

ROUTLEDGE STUDIES IN THE GROWTH ECONOMIES OF ASIA

Economic Change in Asia

Implication for corporate strategy
and social responsibility

Edited by
M. Bruna Zolin, Bernadette
Andreosso-O'Callaghan
and Jacques Jaussaud

ROUTLEDGE


4 Economic and social importance of the growing natural fiber market

China's role in the international cotton market

Carolina Gavagnin and M. Bruna Zolin

4.1 Introduction

The 2008 global crisis has severely affected the textile filament industry, including natural fibers, and particularly cotton. Cotton is the world's most important natural fiber. It supplies an important part of the textile industry that employs more labor globally than any other industry. The textile industry has played a decisive role in the processes of development of some Asian countries (e.g., China, India, Hong Kong and Bangladesh) by providing substantial employment and significant contributions to export earnings. In developed countries, one of the main reasons for its great importance is in terms of its employment rate, which has been greatly reduced by the 2008 economic crisis and by competition from lower-cost countries in the developing world, creating concerns about the entire textile manufacturing systems and associated labor markets in developed countries.

Research on the cotton market tends to focus on the distortions that industrialized countries cause in the international market due to the high level of subsidies given to this crop (Baffes, 2003, 2007; Gilson *et al.*, 2004; Anderson and Martin, 2008; Shahin, 2008). Generally, the guilty parties are identified as the United States and the EU. Although the pre eminent role is played by China in this area (as the world's main consumer, producer and importer), the effects produced by this country on the international cotton market tend to be underestimated. In absolute terms, the Chinese government subsidizes the sector offering the highest level of support worldwide since 2009–10 (ICTSD, 2013), even if, in relative terms (per unit of product), the EU is the largest subsidizer.

Although cotton is naturally a perennial plant (its life cycle is about 10 years), in extensive plantations it is grown as an annual crop. It is thus subject to annual change if and when other crops prove to be more profitable. Cotton is an extremely widespread vegetable textile fiber – the most widespread in the world. According to UNCTAD (2014) in 2007–08, out of the 65 countries where cotton is grown, 52 are developing countries, 21 are classified as least-developed countries and 22 (33 per cent of the total) are located in the Asian continent.

Cotton is one of the oldest crops in the world, and international trade in cotton can be traced back at least a thousand years (Findlay and O'Rourke, 2003). Since

the Industrial Revolution, cotton has become a natural resource for some developing countries. A multitude of small countries – such as Mali, Burkina Faso and Chad – is cultivated on large areas. Thanks to the aid of international organizations, massive cotton plantations have been established for export or to

Currently the market is dominated by China, where labor costs are high. In the textile industry, labor costs have increased significantly in terms of technology. Approximately 100 million hectares of 2 to 15 acres, produced by a large number of developing countries, which is confirmed by its high employment rate.

Since China's accession to the World Trade Organization, its cotton policy has been to store cotton in order to meet domestic demand. It had amassed an inventory of 10 million bales of production. "With market liberalization, we do without imports from the United States," the Council International de Commerce has stated, however, is not accurate.

China has repeatedly stated that it has served the world well. They buy more cotton from the United States and sell it on the local market.

The world's cotton market has been affected by the economic crisis. More details follow:

- Environmental degradation is the decline of the crop. In addition to the need to reduce yield, the use of humans, animals and the use of chemicals

the Industrial Revolution it has experienced widespread growth. It is an important natural resource for millions of consumers, a major source of export revenues in some developing countries and a source of income and means of survival for a multitude of small and poor farmers, generally located in rural areas. In developed countries – such as the United States and the European Union countries – cotton is cultivated on large industrial farms with the support of government subsidies. Thanks to the aid received from Western countries, agricultural land turned into massive cotton plantations in non developed countries provides cheap raw materials for export or to mass-produce products.

Currently the majority of the world's cotton is grown in developing countries where labor costs are low. According to UNCTAD (2014), labor costs in the textile industry represent approximately one-sixth of total production costs, and rising labor costs have eroded the comparative advantage held by developed countries in terms of technology and better infrastructures in favor of low-cost economies. Approximately 100 million farmers in developing countries, working small plots of 2 to 15 acres, provide the world with two-thirds of its cotton (Takacs, 2012). In a large number of developing countries agriculture fulfils a major economic role, which is confirmed by its large contribution to the gross domestic product (GDP) and its high employment rate.

Since China's accession to the World Trade Organization, the country has achieved enormous progress, which has been enhanced by the central government's cotton policies (Yong, 2011b). In 2011, the Chinese government began to store cotton in order to support the domestic price paid to farmers. By 2012, China had amassed an inventory equivalent to 85 per cent of the total national annual production. "With more than 10 million tons of inventory, Beijing in theory could do without imports for 5–6 years," says Kevin Latner, executive director of Cotton Council International (CCI), a body promoting American cotton. The hypothesis, however, is not accurate.

China has repeatedly made it clear its goal is price stability. And its action so far has served rather to rebalance the market: when international prices fall, they buy more cotton which by the way is a great deal, because then they can sell it on the local market at higher prices.

(Bellomo, 2013)

The world's cotton market is facing a lot of problems, aggravated by the continuing economic crisis. More specifically, the main issues can be summarized as follows:

- **Environmental deterioration:** One major component of environmental degradation is the depletion of fresh water. Cotton is, indeed, a water-intensive crop. In addition, pesticides and other chemicals are widely used in order to reduce yield losses and facilitate crop harvests. Pesticides can harm humans, animals and beneficial organisms and reduce biodiversity. Heavy use of chemicals on poor-quality soil contributes to a loss of fertility and

The FAOSTAT database provides up-to-date data relating to production and trade of agricultural crops by country, specifically harvested area, yield, imports and exports. The World Development Indicators (WDI) is the primary World Bank data catalogue presenting the most current and accurate global development data available at global and national levels. USDA's Foreign Agricultural Service contains current and historical official data on supply, use and trade of agricultural commodities for the United States and key producing and consuming countries, including China. All Indexmundi data about agricultural commodities are sourced from the USDA. ICAC, whose purpose is to assist governments in fostering a healthy world cotton economy (Valderrama, 2005), provides statistics on world cotton production, consumption and trade. In doing so, it strives to identify emerging changes in the structure of the world cotton market. Cotlook and PCI Fibres are the official source of cotton and manmade fiber prices, respectively. The period taken into account is 2000–12.

As far as the Chinese market is concerned, the study considers its relationship with the major variables affecting production, consumption and international trade.

The wide range of varieties of cotton grown worldwide reflects differences in cotton prices. Hence the need for standardization in a global cotton price indicator. Nowadays there are basically two points of reference for cotton prices: the Cotlook A Index and the New York Futures Exchange (NYFE). The former reflects cotton prices in the everyday physical cotton market, whereas the latter is a purely speculative market. The A Index, compiled by Cotlook Ltd., a private company in Liverpool, is indeed the most often quoted indicator of average international prices. It is calculated by averaging the offer values of the cheapest five quotations for delivery to East Asia for middling-quality cotton of 1½inches.² In this chapter the Cotlook A Index is referred to as the cotton price indicator.

