Prebisch and Singer in the Egyptian cotton fields

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Abstract

By emphasising the role of historical contingency in determining the losers and winners of economic interaction, the article argues that barter terms of trade (BTT) evolution is key to understanding central phenomena of the modern capitalist era apart from Weberian and Sombartian culturalist interpretations. By examining BTT data between Egypt and Britain in the long 19th century, the article demonstrates how it was a rational choice by an independent economy to commit to a 'peripheral' comparative advantage as future value evolution could not have been predicted at the onset of such commitment. Relying on previously unpublished archival records, the article also explores the role of empire and political power in determining supply and demand and hence value evolution, challenging neoclassical assumptions about the central role of consumer choice in influencing supply, demand and commodity value.

Introduction

The trade dimension of the British colonial enterprise in Egypt has been typically analysed through the lens of transforming Egypt into 'Lancashire's cotton farm', that is, into the cotton farm of a rapidly growing textile industry in Northern England.[1] This transformation is often evoked in the literature as an explanation for the dwindling of Egypt's millenia-old textile industry, limiting its exports to primary commodities, namely cotton, and subjecting its economy to agrarian 'backwardness' and volatility.[2]

According to this reading, land speculation, rentierism, and low-added value activity have stagnated the economy and deprived it of a breakthrough homologous with the industrialising centres of 19th century Europe. In this respect, Egypt has only been integrated into the world capitalist economy from a subordinate position, sometimes referred to as 'agrarian capitalism'.[3]

While this reading is valid, I argue in this article that this rationale could only be reached with the benefit of hindsight. This is because of the contingency of commodities' value evolution, that is, an evolution which could not have been predicted when economies first commit–or are impelled to commit–to their Ricardian 'comparative advantages'.

This was especially the case in the midst of a novel industrial revolution radically reshaping value and production landscapes and introducing unprecedented volatility caused by recurrent technologically driven capitalist cycles, as price volatility of primary commodities relative to finished goods have become a characteristic feature of modern economies.[4] The case of Egypt also challenges the view of the Global South economies being passive recipients of their role in the International Division of Labour (IDL), as Egypt was effectively independent when it committed to its Ricardian comparative advantage.

Emphasising the role of historical contingency counterbalances culturalist explanatory frameworks for the Great Divergence, in particular the Sombartian and Weberian views of capitalist development as emerging from a rationalist mentality expressed in the form of double bookkeeping[5]and capital accounts[6]. More recently, Bryer's theory of capitalist mentality

[1] Abd al-Mutalib, 'Al-qutn fi al-alaqat al-misriya al-britaniya', p. 5.
[2] Abbas, 'al-Niẓām al-ijtimāʿī fī Miṣr; Owen, 'Cotton and the Egyptian economy'.
[3] Richards, Primitive accumulation in Egypt', p. 5; Stauth, 'Capitalist farming and small peasant households in Egypt', p. 286.
[4] Chakraborty & Sarkar, 'From the classical to empiricists' p. 1125; Bond,' An econometric study of exports of manufacture'.
[5] Sombart, 'Modern capitalism'.
[6] Weber, 'General economic history'.

postulates that such mentality is formulated by the rational calculation of rates of return on capital employed.[7] However, Toms argues that such rational accounting is the outcome–not the cause–of the so-called capitalist spirit. Toms asserts that such an argument "contrasts with much of the literature which sees the development of accounting technique as a precursor or facilitator of the capitalist spirit of rationality".[8]

Some culturalist explanations went as far as blaming language for the Great Divergence. American Sinologist Derk Bodde pointed to Chinese language as a key contributing factor of the Great Divergence. He argued that its potential was limited as a mode of transmitting precise information and therefore constituted an obstacle in the way of the growth of useful knowledge. Bodde also argues that the gap between the written and spoken forms of Chinese language made written sciences inaccessible to the masses.[9]

Economic historian, Joel Mokyr, argues that despite China and India achieving similar levels of scientific and technological advancement as Europe up until the 18th century, it was in Europe that the industrial revolution took place because of a shared Latin heritage. According to Mokyr, political fragmentation allowed heterodox ideas to emerge in Europe since innovators could easily escape their countries of birth and residence in the case they tried to suppress their innovation. This led to an emergence of what Mokyr calls an 'integrated market of ideas', where this fragmentation was nevertheless coupled with a shared intellectual basis found in the classical Latin heritage.[10]

