China’s Role on the International Cotton Market

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Abstract
The aim of this paper is to investigate the main features of world cotton market by focusing on the role of China, and analysing the effect of predetermined macroeconomic variables on Chinese cotton market. First, a global overview of cotton market is given; after that, the main reasons for considering China as the leading country in this sector are illustrated. To follow the paper analyses what factors and to which extent they may have affected Chinese cotton production, consumption and international trade over the last years by means of a correlation matrix. Findings and conclusions are lastly presented.

Keywords
Cotton, China, Production, Consumption, Trade, Man-made Fibres, Public Policies.

JEL Codes: Q11, O53, Q17, Q18, O13.

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1. Introduction

Cotton is a vegetable textile fibre extremely widespread, the most widespread in the world. It is grown in more than 100 countries, on 2.5% of arable land area (Bruinsma, 2003).

It 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). But since the Industrial Revolution it has experienced a widespread growth, until being nowadays an important resource for millions of consumers, a major source of export revenues in some developing countries and a source of income and survival for a multitude of small and poor farmers.

In developed countries - such as the United States and the European Union - cotton is cultivated on large, industrial farms with the support of government subsidies. But the majority of the world’s cotton is grown in developing countries where labour costs are low. Approximately 100 million farmers in these developing countries, working small plots of two to fifteen acres, provide the world with two-thirds of its cotton (Takacs, 2012).

China is the largest producer, importer and consumer of raw cotton in the global market.

Since China’s accession into the World Trade Organization, the country has achieved an enormous progress, which was enhanced by Central Government cotton policies (Yong, 2011).

In 2011, the Chinese government has begun to store cotton in order to support the domestic price paid to farmers. In 2012 he amassed 85% of the total national production and purchase of this program is set to continue throughout 2013. "With more than 10 million tons of inventory, Beijing in theory could do without import for 5-6 years," says Sole 24 Ore Kevin Latner, Executive Director of Cotton Council International (CCI), a body promoting American cotton. The hypothesis, however, is not realistic. "China has repeatedly made it clear he wants price stability. And his action so far has served rather to rebalance the market when international prices fall, buy more cotton, which by the way is a great deal, because then they can sell on the local market at higher prices" (Bellomo, 2013).

This paper aims to assess the role of China in the world cotton market and to analyse what factors and to which extent they may have affected Chinese cotton production, consumption and international trade over the last decade.

The paper is organized into sections. First, after a brief presentation of the adopted methodology, an overall picture of the world cotton market is provided. Then a deepening of Chinese cotton market and the repercussions of China’s behavior worldwide are dealt with. The impact that some macroeconomic variables have on the phenomenon
of Chinese behavior have been described by means of a correlation matrix. The findings and conclusions sum up our research.

2. Materials and Methods

A brief presentation of the world cotton market (production, consumption, trade) is obtained by taking the following statistical sources: FAO, the World Bank, the United States Department of Agriculture (USDA), Indexmundi, International Cotton Advisory Committee (ICAC), Cotton Outlook (Cotlook), PCI Fibres. The FAOstat database provides up-to-date data relating to production and trade of agricultural crops, specifically harvested area, yield, imports and exports, by country. 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 level. 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, included China. All Indexmundi data about agricultural commodities is 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 to identify emerging changes in the structure of the world cotton market. Cotlook and PCI Fibres are the official source of cotton and man-made fibres price respectively. The period taken into account is 2000-2012. As far as Chinese market is concerned, we consider 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. Henceforth the standardization in a global cotton price indicator. Nowadays there are basically two points of reference for cotton price: the A Index and the New York Futures Exchange (NYFE). The first one reflects cotton price in everyday physical cotton market; whereas the second one 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 offering values of the cheapest five origins delivered to East Asia for Middling grade cotton of 1-3/32” in length on CFR Far Eastern main ports terms. In this paper we refer to Cotlook A Index as the cotton price indicator.
Since 2002 the Chinese Cotton index (CC Index) reflects cotton price in China. It is an indicator of Type 328 cotton price level, calculated as the daily average of offering prices received by 200 Chinese mills.

In order to analyse Chinese cotton production, consumption and trade, we selected some influencing variables: namely cotton price, cotton substitutes price, land, productivity and government investment as for cotton production.

In order to measure a proxy of these variables we used the following indicators, respectively: the Chinese Cotton (CC) index, the CPI synthetic fibres index, cotton harvested area, the quantity of cotton produced per hectare, and government expenditure in the primary sector.

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

The variables influencing cotton international trade are assumed to be the price of cotton and that of cotton substitutes, the exchange rate yuan/US$.