Since 2002 the Chinese Cotton Index (CC Index) reflects cotton prices in China. It is an indicator of the Type 328 cotton price level, calculated as the daily average of offer prices received by 200 Chinese mills.

In order to analyze Chinese cotton production, consumption and trade, the study selected some influencing variables – namely, cotton prices, cotton substitute prices, harvested area, productivity and government investment for cotton production.

In order to measure a proxy of these variables, the study used the following indicators, respectively: the CC Index, the PCI synthetic fibers index, the cotton harvested area, the quantity of cotton produced per hectare and government expenditure in the primary sector.

Cotton consumption, in addition to cotton prices and cotton substitute prices, is supposed to be affected by the average standard of living (GDP per capita) and population trends.

The variables influencing the international cotton trade are assumed to be the price of cotton, the price of cotton substitutes and the exchange rate yuan/US dollar. The study aims to measure the linear association between production (consumption, imports and exports) and each of the previously listed variables through the Pearson correlation index (r).

4.3 The world cotton market: stylized facts

India has been well known for its textile goods since ancient times. During the second half of the seventeenth century, cotton goods in Europe were imported from India. The Industrial Revolution, however, changed the international competitive advantages, and India lost its leader position. Britain subsequently became the world's most important textile producer, even exporting to India. Rising wages and raw cotton prices in Britain were compensated for by competitive advantages in productivity. With globalization, the developed countries (particularly in Europe and for the clothing industry) delocalized, and European companies have gradually divested production, and some countries (especially in Asia) have taken advantage of this situation. At the beginning of the twenty-first century, Europe appears to be returning to Asia what the Industrial Revolution had taken away. As a general trend, however, since the 1970s cotton's share of world textile fiber consumption has started to decline and give way to chemical fibers, although cotton still remains the most important natural fiber.

Currently, cotton textile manufacturing is the most important industry within the textile sector, even if the volume is lower compared with the 1960s because of competition with synthetic fibers. Cotton, an important natural fiber, is produced mainly in the United States, India, China, Egypt, Pakistan and Eastern Europe (Table 4.1). India has the largest area cultivated for cotton production, but China is the largest producer and consumer of cotton in the world. Developing countries account for 81 per cent of global cotton production (ICTSD, 2013).

The textile industry and, consequently, the cotton industry, had and continues to have an important role in the EU. Among the member states, Italy is the leading manufacturer of textile products, followed by Germany, the United Kingdom and France. Turkey is included among the world's leading cotton consumers (Table 4.1). Because of the end of protectionism due to the expiration of the

Table 4.1 The cotton market: main producing and consuming countries (estimates 2013)

Country	Production (1,000 480-lb bales)	Share of world production (%)	Consumption (1,000 480-lb bales)	Share of world consumption (%)
China	34,000	28.95	36,000	33.12
India	28,000	23.84	22,750	20.93
United States	13,500	11.50	3,505	3.22
Pakistan	9,500	8.09	11,725	10.79
Brazil	7,000	5.96	4,050	3.73
Turkey	2,250	1.92	6,100	5.61
European Union	1,599	1.36	973	0.90
Rest of World	21,575	18.37	23,600	21.71
World	117,424	100.00	108,703	100.00

Source: Indexmundi and USDA.

Multi-Fib
global cot
ling conce
the Europ
at a disad
dimension
The turno
whereas e
and home
value. Evi
with deve

The gr
(2013), w
allocated

In the v
and consu
share of c
market ar
China and
total cons

In dyna
without a
sumption
reduction

1,40,00

1,20,00

1,00,00

1,000 480-lb bales

80,00

60,00

40,00

20,00

Figure 4.1

Source: Aut

Note: Cotto

Multi-Fiber Arrangement (1994), the European Union has been open to greater global competition, particularly from China, India and other Asian countries, fueling concrete fears and concerns within its borders. According to Scheffer (2012), the European textile and clothing industry is highly export oriented; however, it is at a disadvantage in terms of supply to lower- and middle-income countries. The dimensions of the EU industry declined substantially between 2000 and 2010. The turnover of the industry decreased by 25 per cent (slightly more in textiles), whereas employment decreased by 50 per cent. In terms of demand, the clothing and home textiles market in Europe is slowly growing in volume but is stable in value. Even if the luxury segment has performed well, the gap in growth compared with developing countries is not sufficient to cover losses through competition.

The growth of world cotton production in recent years, according to ICAC (2013), was due to the growth in productivity rather than to an increase in land allocated to production. Much of this increase is attributable to China (Table 4.3).

In the world cotton market, there is a pronounced concentration in production and consumption: the leading cotton-producing economies also account for a large share of cotton consumption (ICAC, 2012a). The main actors in the world cotton market are China, India, the United States, Pakistan, Brazil and Turkey (Table 4.1). China and India account for 53 per cent of world production and 54 per cent of total consumption.

In dynamic terms, starting from 2010, world production exceeds consumption without attenuating the increase in world prices. In 2012 an improvement in consumption and a reduction in the quantity produced corresponded to a significant reduction in prices due to stock accumulation on the Chinese market (Figure 4.1).

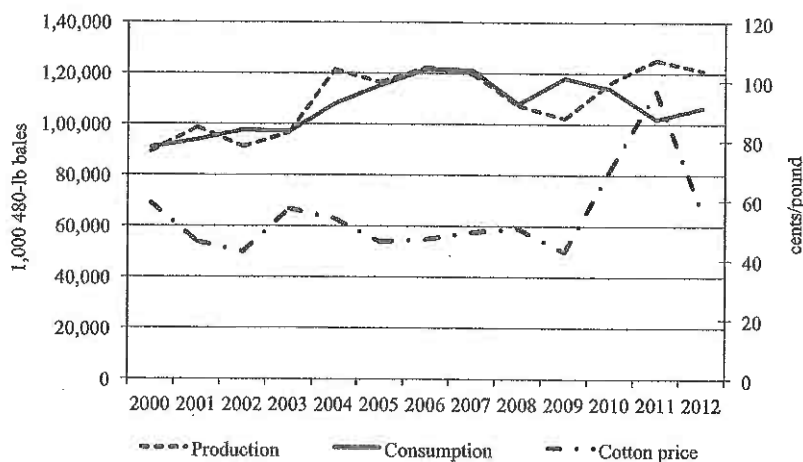


Figure 4.1 The world cotton market: production, consumption and cotton price (2000–2012)

Source: Authors' elaboration based on USDA and Cotlook data.