Non-culturalist interpretations of the Great Divergence also exist. Chaudhuri argues that because wages were higher in England than in India and China, there was a bigger incentive there to develop labour-saving technologies; additionally, the far more superior quality of Eastern textiles did not provide the impetus to mechanisation outside of Europe. This impetus only came after increased pressure caused by mechanisation became an inescapable reality. It was, however, already too late by then and Europe was already at an enormous advantage. The most Global South countries could do to compete was to import machinery from Europe in order to automate their production processes, giving rise to another high added value economic activity in Europe, that is, machine production.[11]

[7] Bryer, 'A Marxist accounting history'.
[8] Toms, 'Calculating profit'.
[9] Bodde, 'Chinese thought, society, and science'.
[10] Mokyr, 'A culture of growth'.
[11] Chaudhuri, 'The Structure of Indian Textile Industry'.

Additionally, Pomeranz argued that it was the location of coal and access to new world trade and resources that helped Western Europe diverge from the hitherto strikingly similar East Asian economies in the 19th century.[12]

In fact, the industrial revolution and its legacy satisfies the three criteria of historical contingency as set out by Walter Alvarez, that is, rarity, unpredictability and significance.[13] For the purpose of this article, unpredictability refers to the inability to predict the occurrence of the industrial revolution itself but also its repercussions. This is of particular importance to debates about the Great Divergence which is often attributed to cultural and ethical shifts in the West, and is rarely attributed to chance as an at least partial explanatory framework.

The article will test the contingent drawbacks of economic dependence on cotton by tracing the evolution of the barter terms of trade (BTT) of Egyptian cotton relative to British manufactured textiles. The article will also assess the evolution of the profitability, prices and output of Egyptian cotton and British textiles, and the degree of contingency/predictability of the causes behind such evolution. The timeframe for this study is the long 19th century, which corresponds to what I call the "cotton era" which started with Muhammad Ali's experiment with the cultivation of long-staple cotton in the early 1820s and gradually ended with the rise of national independence policies from the 1920s until the establishment of the republic in the 1950s and the ensuing industrialisation of the economy. The rationale behind the choice of cotton and manufactured textiles is because trade between Egypt and Britain constituted most of Egypt's foreign trade, with cotton constituting over 90 per cent of Egypt's exports for much of the long 19th century[14], while manufactured textiles similarly constituted the majority of Egypt's imports from Britain. Moreover, Egypt's entire cotton production was exported during much of the study's time frame (see Table 1).

Table 1 Amount of cotton production and exportation in Egypt from 1885 to 1914 (in thousands of cantars)

Year	*Production*	*Exportation*
1885-1889	2925	3175
1890-1894	4760	4749
1895-1899	5960	5905

[12] Pomeranz, 'The Great Divergence'.
[13] Alvarez, 'A most improbable journey'.
[14] Gad, 'matha jara li mashru' tal'aat harb'.

1900-1904	6093	6062
1905-1909	6379	6359
1910-1914	7664	7369

Source: TNA, Annuaire Statistique de l'Egypte (1915), FO 633/102

- The figures are for five year averages.
- The reasons why exportation exceeds production in some years is due to the exportation in the mentioned years of stocks of previous seasons.

Value between the ontological and the actual

The origin of modern value theories is typically traced back to classical political economy, where Adam Smith distinguished between 'value in exchange' and 'value in use'. He viewed labour as the source of all value in exchange in 'primitive' societies while emphasising how both types of value are inversely related by evoking the famous water-diamond paradox.[15] David Ricardo, on the other hand, argued that labour is the source of exchange value even in modern economies.[16] While agreeing that labour is the source of exchange value, Marx criticised the classical view for its ahistoricism and individualism.[17] He emphasised instead the social dimension and the class nature of value creation, that is, value as a set of social relations.

Marx did this by introducing concepts such as 'socially necessary labour time', which takes into account the historical level of technology and average skill and productivity in society–as well as 'commodity fetishism' which sees value as existing within the commodity and hence obscures the set of social relations behind value creation.[18] Neoclassical economics rejected any linkages between labour and value and introduced the concept of marginalism to blur the distinction between use and exchange value; they focused instead on marginal utility and the marginal cost of production as the source of exchange value. Austrian School economists have asserted that value is subjective and is not objectively determined by any property of the exchanged commodity (e.g. labour).