We aim at measuring the linear association between production (consumption, imports and exports) and each of the previously listed variables through the Pearson correlation index (r).

3. The World Cotton Market: stylised facts

In the world cotton market, there is an extreme production and consumption concentration: the leading cotton producing economies account for a large share of consumption (ICAC, 2012). The main actors in the world cotton market are China, India, the United States, Pakistan, Brazil and Turkey (Table 1).

<table>
<thead>
<tr>
<th>Country</th>
<th>Production (1000 480 lb bales)</th>
<th>Share of world production (%)</th>
<th>Consumption (1000 480 lb bales)</th>
<th>Share of world consumption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>34,000</td>
<td>28.95</td>
<td>36,000</td>
<td>33.12</td>
</tr>
<tr>
<td>India</td>
<td>28,000</td>
<td>23.84</td>
<td>22,750</td>
<td>20.93</td>
</tr>
<tr>
<td>United States</td>
<td>13,500</td>
<td>11.50</td>
<td>3,505</td>
<td>3.22</td>
</tr>
<tr>
<td>Pakistan</td>
<td>9,500</td>
<td>8.09</td>
<td>11,725</td>
<td>10.79</td>
</tr>
<tr>
<td>Brazil</td>
<td>7,000</td>
<td>5.96</td>
<td>4,050</td>
<td>3.73</td>
</tr>
<tr>
<td>Turkey</td>
<td>2,250</td>
<td>1.92</td>
<td>6,100</td>
<td>5.61</td>
</tr>
<tr>
<td>Rest of World</td>
<td>23,174</td>
<td>19.74</td>
<td>24,573</td>
<td>22.60</td>
</tr>
<tr>
<td>World</td>
<td>117,424</td>
<td>100.00</td>
<td>108,703</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Author’s elaboration based on Indexmundi data
Many factors are affecting world cotton market, both on supply side and demand side.

More precisely, the main determinants of cotton supply are the price of cotton, the profitability of alternative products (cereals), the costs of production, stocks, changes in technology, environmental constraints and public policies (Theriault et al, 2013).

As for cotton demand, in addition to cotton and substitutes prices changes, it is influenced by population tastes and preferences, demographic factors, income and the general level of prices (Baffes et al, 2005).

If we consider the global trend of cotton production, consumption and international trade in the period between 2000 and 2012, production and consumption appear to be influenced by cotton price movements (Graph 1): peaks in cotton price correspond to an increase in cotton production and a contraction in cotton demand, as it happened in 2011; whereas when cotton price decreases, as in 2009, global consumption leaps up and production goes down.

**Graph 1: The world cotton market: production, consumption and cotton price*, 1000 480 lb bales and cents/pound (2000 – 2012)**

* Cotton price calculated as yearly average price (A index)
Source: Author’s elaboration based on USDA and Cotlook data

Over the past few years, cotton and more in general natural fibres have been gradually replaced by man-made fibres (MMF) - among them nylon, polyester , acrylic are the most common. This global shift of preference has been mainly influenced by man made fibres lower cost (Angel, 2012).

In 2012 world final demand for fibres - natural and man-made - exceeded 80 Million tons, and if we consider the final demand for cotton and man-made fibres in the same year, the share of cotton

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1 From this point forward we will refer to Cotlook A Index as cotton price, unless otherwise specified.
demand equals 31.6%. Global demand for man-made fibres is projected to further increase (Morris and Wagneur, 2012).


<table>
<thead>
<tr>
<th>World fibre consumption (Million tons)</th>
<th>Share of cotton consumption (%)</th>
<th>Share of MMF consumption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 67,736</td>
<td>2007 36.3</td>
<td>2007 55.5</td>
</tr>
<tr>
<td>2010 69,728</td>
<td>2010 32.9</td>
<td>2010 60.1</td>
</tr>
<tr>
<td>2012 83,500</td>
<td>2012 31.6</td>
<td>2012 60.9</td>
</tr>
</tbody>
</table>

*Source: Author’s elaboration based on FAO and ICAC data*

Cotton price, as it happens for other basic commodities, is subject to large fluctuations (FAO, OECD, IMF, UNCTAD, WTO, 2011). Price volatility is influenced by the substitution effect caused by competition with synthetic fibres, exchange rates fluctuations, demand and the application of new technologies and cultivation techniques, subsidies granted to cotton producers - particularly in developed countries - and unpredictable weather events (Marvaha, 2011).