Note: Cotton price calculated as yearly average price (A index).

mes. During the re imported from onal competitive ntly became the Rising wages and ve advantages in ularly in Europe s have gradually taken advantage pe appears to be ay. As a general ber consumption tion still remains

t industry within 1960s because of iber, is produced Eastern Europe iction, but China s loping countries 3).

had and contin- ates, Italy is the the United King- ; cotton consum- expiration of the

(estimates 2013)

Share of world consumption (%)
33.12
20.93
3.22
10.79
3.73
5.61
0.90
21.71
100.00

4.4 Supply and demand determinants

Many factors have affected and are affecting the world cotton market, both on the supply side and the demand side.

More specifically, the main determinants of cotton supply are the price of cotton, the profitability of alternative products, the costs of production, the size of buffer stocks, changes in technology, environmental constraints and public policies (Theriault, Serra and Sterns, 2013).

Cotton demand, in addition to price changes in cotton and cotton substitutes, is influenced by consumer tastes and preferences, demographic factors, income and the general level of prices (Baffes, Ataman Aksoy and Beghin, 2005).

As expected, in relation to the global trend in cotton production, consumption and trade in the period between 2000 and 2012 appear to be influenced by cotton price³ movements (Figure 4.1): peaks in the cotton price are followed by an increase in cotton production and a contraction in cotton demand, as happened in 2011; whereas, when the cotton price decreases, as in 2009, global consumption leaps up and production goes down.

Since the 1960s, the use of synthetic fibers has increased dramatically, causing the natural fiber industry to lose much of its market share. Since late 1990s, cotton and natural fibers in general have been gradually surpassed by manmade fibers (MMF) – among which nylon, polyester and acrylic are the most common. This global shift in preferences has been mainly influenced by MMF's lower cost (Carmichael, 2015).

In 2012 world demand for fibers – natural and manmade – exceeded 80 million tons, and taking into account the demand for cotton and manmade fibers in the same year, the share of cotton demand equalled 31.6 per cent of total demand (Table 4.2). Global demand for manmade fibers is projected to further increase (Morris and Wagneur, 2012).

In relation to international trade, since 2000 the volume of traded cotton has been constantly increasing until reaching its peak in 2005 (Figure 4.2), when all textile trade was integrated into World Trade Organization rules and textile quotas were eliminated with the Multi-Fiber Agreement (ESCAP, 2008). The economic crisis that hit the world commodities markets in 2008, leading to unprecedented high prices, resulted in a contraction of the cotton trade. Since 2011 a decrease in the general price levels of commodities has sustained international trade recovery.

Table 4.2 World fiber consumption: share of cotton and manmade fibers (2007, 2010, 2012)

World fiber consumption (Million tons)			Share of cotton consumption (%)			Share of MMF consumption (%)		
2007	2010	2012	2007	2010	2012	2007	2010	2012
67,736	69,728	83,500	36.3	32.9	31.6	55.5	60.1	60.9

Source: FAO and ICAC.

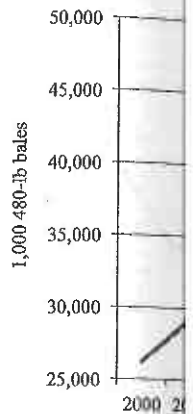


Figure 4.2 The world cotton trade volume
Source: Authors' elaboration

Cotton prices, as (FAO *et al.*, 2011). E and the stronger the economy is, the gre

Price volatility is synthetic fibers, exclud and cultivation in developed countri

World cotton trade intervention. Subsid border protection (s mum support price t cent of world cotton of direct and indirect are an extremely imp tries located in Wes revenues. Support to contention for many was led to deal with

World subsidies s If ICAC data are co industry diminishes, 2002 and 2005, the at and cotton prices de

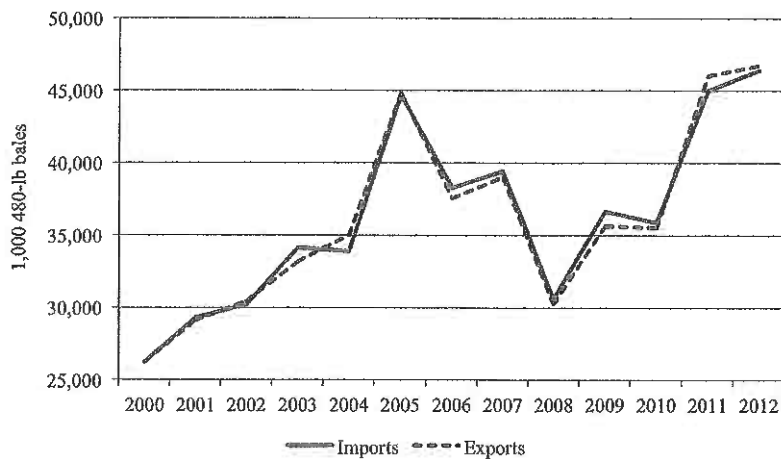


Figure 4.2 The world cotton market: imports and exports (2000–2012)

Source: Authors' elaboration based on USDA data.

Cotton prices, as with other basic commodities, are subject to large fluctuations (FAO *et al.*, 2011). Extreme price volatility leads to high uncertainty in economies, and the stronger the country's dependency on commodities and the more open the economy is, the greater the uncertainty.

Price volatility is influenced by the substitution effect caused by competition with synthetic fibers, exchange rate fluctuations, demand, the application of new technologies and cultivation techniques, subsidies granted to cotton producers – particularly in developed countries – and unpredictable weather events (Marwaha, 2011).

World cotton trade and production are highly affected by government policy intervention. Subsidies to the cotton sector include direct support to production, border protection (such as tariffs and quotas), crop insurance subsidies and minimum support price mechanisms. According to ICAC (2013), in 2012 about 49 per cent of world cotton production received direct government assistance. The impact of direct and indirect subsidies on cotton prices is not easily measurable, and prices are an extremely important variable for some developing countries – namely countries located in Western and Central Africa – who heavily rely on cotton export revenues. Support to the cotton industry in developed countries is a major cause of contention for many developing countries: in 2004 the World Trade Organization was led to deal with “the cotton problem” as a separate issue (Baffes, 2011: 8).