However, for this article, I adopt a more concrete and structural approach to the question of value in lieu of the aforementioned ontological approaches. This approach empirically studies

[15] Smith, 'The wealth of nations'.
[16] Ricardo, 'Principles of political economy'.
[17] Pilling, 'Marx's 'capital''; Mau, 'Mute compulsion'.
[18] Marx, 'Capital'.

how exchange values *actually* develop over time, and identifies the winners and losers of such evolution. This approach is most associated with the work of Prebisch and Singer.

Raul Prebisch and Hans Singer argue that the value of primary commodities tends to fall over time relative to manufactured commodities. The primary reason they cite for this dynamic is that secondary goods have higher income elasticity of demand relative to primary goods meaning that as people's incomes rise, more of this additional income is spent on secondary than primary products since primary needs should be already satisfied.[19] There is some empirical evidence that this is indeed the case.[20] Additionally, productivity gains resulting from technological progress are likely to be passed on to the consumer in the case of competitive primary products. On the other hand, the cost-plus pricing characteristic of high-technology manufacturing make gains from technological progress tend to accrue more to the producers, which are typically domiciled in the Global North.[21]

Additionally, the ability of advanced capital economies to produce synthetic substitutes for the primary commodities of peripheral economies, as well as developing more efficient ways of using primary commodities, provides them with increasingly favourable terms of trade.[22]

When the economic underpinnings of Egypt's anti-colonial nationalist project is at all discussed, it has been argued that such policies were driven by the extreme volatility of cotton prices. For example, it has been repeatedly argued that the Urabi revolution against foreign interference was a direct consequence of the Khedive Ismail debt crisis, which was in itself a consequence of a collapse of cotton prices after an unprecedented boom caused by the blockade of the American South in the 1860s.[23]

Additionally, in a later period, Talaat Harb's national independence project also emphasised the negative impacts of cotton dependency resulting from its volatility, and called for the diversification and modernisation of the economy away from dependence on cotton production. The project took major steps in this direction by establishing Banque Misr–Egypt's first national bank–in 1921 and the Misr companies spanning across many modern sectors (e.g. insurance,

[19] Prebisch, 'The economic development of Latin America'; Singer, 'The distribution of gains'.
[20] Arezki, R. et al, 'Testing the Prebisch-Singer Hypothesis since 1650'; Bond, 'An econometric study of exports of manufacture'; Goldstein & Khan, 'Income and price effects in foreign trade'; Chakraborty & Sarkar, 'From the classical to empiricists';
[21] Singer, 'Beyond terms of trade'.
[22] Raffer & Singer, 'The Economic North-South divide', p.26.
[23] Cole, 'Colonialism and revolution in the Middle East'; Owen, 'Cotton and the Egyptian economy'.

cinema, industry, printing, real estate, etc.), including textile companies such as the Misr Spinning and Weaving Company.[24]

While the social, economic and political upheavals caused by the volatility of commodity dependence is an unquestionably valid argument, one often ignored driver of the anti-colonial project in Egypt is the unfavourable BTT which put increasing pressure on the country's biophysical resources (e.g. water, land and labour) pushing it towards its ecological limits.

Research design

This article's objective is to test the PSH in the case of British-Egyptian bilateral trade to evaluate the way in which the BTT has evolved during the study's timeframe. This evolution will focus on the BTT of raw cotton versus manufactured textiles, which constituted the bulk of Egyptian trade with Britain. Barter terms of trade means simply doing away with money as a measure of trade, and measuring the value of commodities relative to one another. As discussed above, the ecological untenability of this trade regime could also offer a partial explanation–in addition to the volatility argument–for the rise of anti-colonial trade and economic policies in the aftermath of World War I in Egypt.

Methodology and data

In order to compute the cotton-textile BTT data, I collected data on Egyptian exports of cotton from Arthur E. Crouchley's *The Economic Development of Modern Egypt.* As for the value of British cotton piece goods, I relied on Mitchell's *British Historical Statistics.* Crouchley reports the value of cotton[25] in terms of rials/cantar[26], while Mitchell gives the price of cotton piece goods in pences per linear yards. In order to enhance comparability of the value of raw cotton and cotton piece goods across time and different measurements, I made a few weight and currency conversions.