Regarding international trade, since 2000 cotton traded volume has been constantly increasing until reaching its peak in 2005 (Graph 2), when all textile trade was integrated into World Trade Organization rules and textile quotas were eliminated with Multi Fibre Arrangement (Adhikari and Yamamoto, 2008). The economic crisis that hit the world commodities in 2008, leading to unprecedented high prices, resulted in a contraction of cotton trade. Since 2011 a decrease in commodities general price level sustained international trade recovery.

**Graph 2: The world cotton market: imports and exports, 1000 480 lb bales (2000 – 2012)**

*Source: Author’s elaboration based on USDA data*
World cotton trade and production are highly affected by government policy intervention. Subsidies to the cotton sector include direct support to production, border protection, crop insurance subsidies and minimum support price mechanisms. According to the International Cotton Advisory Committee (ICAC), in 2012 about 49% of world cotton production received direct government assistance.

World direct support seems to have a negative influence on cotton price (Graph 3): if we consider ICAC data we find that when direct assistance to cotton 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 increases and cotton price decreases (ICAC, 2013).

Graph 3 World direct assistance to cotton and cotton price, cents/pound (2000 – 2012)

Source: Author’s elaboration based on ICAC data

The impact of direct or indirect subsidies on cotton prices is not easily measurable, and prices are an extremely important variable for some developing countries - like Western and Central Africa, Brazil - who heavily rely on cotton exports revenues. Support to cotton industry in developed countries is a major cause of protest by many developing countries: in 2004 the World Trade Organization was lead to deal with “the cotton problem” as a separate issue (Baffes, 2011).

4. The Chinese market

China is at the centre of the global cotton market, as the world’s largest cotton producing, consuming and importing country (Table 3). China imports cotton from the United States, India, Australia and Uzbekistan in particular (Meyer et al, 2013).

<table>
<thead>
<tr>
<th>Year</th>
<th>China 1000 480 lb bales</th>
<th>World share %</th>
<th>China 1000 480 lb bales</th>
<th>World share %</th>
<th>China 1000 480 lb bales</th>
<th>World share %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>30.300</td>
<td>24.95</td>
<td>36.700</td>
<td>34.00</td>
<td>35.000</td>
<td>28.43</td>
</tr>
<tr>
<td>2008</td>
<td>37.250</td>
<td>34.54</td>
<td>42.750</td>
<td>39.38</td>
<td>36.000</td>
<td>33.55</td>
</tr>
<tr>
<td>2012</td>
<td>6.385</td>
<td>18.85</td>
<td>6.996</td>
<td>22.86</td>
<td>20.327</td>
<td>44.09</td>
</tr>
</tbody>
</table>

Source: Author’s elaboration based on USDA’s data

Although China maintains its primacy in the market, especially due to its massive cotton imports, production and consumption have recently shown a decreasing pattern. The following graph depicts the trend of Chinese cotton market in the period 2000-2012.

Graph 4: The Chinese cotton market: production, consumption and imports, 1000 480 lb bales (2000-2012)

Source: Author’s elaboration based on USDA’s data

After a constant increase in production and consumption, in 2008 cotton market in China has suffered a slight contraction, partly to be conducted to overall economic crisis that hit world commodities. According to China Cotton Association, cotton production has slowed because of lower acreage, increasing costs of labor, fertilizer and seed, low technological adaptation, preferential government support to grain crops and volatile prices (Shennong, 2011).

Since global economic growth is expected to remain slow and the price of cotton fibre is higher and more volatile than that of man-
made fibre also consumption has decreased. Nevertheless, 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 Xinping, 2013).

China’s accession to the World Trade Organization in December 2001 reduced Government’s former strict control of trade. Cotton imports tripled in 2005 after removal of textile and clothing global trade quotas (Yong, 2011). High cotton imports are a consequence of low cotton production relative to high consumption: over the years cotton consumed by Chinese mills far exceeded the amount of harvested cotton, thus leaving mills dependent on imported cotton. China is the largest man-made fibre producing country in the world. Man-made fibre industry follows a constant increasing pattern, its scale averaged about 24 million metric tons in 2012 (China Synthetic Fibre Market Report, 2012). In addition to price differences with respect to cotton and natural fibres more in general, other major factors that have contributed to man-made fibres market growth 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 duties with an effective tariff of 40% 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.

China behavior largely influences the market price, both at domestic and international level. And Government policies, which are soon expected to result in China holding almost half of world cotton stocks, represent a major reason for China’s commanding influence in the cotton market (Cotton Incorporated, 2013). Any public decision involving cotton stocks potentially has an impact on global price direction. The United States, the world’s leading cotton exporter, sees half of its cotton production being imported by China and would not get along without it (Bellomo, 2013).