World subsidies seem to have a negative influence on cotton prices (Figure 4.3). If ICAC data are considered, it is found that when direct assistance to the cotton industry diminishes, the A index leaps up, such as in 2004 and 2011; vice versa, in 2002 and 2005, the amount of subsidy provided to the world cotton industry increased and cotton prices decreased (ICAC, 2013).

arket, both on the

: the price of cot-
tion, the size of
nd public policies

ton substitutes, is
ctors, income and
2005).

ion, consumption
ffluenced by cot-
e followed by an
d, as happened in
bal consumption

ramatically, caus-
Since late 1990s,
ssed by manmade
he most common.
MMF's lower cost

exceeded 80 mil-
nanmade fibers in
nt of total demand
o further increase

traded cotton has
ure 4.2), when all
and textile quotas
8). The economic
; to unprecedented
2011 a decrease in
nal trade recovery.

s (2007, 2010, 2012)

ve of MMF
sumption (%)

	2010	2012
7		
5	60.1	60.9

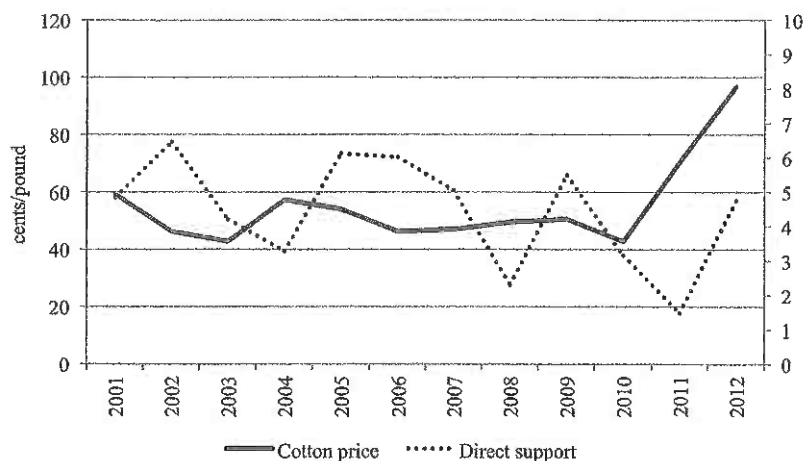


Figure 4.3 World direct assistance to cotton and cotton price (2000–2012)
Source: Authors' elaboration based on ICAC data.

4.5 The Chinese market

China is at the center of the global cotton market, as the world's largest cotton-producing, consuming and importing country (Table 4.3). China imports cotton from the United States, India, Australia and Uzbekistan in particular (Meyer, MacDonald and Kiawu, 2013).

Although China maintains its primacy in the market, especially due to its massive cotton imports, production and consumption have recently shown a decreasing pattern. Figure 4.4 depicts the trend of the Chinese cotton market in the period 2000–12.

After a constant increase in production and consumption, in 2008 the cotton market in China suffered a slight contraction, partly related to the overall economic crisis that hit world commodities.

However, the China Cotton Association (2014) ascribes the decrease in cotton production to lower acreage; increasing costs of labor, fertilizer and seed; low technological adaptation; preferential government support to grain crops; and volatile prices.

As far as technological adaptation is concerned, in the early 1990s China became the first country to commercialize genetically modified (GM) plants, starting with the virus-resistant tobacco, applied on a large scale. At that time, in other parts of the world scholars were discussing whether or not genetically modified organisms (GMOs) pose a risk to health (Jia and Peng, 2002). Among modified organisms, Bt cotton – an engineered variety made by US biotech giant Monsanto – is the most grown transgenic crop in China. Bt cotton makes up 95 per cent of China's

Table 4.3 Chinese cotton

	2000
China	
1,000 lb bales	
Production	20,300
Consumption	22,725
Imports	230

Source: USDA.

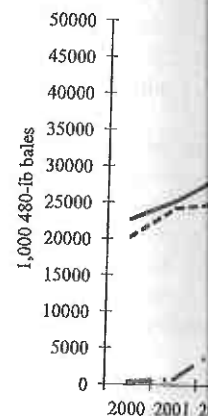


Figure 4.4 The Chinese cotton market (2000–2012)
Source: Authors' elaboration based on ICAC data.
Note: Imports are represented by the dotted line.

vast cotton plantation. According to these authors and their study show ladybirds, lacewings crops can promote bio. *The Guardian* (Sample have been struck by in

Table 4.3 Chinese cotton production, consumption and imports (2000, 2004, 2008, 2012)

	2000		2004		2008		2012	
	China 1,000 480- lb bales	World 480- share %	China 1,000 480- lb bales	World 480- share %	China 1,000 480- lb bales	World 480- share %	China 1,000 480- lb bales	World 480- share %
Production	20,300	22.78	30,300	24.95	36,700	34.00	35,000	28.43
Consumption	22,725	25.04	37,250	34.54	42,750	39.38	36,000	33.55
Imports	230	0.88	6,385	18.85	6,996	22.86	20,327	44.09

Source: USDA.

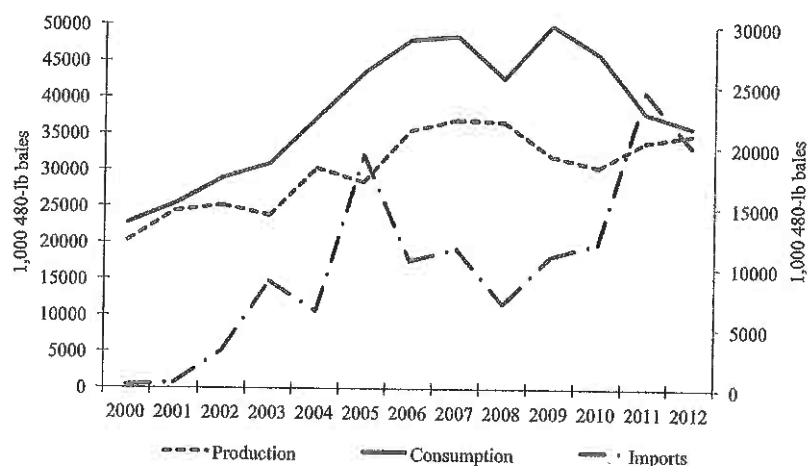


Figure 4.4 The Chinese cotton market: production, consumption and imports (2000–2012)

Source: Authors' elaboration based on USDA data.

Note: Imports are represented on the secondary vertical axis.

vast cotton plantations. Chinese researchers express very different and discordant opinions on the merits of Bt cotton. According to Lu *et al.* (2010) and Huang *et al.* (2010), the introduction of Bt cotton has led and is leading to strong environmental benefits (with favorable economic benefits by the reduction in production costs) in addition to the cultivated soil and benefits to neighboring farmers' soils. According to these authors, since its introduction in 1997, pesticide use has halved, and their study showed this led to a doubling of natural insect predators such as ladybirds, lacewings and spiders. In addition, the authors highlighted that such crops can promote biocontrol services in agricultural areas. However, according to *The Guardian* (Sample, 2010) millions of hectares of farmland in northern China have been struck by infestations of bugs following the widespread adoption of Bt

cotton. Outbreaks of infestations of myriads of bugs, which can devastate around 200 varieties of fruit, vegetable and corn crops, have risen dramatically in the past decade, as cotton farmers have shifted from traditional cotton crops to GM varieties, scientists said.

Because global economic growth is expected to remain slow and uncertain, the price of cotton fiber is higher and more volatile than that of manmade fiber.