First, I converted rials to Egyptian pounds and pences to pound sterlings in order to make prices comparable. The conversion rates of both pounds were stable throughout the period as both currencies were backed by gold, and the Egyptian pound was also pegged to pound sterling at an almost equal value (LE 1 equals 0.975 Sterling) for the entire period. Therefore, I treated the LE and Pound Sterling as having equal value throughout the study's timeframe.

The main limitation in computing the BTT is that the data fails to account for the quality and types of the traded goods. One of the first economists to highlight this shortcoming of calculating BTT

[24] Gad, 'matha jara li mashru' tal'aat harb'.
[25] Crouchley's pricing is the average for each year.
[26] The cantar is about 100 lbs/45 kgs of ginned cotton.

was Gottfried Haberler in 1959 when he argued that all terms of trade have a strong bias because they cannot allow for changes in quality and for the appearance of new commodities.[27]

Haberler believes that the changes of quality is a bias against industrialised products since it is those manufactured products that improve in quality while primary products remain qualitatively stable. Haberler asserts that 'this bias operates in such a way as to make the movement in the terms of trade of the primary exporters (finished goods importers) appear much less favourable than it actually was'.

However, Sandberg computed a quality index to test the claim that 'underdeveloped countries have gained from improvements in the quality of their industrial imports'. Sandberg found that export quality, namely that of British cotton cloth, from high income to low income countries actually fell significantly from 1815 to 1913–a period that roughly corresponds with the present study's timeframe.[28]

Sandberg writes that the primary reason why industrial products from high to low income countries fell in quality is that Lancashire deliberately developed special types of cheap cloth for low-income markets as its production capacity was growing and hence the share that goes to luxury products necessarily declined. Also, the share of British cotton going to low-income countries dramatically increased during the period.[29]

The decline of quality to low-income countries to which Egypt belongs means that if any bias exists, it will be an underestimation of the barter value of manufactured textiles, rendering any decline in the value of raw cotton versus manufactured textile even more stark than is reported by the data presented in this article. This is also exacerbated by the fact that cotton has witnessed significant improvements in quality over the course of the 19th century.

Finally, for the narrative sections of the article, I relied on a variety of material from the time such resulting from my archival research such as a land tax memorandum by Edgar Vincent from 1884, the Board of Trade's Textiles Committee report from 1916, as well as sources on the issue of cotton supply from the time such as Barois' *Irrigation in Egypt* from 1889 and Scherer's *Cotton as a World Power* from 1916.

The upward trend and the unforeseeable collapse

[27] Haberler, 'International trade and economic development'.
[28] Sandberg, 'Movements in the quality of British cotton'.
[29] Ibid.

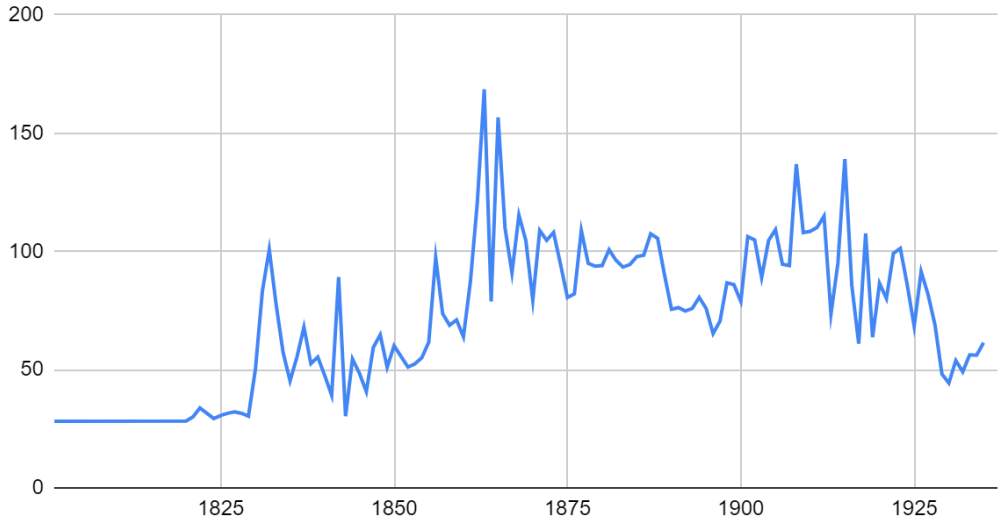
The technological advances that led to the industrial revolution made the price of textiles drop quite significantly. It was reported to have declined by nearly 50 per cent between 1770 and 1815 despite massive wartime inflation that almost doubled the cost of living during the same period.[30] This drop in value was due to the long list of technological advancement in the production of textile in the 18th and the 19th century. Given this steep decline in the value of textiles, it is expected that its relative value to the price of its raw material would also decline as production of cotton–while it could increase due to advancements in agricultural technology and methods–was still bounded by nature (namely land and water resources). For example, the cotton yield per feddan in Egypt increased 58 per cent in 58 years from 3.29 cantars in 1879 to 5.2 cantars in 1937.[31] On the other hand, labour productivity of textiles increased by 700 per cent in the 62 years between 1830 and 1892.[32]

