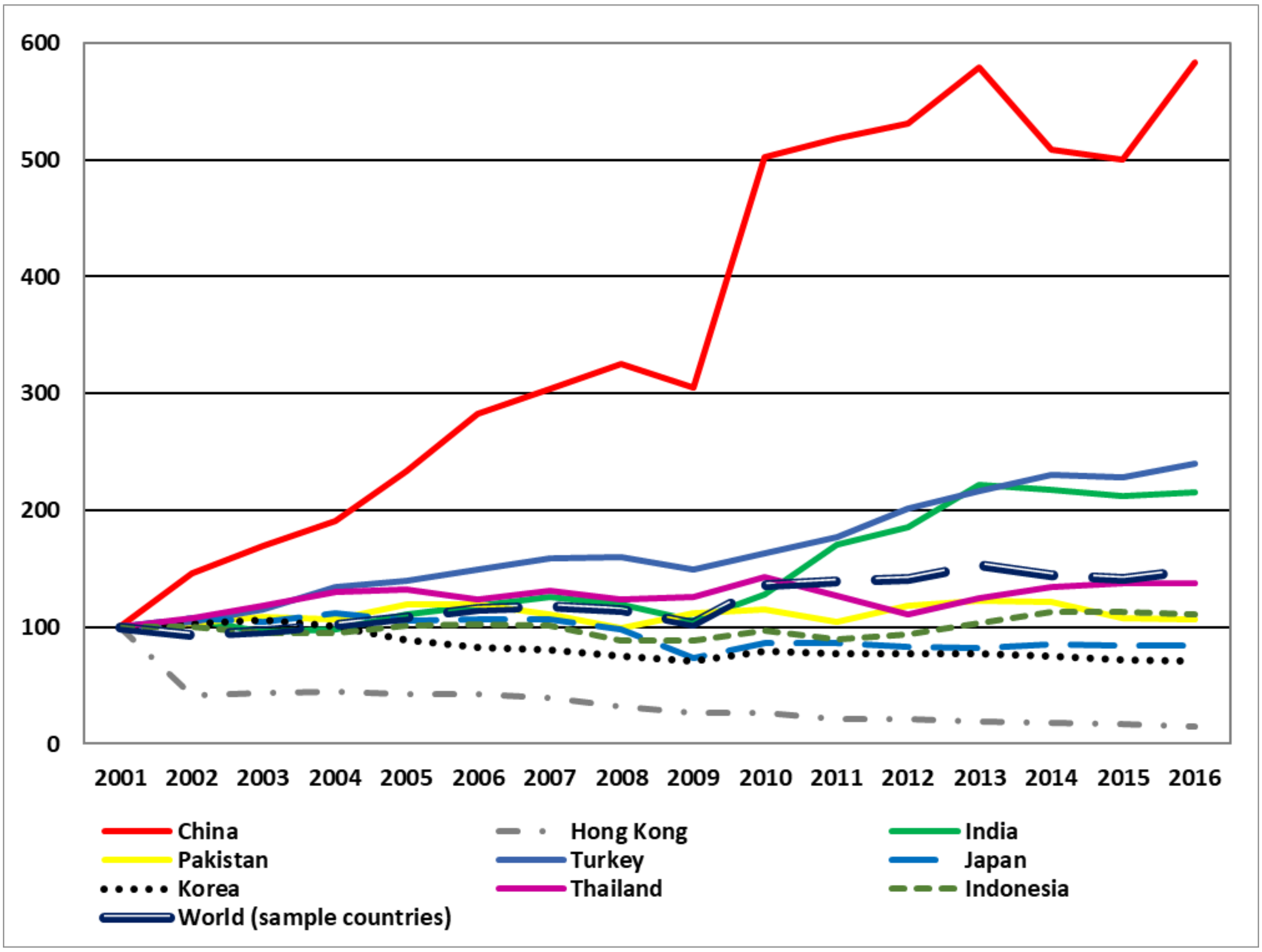
Notes: Authors' elaboration on WTO data. All countries' values are measured on the left vertical axis, with the exception of China's data, measured on the right axis.

Figure 3: China's Balassa indexes in 2016: textile versus high-tech sectors



Notes: Authors' elaboration on WTO data

Figure 4: Export volumes by country - Indices 2001=100



Notes: Authors' elaboration on Comtrade data.