Consumption has also decreased in the Chinese market. Nevertheless, the China Textile Industry Association claims that growing per capita incomes and rising standards of living will be the main driver of cotton consumption recovery (Meador and Xiping, 2013).

China's accession to the World Trade Organization in December 2001 reduced the Chinese government's former strict control of trade. Cotton imports tripled in 2005 after the removal of textile and clothing global trade quotas (Yong, 2011a). High cotton imports are a consequence of low cotton production relative to high consumption – over the years the amount of cotton consumed by Chinese mills far exceeded the amount of Chinese harvested cotton, thus leaving mills dependent on imported cotton.

China is not only the largest producer of cotton, but is also the largest man-made fiber-producing country in the world. China's manmade fiber industry follows a constantly increasing pattern, with its production scale averaging at about 24 million metric tons in 2012 (ICAC, 2012b). In addition to price differences with respect to cotton and natural fibers in general, other major factors that have contributed to growth in the manmade fiber market in China are rising prosperity, population growth and the growing demand from Chinese industry for advanced products (Morrison, 2012).

The Chinese government supports cotton production by controlling imports and by applying border protection measures based on quotas and duties⁴ with an effective tariff of 40 per cent on cotton imported without a quota. In addition, China maintains a strategic reserve of cotton – managed by the China National Cotton Reserve Corporation (CNCRC) agency – serving as a national buffer stock. The government releases cotton to the market from the reserve when there is shortage and replenishes it when there is abundance, thus supporting prices. Thus, China's behavior greatly influences the market price,⁵ both at domestic and international levels. The efforts of China (given the rules on international trade) to ensure high prices to domestic producers required a significant accumulation of stocks – purchased on the international market – especially in 2011. Government policies, which are soon expected to result in China holding almost half of the world's cotton stocks, represent a major reason for China's commanding influence in the cotton market (Cotton Incorporated, 2013). Any CNCRC decision involving cotton stocks potentially has an impact on the global price direction. The United States, the world's leading cotton exporter, sees half of its cotton production imported by China and would not get along without it (Bellomo, 2013).

Direct assistance in China totalled \$3.1 billion in 2011–12 and reached an estimated \$5.8 billion in 2012–3 (ICAC, 2013).

4.6 Res

In such a co
on producti
drawn up.
defined as t
of their stan

The ident
index and, c
related to su
into account
investment i
For the cons
price of oil i
only very w
(ICAC, 2010
rate has been

We have
depicted in T

As far as
correlated w
government

In particu
land area all

Table 4.4 Cor
and

Cotton price –
Cotton price –
MMF price – P
Land
Productivity
Government inv
GDP per capita
Total population
Exchange rate y

Source: FAO, the
Note: Government
government budget

4.6 Results

In such a context and in order to identify the variables that have the greatest impact on production, consumption and trade of Chinese cotton, a correlation matrix was drawn up. The study uses the Pearson product-moment correlation coefficient, defined as the covariance of the two considered variables, divided by the product of their standard deviations. The period taken into account is 2000–12.⁶

The identified determinants are three indices, respectively the CC Index, the A index and, considering the substitution effect, the PCI index. Among the variables related to supply, the availability of land and productivity were considered. Taking into account the high level of government support to the cotton sector, government investment is included among the independent variables with regard to production. For the consumption function, the price of cotton adds to the GDP per capita. The price of oil has not been examined because previous studies have concluded that only very weak links exist between the price of oil and the price of textile fibers (ICAC, 2010). As for trade, the relationship with price indices and the exchange rate has been investigated.

We have obtained the following values for r (scatter plots in the appendix), as depicted in Table 4.4.

As far as cotton production is concerned, the results show it to be positively correlated with cotton prices, land dedicated to cotton harvesting, productivity and government investment and negatively correlated to synthetic fiber prices.

In particular, there is a strong positive linear association between production, land area allocation and productivity, but, as expected, high negative correlation

Table 4.4 Correlation between Chinese cotton production, consumption, imports, exports and their determinants (2000–2012)

	<i>Chinese cotton production</i>	<i>Chinese cotton consumption</i>	<i>Chinese cotton imports</i>	<i>Chinese cotton exports</i>
Cotton price – CC Index	0.42	0.26		
Cotton price – A index			0.70	0.37
MMF price – PCI Index	-0.71	0.70	0.67	-0.60
Land	0.84			
Productivity	0.82			
Government investment	0.34			
GDP per capita		0.56		
Total population		0.70		
Exchange rate yuan/\$			-0.64	0.47

Source: FAO, the World Bank and USDA.

Note: Government expenditure in agriculture, forestry and fisheries, according to the central government budget, data available for 2002–2010 period.

with synthetic fiber prices. This can be explained by the recent ever-increasing recourse to advanced technology and to the substitution effect between cotton and synthetic fibers.

Cotton consumption in China is positively correlated to synthetic fiber prices, GDP per capita and population size. A positive correlation between consumption and cotton prices was found. The same happens for cotton imports. This value does not reflect what was expected and can be probably ascribed to the limited number of observations per each variable in the analysis – namely 13 – and, as for imports, to the boost following China's accession to the WTO, the 2005 trade quotas removal and the distortions caused by massive government support. A deeper analysis considering a larger historical timeframe series of observations would clarify whether the result is robust or biased.

As for imports and exports, the results show that there is a strong correlation with synthetic fiber prices and the exchange rate. Contrary to what is expected, between 2000 and 2012 when the yuan depreciated, imports decreased and exports increased. Despite China's accession to the World Trade Organization in 2001, the Chinese government's control – although less strict – is still exercised through specific trade policies.

4.7 Is the primacy of China going to last? Concluding remarks

The importance of cotton stems from its connection to both the agricultural sector and the textile industry. This raw material is cultivated in many developing countries, providing income and employment. But world cotton trade and production are highly affected by government policy interventions, especially if these are implemented in developed countries.

The cotton market is governed by a few countries – indeed, production and consumption are profoundly concentrated in just a few regions globally. An exception is represented by China. China is the leading actor in the cotton market at the global level, being the world's largest producer, consumer and importer of cotton. Indeed, Chinese cotton public policy, based namely, on a cotton reserve system and on import quotas, has a strong influence on the world cotton market. The massive concentration of global cotton buffer supplies in China provides the country with the power to balance the market: when the international cotton price decreases, China stockpiles cotton and buys abroad and then sells it to the domestic market at a higher price, and vice versa.

But what are the main factors influencing the Chinese cotton market? How do they correlate to cotton production, consumption and international trade in China? By identifying the main macroeconomic variables for each aspect of the market and studying their behavior over the last 13 years, the direction and the size of their correlation were analyzed.