The seeds of Egypt's integration into the first IDL experiment of the capitalist era are often traced back to Muhamed Ali's first experiment with the cultivation of long-staple cotton, known as the Jumel cotton, in the early 1820s.[33] In a matter of a few decades, Egypt went from barely growing any cotton to a situation where more than three fourths of all its summer cultivated land was dedicated to cotton production, all of which was exported (see Table 1). The dominance of cotton exports lasted until the end of effective British control over Egypt in the 1950s, after which Egypt started diversifying its economy by accelerating industrialisation where a significantly larger portion of cotton was consumed locally.[34]

The barter terms of trade between Egyptian raw cotton on the one hand and British cotton textiles on the other have witnessed a lot of volatility in the century roughly spanning from the 1820s to the 1930s. However, as the data shows, the overall trend was in favour of cotton especially between 1820 and 1865 making it a very attractive choice of investment during this period. However, for the period after 1865 where cotton farms expanded enormously as a reaction to the American Southern blockade, the barter terms of trade favoured manufactured textiles until the interwar period. For example, in 1821 one cantar of Egyptian cotton could buy only 28 linear yards of British cotton piece goods. By 1937, one cantar of Egyptian cotton could be exchanged for 61 linear yards of British piece goods. The highest point for raw cotton was at the end of the American civil war in 1865 when one cantar of cotton could buy 169 linear yards of British piece goods (See figure 1).

[30] Harley, 'Cotton textile prices', pp. 49-50.
[31] Richards, 'Egypt's agricultural development', Table 3.8.
[32] Blaug, 'The productivity of capital', p. 366.
[33] Schanz, 'Cotton in Egypt'; Fahmy, 'All the pasha's men'; Owen, 'Cotton and the Egyptian economy'.
[34] Owen, 'Agriculture in Egypt'.

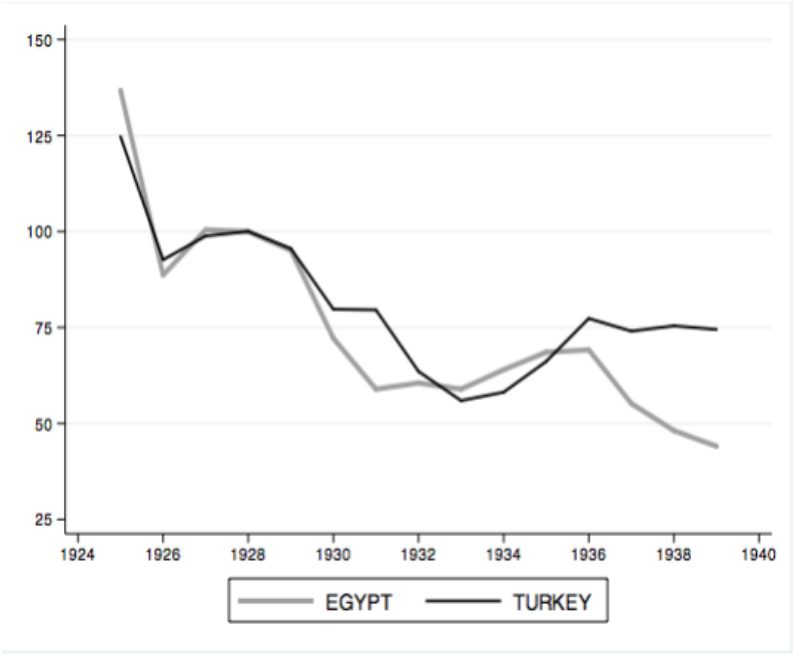
Figure 1 How many linear yards of British cotton piece goods can one cantar of Egyptian raw cotton buy?