Direct assistance in China totalled $3.1 billion in 2011/12, and an estimated $5.8 billion in 2012/13 (ICAC, 2013).

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2 Under its accession agreement into the WTO, China is obliged to establish a calendar year tariff-rate-quota.
5. Results

We have obtained the following values for $r$ (scatter plots in the Appendix):

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

* G expenditure in agriculture, forestry and fisheries, according to Central Government budget, data available for 2002-2010 period

Source: Author’s elaboration based on FAO, the World Bank and USDA data

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

In particular, there is strong positive linear association between production, land and productivity, but high negative correlation with synthetic fibres price. This can be explained by the recent ever increasing recourse to advanced technology and the substitution effect between cotton and synthetic fibres.

Cotton consumption in China is positively correlated to synthetic fibres price, GDP per capita and population.

In particular, there is strong correlation between production and synthetic fibres price and total population, thus confirming the relevance of the substitution effect with man-made fibres.

A positive correlation between consumption and cotton price was found. The same happens for cotton imports. This value does not reflect what we would expect and is to be probably ascribed to the limited number of observations per each variable in our analysis, namely 13. A deeper analysis considering a larger historical time series of observations might clarify whether the result is robust or biased.

As for import and exports, there results to be a strong correlation with synthetic fibres price and the exchange rate. Given the confirmation of the strong substitution effect, we would expect that
when the yuan depreciates imports increase and exports decrease and viceversa.

6. 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 contributing to food security and providing income and employment. But world cotton trade and production are highly affected by government policy interventions, especially in developed countries.

The market of cotton is governed by few countries: production and consumption are indeed extremely concentrated in few – though different – regions.

An exception is represented by China. China is the leading actor in cotton market at global level, being the world’s first producer, consumer and importer of cotton. Chinese Government decisions largely contribute.

Cotton public policy, based on a cotton reserve system and on import quotas, has a strong influence on world cotton market. The massive concentration of global cotton supplies in China provides the country with the power to balance the market: when international cotton price decreases, China stockpiles cotton and buys abroad - then selling it to the domestic market at a higher price - and viceversa.

But what are the main factors influencing 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 behaviour over the last 13 years, we have analysed the direction and the size of their correlation.

Our calculations have revealed that cotton production in China is influenced by the harvested area dedicated to cotton cultivation and land productivity, whereas cotton consumption is strongly correlated with the increase of population and its living standard. Cotton imports and exports strongly depend on exchange rate movements.

A negative correlation between cotton price and cotton production and imports was found. This might be ascribed to the limited number of observations per each aggregate variable of our analysis. Additional research is needed: a larger historical time series of observations should be considered in order to confirm the robustness of our finding or, alternatively, to determine its bias.

The main result emerged 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 man-made fibres 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 fertilizer or seeds costs, are capable of wiping out their profits and pushing them to plant other crops.
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Appendix A

**Scatter Plots**

**Graph A1. Correlation between production and CC Index, 1000 480 lb bales and yuan/ton (2000-2012)**

**Graph A2. Correlation between production and PCI Index, 1000 480 lb bales and cents/pound (2000-2011)**

**Graph A3. Correlation between production and land, 1000 480 lb bales and 1000HA (2000-2012)**
Graph A4. Correlation between production and productivity, 1000 480 lb bales and kg/HA (2000 -2012)

Graph A5. Correlation between production and Government investment, 1000 480 lb bales and US$ (2002-2010)

Graph A6. Correlation between consumption and CC Index, 1000 480 lb bales and yuan/ton (2000-2012)
Graph A7. Correlation between consumption and PCI Fibre Index, 1000 480 lb bales and cents/pound (2000-2011)

Graph A8. Correlation between consumption and GDP per capita, 1000 480 lb bales and US$ (2000-2012)

Graph A9. Correlation between consumption and total population, 1000 480 lb bales and millions (2000-2012)
Graph A10. Correlation between imports and A Index, 1000 480 lb bales and cents/pound (2000-2012)

Graph A11. Correlation between imports and PCI Index, 1000 480 lb bales and cents/pound (2000-2011)

Graph A12. Correlation between imports and exchange rate, 1000 480 lb bales and yuan/$ (2000-2012)
Graph A13. Correlation between exports and A Index, 1000 480 lb bales and cents/pound (2000-2012)

Graph A14. Correlation between exports and PCI Index, 1000 480 lb bales and cents/pound (2000-2011)

Graph A15. Correlation between exports and exchange rate, 1000 480 lb bales and yuan/$ (2000-2012)