The calculations have revealed that cotton production in China is influenced by the size of the harvested area dedicated to cotton cultivation and land productivity, whereas cotton consumption is strongly correlated with the increase in population

and living standard rate movements. C
ful to deepen the a

A negative corre
was found. This m
aggregate variable
timeframe series o
recent global econ
alternatively, to de

The main result
cotton market – the
Competition with c
one of the biggest
are the driving for
fertilizer or seed c
to plant other crops

Having said that
China, and consequ
due to the influence
farms prevents the a
support, their survi
cultivated varieties
that land is a limited
reduces the area all
main cotton consum
is increasing and pe
grow, although at a
fibers. In terms of
comparative advant
countries with abun

Among the environ
requirements of the
results of the effect
of waste materials (l
of production (land

Concerning socia
cultivation of cotto
developing countrie
cotton are still prod
industry is also a cu

Considering all th
a shift, if not in cot
the textile industry
environmental restri
per capita and popu

and living standards (GDP). Cotton imports and exports are correlated to exchange rate movements. Considering government policies supporting trade would be helpful to deepen the analysis of the relationship.

A negative correlation between cotton prices and cotton production and imports was found. This might be ascribed to the limited number of observations per each aggregate variable of the analysis. Additional research is needed: a larger historical timeframe series of observations should be considered – especially considering the recent global economic crisis – in order to confirm the robustness of the results or, alternatively, to determine their bias.

The main result emerging from the analysis is the strong impact of prices on the cotton market – the price of cotton, but most of all, the price of cotton substitutes. Competition with cheaper and technologically advanced manmade fibers is indeed one of the biggest challenges that the cotton sector is facing. For farmers, prices are the driving force: unstable crop prices, together with bad weather and high fertilizer or seed costs, are capable of wiping out their profits and pushing them to plant other crops.

Having said that, is the primacy of China in the cotton market going to last? China, and consequently the world cotton market, is facing a number of challenges due to the influence of economic, social and environmental issues. The small size of farms prevents the achievement of economies of scale; in the absence of government support, their survival may be put at risk. Moreover, there are too many different cultivated varieties of cotton, often of poor quality, especially in China. Considering that land is a limited factor and any increase in the surface area for harvesting cotton reduces the area allocated to other staple crops, food production concerns arise. The main cotton consumer countries are developing countries where per capita income is increasing and population is growing. The demand for cotton seems destined to grow, although at a slower pace because of the shift in preferences towards manmade fibers. In terms of production costs, the increase in labor costs should reduce the comparative advantage based on the production costs in China and shift demand to countries with abundant and cheaper labor (Bangladesh and Vietnam, for example).

Among the environmental concerns needing to be considered are the high water requirements of the crop, the abundant use of chemical inputs, the conflicting results of the effects on the soil and on human health of GM cotton, the treatment of waste materials (plastic residues) and the limitation of the most important factor of production (land).

Concerning social issues, the extreme dependence on income derived from the cultivation of cotton – in particular its importance to rural and poor people in developing countries – has to be mentioned. Equally, large amounts of the world's cotton are still produced in slavery-like conditions, and child labor in the cotton industry is also a current issue.

Considering all these elements, it is very likely that in the future there could be a shift, if not in cotton production, in cotton consumption and, consequently, in the textile industry to countries with economies with lower labor costs and fewer environmental restrictions and where future projections forecast increasing income per capita and population growth rates.

- China Cotton Association (2014) *China Cotton Report*, 2(5). Available from: www.english.china-cotton.org/ [Accessed: 7 October 2015].
- CottonConnect (2014) *Cotton Connect Impact*. Available from: www.cottonconnect.org/ [Accessed: 10 October 2015].
- Cotton Incorporated (2013) *Chinese Cotton Policy: Decisions and Effects*. Available from: www.cottoninc.com/corporate/Market-Data/SupplyChainInsights/Chinese-Cotton-Policy/ [Accessed: 5 August 2015].
- ESCAP (2008) *Unveiling Protectionism: Regional Responses to Remaining Barriers in the Textiles and Clothing Trade*, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), New York.
- FAO, Ifad, UNCTAD, WFP (2011) *Price Volatility in Food and Agricultural Markets: Policy Responses*, Food and Agricultural Organization.
- Findlay R. and O'Rourke K.H. (2003) Commodity Market Integration, 1500–2000, in *Globalization in Historical Perspective*, (eds) Bordo M.D., Taylor A.M. and Williamson J.G., Chicago: University of Chicago Press, pp. 13–64.
- Gillson I., Poulton C., Balcombe K. and Page S. (2004) *Understanding the Impact of Cotton Subsidies on Developing Countries*, Overseas Development Institute, London.
- Huang J., Mi J., Lin H., Wang Z., Chen R., Hu R., Rozelle S. and Pray C. (2010) A Decade of Bt Cotton in Chinese Fields: Assessing the Direct Effects and Indirect Externalities of Bt Cotton Adoption in China, *Science China, Life Sciences*, 53(8), pp. 981–991.
- ICAC (2010) *Cotton: Review of the World Situation*, International Cotton Advisory Committee (ICAC), 63(3), www.icac.org/cotton_info/publications/reviews/2010/english/erev1_10.pdf.
- ICAC (2012a) *Cotton: Review of the World Situation*, International Cotton Advisory Committee (ICAC), 65(5), www.icac.org/cotton_info/publications/reviews/2010/english/erev1_10.pdf.
- ICAC (2012b) *Manmade Fibres: Current Situation and Developments Aimed at Sustainability*, *International Cotton Advisory Committee (ICAC) 71st Plenary Meeting*, Interlaken, Switzerland.
- ICAC (2013) *Production and Trade Policies Affecting the Cotton Industry*, September 2013, International Cotton Advisory Committee (ICAC), Washington, DC.
- ICTSD (2013) *Cotton: Trends in Global Production, Trade and Policy*, Information Note, International Centre for Trade and Sustainable Development (ICTSD), Geneva.
- Jia S.R. and Peng Y.F. (2002) GMO Biosafety Research in China, *Environmental Biosafety Research*, 1(1), pp. 5–8.
- Lu Y., Wu K., Jiang Y., Xia B., Li P., Feng H., Wyckhuys K.A. and Guo Y. (2010) Myriad Bug Outbreaks in Multiple Crops Correlated with Wide-Scale Adoption of Bt Cotton in China, *Science China Life Sciences*, 328(5982), pp. 1151–1154.
- Marwaha S. (2011) Impacting Factors on Global Cotton Price, *The Indian Textile Journal*, July 2011, pp. 72–79.
- Meador M. and Xinping W. (2013) *Peoples Republic of China: Cotton and Products Annual 2013*, Gain Report No. 13017, Beijing: United States Department of Agriculture (USDA) Foreign Agricultural Service.
- Meyer L., MacDonald S. and Kiawu J. (2013) *Cotton and Wool Outlook*, CWS-13e, Washington, DC: United States Department of Agriculture (USDA).
- Morris D. and Wagener C. (2012) *India, The Market for Natural and Man-made Fibres, Textiles and Textile Manufactures to 2012*, Comité International de la Rayonne et des Fibres Synthétiques (CIRFS), Brussels.

est, and children, some as
y hand for little or no pay.
: reportedly punished with
ool. Human rights groups

very to the Far East, in view
The terms quoted are Cost
ged to middling 1½ inches.
trading patterns.
\ Index as the cotton price,

to establish a calendar-year

urement and sale of cotton.
prices (price at which the
ere decided by the central
, the Chinese government
nt and selling prices were

ies Need Agricultural Pol-
ries and the WTO: Policy
York: United Nations Uni-

udy in Policy Incoherence,
nent, Washington, DC, The

st and Central Africa, The
/INTTRADERESEARCH/
ed: 15 November 2015].