To sum up, the study's timeframe could be divided into roughly four sub-periods. The first is between 1821 and 1865 which–despite some volatility–saw the price of cotton rise relative to manufactured textile. The second stage was from 1865 to 1898 which saw a relative decline of cotton from the 1865 peak mostly driven by the end of the American civil war and the 1873 depression. The third phase extended from 1898 to 1917 and saw a new rise in relative cotton value, while the fourth and last stage from 1917 to 1937 saw a decline in cotton's barter value, mostly caused by the Great Depression. Although studies of the barter terms of trade in Egypt are rare, Karakoç confirms that the general net barter terms of trade for Egypt had deteriorated significantly during the interwar period caused by a collapse in global agricultural prices (see figures 2 and 3).[35] Panza's results on Egypt's terms of trade patterns in the long 20th century follows exactly the same patterns of the cotton-textiles BTT presented in this article.[36]

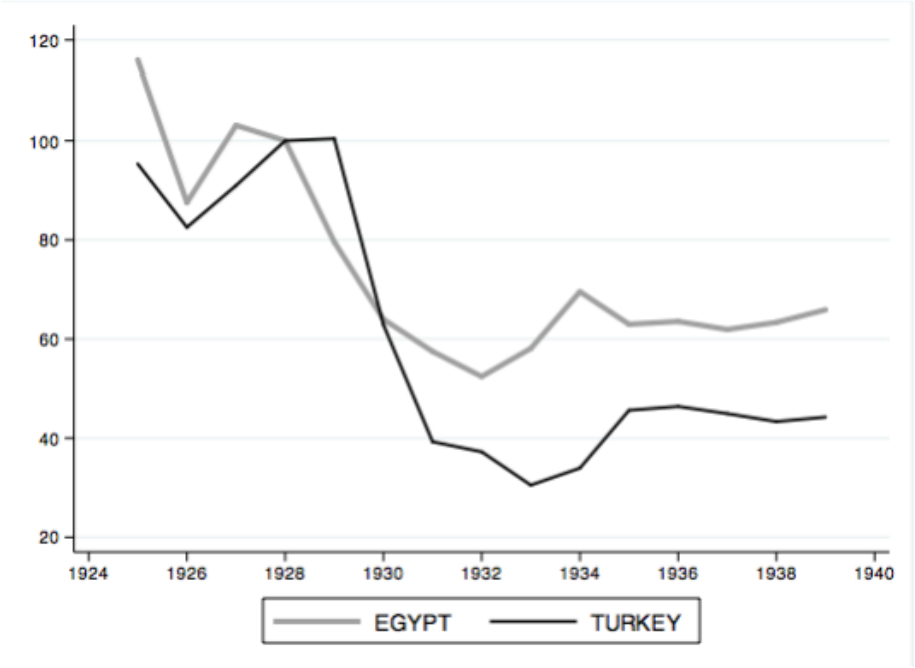
Figure 2 Net barter terms of trade in Egypt and Turkey (1928=100), 1925-1939

[35] Karakoç, U. 'Sources of economic growth in interwar Egypt and Turkey: Industrial growth, tariff protection and the role of Agriculture' (unpub. Ph.D. thesis, London School of Economics, 2014).
[36] Panza, 'De-industrialization and re-industrialization in the Middle East'.



Source: Karakoç, U. 'Sources of economic growth in interwar Egypt and Turkey: Industrial growth, tariff protection and the role of Agriculture' (unpub. Ph.D. thesis, London School of Economics, 2014).

Figure 3 Agricultural prices in Egypt and Turkey (1928=100), 1925-1939



Source: Karakoç, U. 'Sources of economic growth in interwar Egypt and Turkey: Industrial growth, tariff protection and the role of Agriculture' (unpub. Ph.D. thesis, London School of Economics, 2014).

It is important to note that these BTT stages do not always correspond with the boom and bust cycles of cotton, although they would obviously be influenced by it. This is because the prices of both textiles and cotton would fall and rise together for the obvious reason that higher/lower cotton prices will increase/reduce the production cost and hence the price of piece goods as the cost of raw cotton would typically constitute between a quarter and a third of textile's production cost in the 19th century.[37] Figures 4 and 5 demonstrate how raw cotton and cotton piece goods followed generally similar trends.

Figure 4 Prices of British cotton piece goods (1821-1937)

[37] Harley, 'Cotton textile prices'.

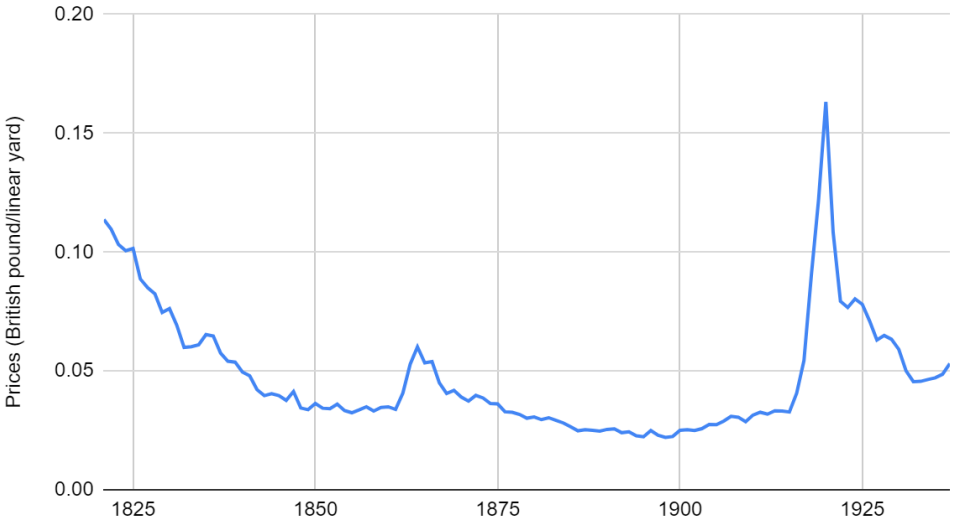


Figure 5 Prices of Egyptian cotton (1821-1937)

However, booms and busts in cotton prices still had an impact on barter terms of trade as price swings of commodities tend to be more acute than manufactured textiles as is clear from figures 4 and 5 showing how price movements of piece goods are relatively smooth compared to raw cotton despite both following similar trends.

Wars, economic cycles and colonial administration

The reasons driving these price fluctuations vary. Before the cultivation of cotton in 1820, the end of the Napoleonic war caused a dramatic decline in raw cotton prices. This allowed for the beginning of British domination of the textile world market as the earlier increases in textile productivity were offset by high raw cotton prices. This in turn gave the Indian textile industry, which had access to cheaper locally-grown cotton, a competitive advantage that kept it competitive on the world stage despite having lower labour productivity than in Britain.[38] After a period of price stability in the early 1820s, the financial crisis of the late 1825 led to a decline in the price of cotton before it recovered and even saw a significant increase before dropping again in the early 1830s and then stagnating from then until the American civil war boom in the early 1960s.

This boom was however short-lived as prices started to fall once the blockade was lifted after the end of the war. This was exacerbated by the colonial integration of Egypt and India into the textile value chain as major cotton producers which massively increased global supply.[39] The depression of 1893 further deteriorated the situation.

From the onset of the 20th century until the outbreak of World War I, cotton prices saw a significant increase which led to significant land speculation in Egypt with dangerous socioeconomic consequences.[40] The post-war recovery of prices was again disrupted by the Great Depression.

To sum up, there seems to be three main types of events that determine the cotton-textile BTT evolution. First are wars; in this section, we mentioned three wars that had a big impact on the cotton-textile BTT in the long 19th century, that is, the Napoleonic wars, the American civil war and World War I. From Egypt's point of view, these wars are highly contingent as Egypt had no role in their outbreak and had not actively participated in any of them.