Problem', Policy Research
nomics, Development Pros-
ent Network.

rket Setting, Trade Policies,
World Bank, Washington.

Global Cotton Cultivation,
Committee. Available from:
ls/20111012131831705.pdf

o del cotone, *Il Sole 24 Ore*,
nza-e-mercati/2013-05-22/
[Accessed: 7 October 2015].
, *Textile World*, 3 February
/2014/Fiber_World/Man-
r 2015].

- Morrison W.M. (2012) *China's Economic Conditions*, Congressional Research Service (CRS) Report for Congress, Library of Congress, Washington, DC.
- Sample I. (2010) Scientists Call for GM Review after Surge in Pests around Cotton Farms in China, *The Guardian*, 13 May 2010. Available from: www.theguardian.com/environment/2010/may/13/gm-crops-pests-cotton-china [Accessed: 30 October 2015].
- Scheffer M.R. (2012) *In-Depth Assessment of the Situation of the T&C Sector in the EU and Prospects*, Final Report prepared for European Commission Enterprise and Industry DG, Saxion Universities, Enschede, The Netherlands.
- Shahin M. (2008) The Cotton Initiative, in *Developing Countries and the WTO: Policy Approaches*, (eds) Sampson G.P. and Chambers W.B., New York: United Nations University Press, pp. 41–61.
- Siegle L. (2013) Why Does Cotton Production Still Cause Slave Labour?, *The Guardian*, 27 October 2013. Available from: www.theguardian.com/environment/2013/oct/27/cotton-production-slave-labour-uzbekistan [Accessed: 3 September 2015].
- Takacs H. (2012) Sustainable Cotton Production in India: A Case Study in Strategic Corporate Social Responsibility, *International Journal of Business and Social Research (IJBSR)*, 2(3), pp. 1–10.
- Textile Exchange (2013) *Farm & Fibre Report 2011–2012*. Available from: http://farmhub.textileexchange.org/upload/library/Farm%20and%20fiber%20report/Farm_Fiber%20Report%202011-12-Small.pdf [Accessed: 11 November 2015].
- Theriault V., Serra R. and Sterns J.A. (2013) Prices, Institutions, and Determinants of Supply in the Malian Cotton Sector, *Agricultural Economics*, 44(2), pp. 161–174.
- UNCTAD (2014) *Agricultural Products: Cotton*, United Nations Conference on Trade and Development. Available from: www.unctad.info/en/Infocomm/Agricultural_Products/Cotton/Description/ [Accessed: 11 November 2015].
- Valderrama C.A. (2005) *A Profile of the International Cotton Advisory Committee*, International Cotton Advisory Committee. Available from: www.new-rules.org/storage/documents/ffd/valderrama.pdf [Accessed: 27 August 2015].
- Yong W. (2011a) *How WTO Accession Has Changed China and the Road Forward*, Centre for International Governance Innovation (CIGI), 19 May 2011. Available from: www.cigionline.org/publications/2011/5/how-wto-accession-has-changed-china-and-road-forward [Accessed: August 2015].
- Yong W. (2011b) *China's Development since WTO Accession*, East Asia Forum: Economics, Politics and Public Policy in East Asia and the Pacific, 6 October 2011. Available from: www.eastasiaforum.org/2011/10/06/chinas-development-since-wto-accession/ [Accessed: 13 August 2015].

Appendix Scatter plot

Figure 4.A1 Cotton yield
Source: Authors' calculations

Figure 4.A2 Cotton yield
Source: Authors' calculations

h Service
d Cotton
lian.com/
er 2015].
in the EU
l Industry

O: Policy
ions Uni-

ve Guard-
13/oct/27/

egic Cor-
Research

/farmhub.
Fiber%20

ts of Sup-

Trade and
Products/

tee, Inter-
y/storage/

rd, Centre
m: www.
and-road-

Econom-
Available
ccension/

Appendix Scatter plots

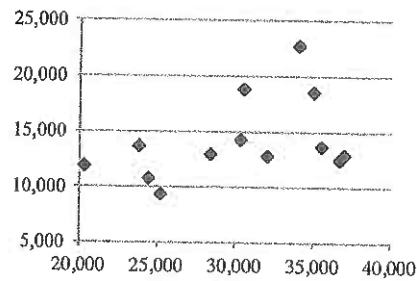


Figure 4.A1 Correlation between production and the CC Index, 1,000 480-lb bales and yuan/ton (2000–2012)

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

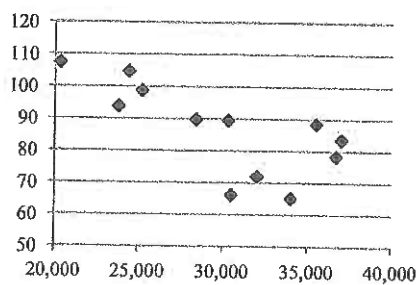


Figure 4.A2 Correlation between production and the PCI Index, 1,000 480-lb bales and cents/pound (2000–2011)

Source: Authors' elaboration based on PCI Fibres and USDA's data.

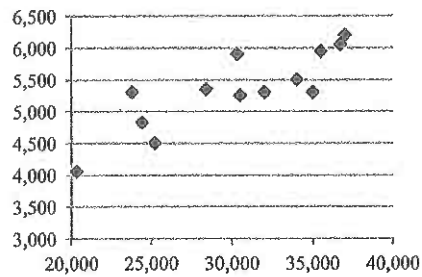


Figure 4.A3 Correlation between production and land, 1,000 480-lb bales and 1,000 HA (2000–2012)

Source: Authors' elaboration based on USDA's data.

Figure 4.

Source: A

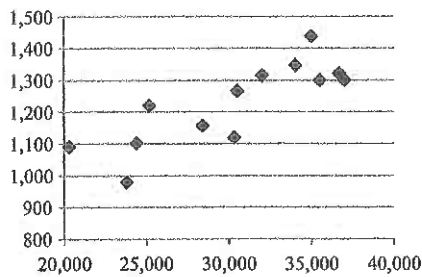


Figure 4.A4 Correlation between production and productivity, 1,000 480-lb bales and kg/HA (2000–2012)

Source: Authors' elaboration based on USDA's data.

Figure 4.

Source: A

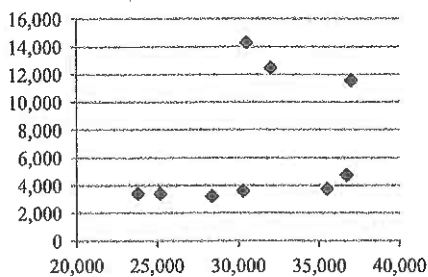


Figure 4.A5 Correlation between production and government investment, 1,000 480-lb bales and US\$ (2002–2010)

Source: Authors' elaboration based on FAO and USDA's data.

Figure 4.

Source: Au

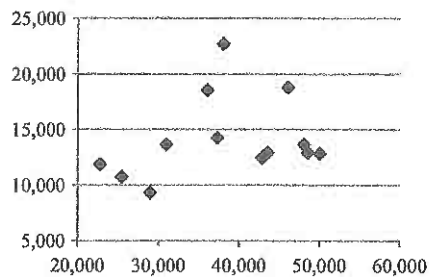


Figure 4.A6 Correlation between consumption and the CC Index, 1,000 480-lb bales and yuan/ton (2000–2012)

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

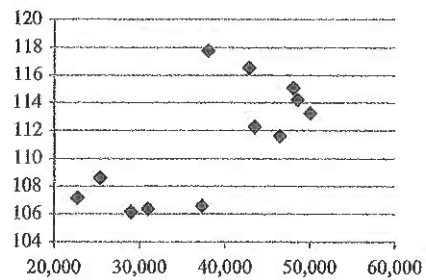


Figure 4.A7 Correlation between consumption and the PCI Fibre Index, 1,000 480-lb bales and cents/pound (2000–2011)

Source: Authors' elaboration based on PCI Fibres and USDA's data.

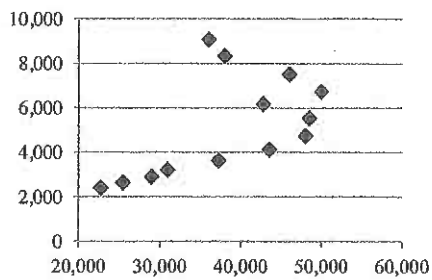


Figure 4.A8 Correlation between consumption and GDP per capita, 1,000 480-lb bales and US\$ (2000–2012)

Source: Authors' elaboration based on World Bank and USDA's data.

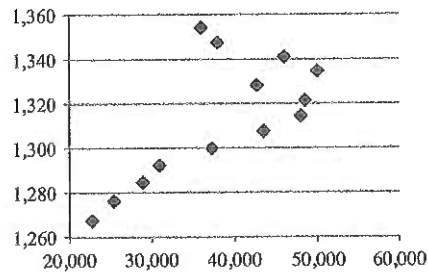


Figure 4.A9 Correlation between consumption and total population, 1,000 480-lb bales and thousands (2000–2012)

Source: Authors' elaboration based on FAO and USDA's data.

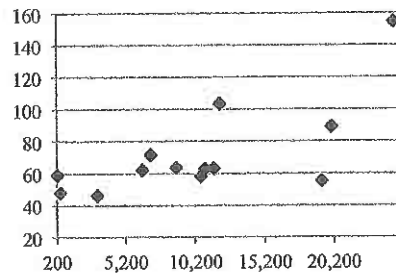


Figure 4.A10 Correlation between imports and the A index, 1,000 480-lb bales and cents/pound (2000–2012)

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

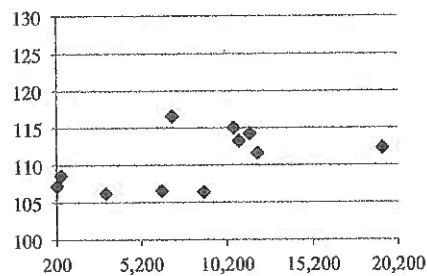


Figure 4.A11 Correlation between imports and the PCI Index, 1,000 480-lb bales and cents/pound (2000–2011)

Source: Authors' elaboration based on PCI Fibres and USDA's data.

Figure 4.A12 Correlation between imports and yuan

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

Figure 4.A13 Correlation between imports and pound

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

Figure 4.A14 Correlation between imports and pound

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

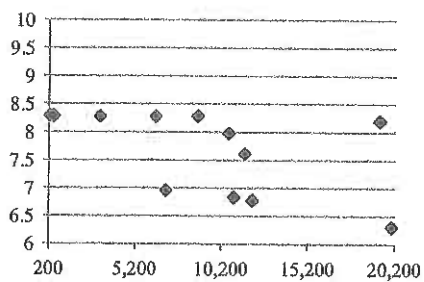


Figure 4.A12 Correlation between imports and the exchange rate, 1,000 480-lb bales and yuan/\$ (2000–2012)

Source: Authors' elaboration based on World Bank and USDA's data.

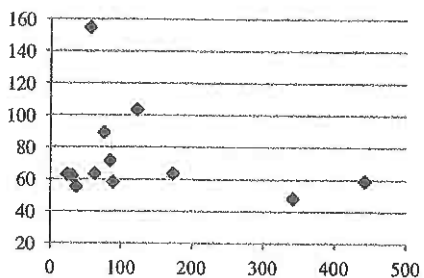


Figure 4.A13 Correlation between exports and the A Index, 1,000 480-lb bales and cents/pound (2000–2012)

Source: Authors' elaboration based on USDA and Cotton Outlook's data.

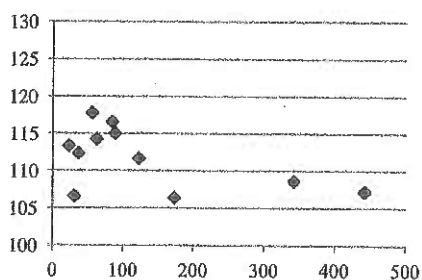


Figure 4.A14 Correlation between exports and the PCI Index, 1,000 480-lb bales and cents/pound (2000–2011)

Source: Authors' elaboration based on PCI Fibres and USDA's data.

480-lb bales and

bales and cents/

b bales and cents/

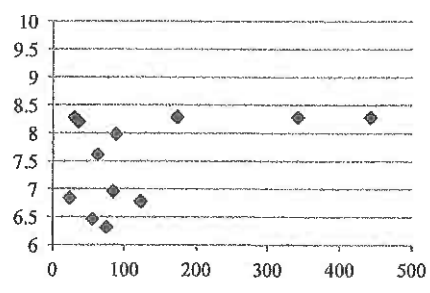


Figure 4.A15 Correlation between exports and the exchange rate, 1,000 480-lb bales and yuan/\$ (2000–2012)

Source: Authors' elaboration based on World Bank and USDA's data.