Second are the campaigns conducted by the British government and cotton capitalists to increase the production of cotton throughout the empire to bring its price down. While these events are not contingent, they were still out of Egypt's control. Moreover, the ability to effectively organise the production and trade of a single crop at the world stage by a single power is a feature of a modern capitalist empire and was the first-of-its-kind experiment, and hence rather difficult to predict.[41]

[38] Broadberry & Gupta, 'Shifting competitive advantage in cotton textiles'.
[39] Beckert, 'Empire of cotton'.
[40] Gad, 'matha jara li mashru' tal'aat ha'.
[41] Beckert, 'Empire of cotton'

Lastly are Kondratiev-style capitalist waves, containing within them smaller waves, which were becoming more frequent. As they were becoming more recurrent, the national movement became aware of the pressing need to stop subjecting the economy to the wild swings of the global economy by becoming less cotton dependent, rejecting its place in the IDL through protectionist policies and capital controls as set out by the Talaat Harb project.[42]

Efforts to increase supply and ensuing environmental pressure

The American civil war led to a very rapid increase in cotton production in Egypt but also across the British empire to counter the effect of the war-induced shortage, known as the 'Lancashire cotton famine'. Sven Beckert explains how as a result of the American civil war, Britain and its cotton capitalists stepped up their efforts to increase India's cotton output through huge investments in road and port infrastructure, and even through changes in legal codes, by making the adulteration of cotton a crime and by making market exchange of land easier.[43] A report by the textile committee of the British board of trade on the supply of raw cotton from 1916 expressed its need to employ British expertise to expand the cultivation and productivity of Indian cotton. They described the Indians as a native which is "very conservative in his methods of cultivation". However, the report asserts that "this drawback could be largely overcome by more efficient Government supervision and by demonstration work".[44]

King Edward himself in 1904 addressed the British Parliament to express his concern about the supply of cotton to feed Lancashire's industry, and expressed his wishes that efforts made in 'his' empire would yield successful results.

> The insufficiency of the raw material upon which the cotton industry of this country depends has inspired me with great concern. I trust that the efforts which are being made in the various parts of my Empire to increase the area under cultivation may be attended with a large measure of success.[45]

In 1916 the supply problem was still present and the trauma of the cotton famine was still felt in Britain. For example, the Board of Trade Textiles Committee report states that:

[42] Gad, 'matha jara li mashru' tal'aat harb'.
[43] Beckert, 'Empire of cotton'.
[44] TNA, 'Supply of raw cotton: interim report of the Board of Trade Textiles Committee, CO 323/707/78', p. 603.
[45] Scherer, 'The Economic Interpretation Of History'.

> The sufferings of Lancashire during the time of the cotton famine in the [1860s] [...] clearly demonstrate the disastrous results of dependency [on American cotton]. A failure of the American crop or an attempted cornering of the market by speculators entails not only heavy financial loss to spinners and manufacturers, but serious loss of wages and great suffering to the operatives and their families. Labour is the principal sufferer, for it is frequently possible for employers to make good their losses when prosperous times recur, but time and wages once lost by the operatives are gone for ever.

The same report cites the potential of cotton expansion in India by stating that the annual cotton crop is capable of rapid expansion provided that successful efforts are made including increasing the yield per acre. The report compares India unfavourably to the US and Egypt, stating that its land productivity is very low at 80 to 100 lbs of lint per acre, compared to 200 and 450 lbs in the US and Egypt respectively.

Efforts were also made in Sudan. The textile committee report states that the "Sudan offers a promising field for the immediate extension of cotton cultivation, if the various irrigation schemes [...] are proceeded with". The report states that the paucity of population presents a difficulty but the committee believed that this drawback can be gradually overcome, albeit without specifying how precisely. The report also mentions the need to expand irrigation schemes in Egypt and Sudan for the best apportionment of the water available from the Nile "in order that the development now suggested and so urgently needed may be proceeded with in a methodical manner".[46]

Egypt effectively played its role in increasing the supply of cotton to the Lancashire textile industry after the "famine". It took Egypt 43 years (from 1820 to 1863) to produce one million cantar of cotton. However, this rate accelerated rapidly during the war. For example, between 1864 and 1865 cotton production jumped from 1.1 million cantars to 1.7 million in just one year. By 1875, Egypt produced 3 million cantars of cotton and by 1901 the figure reached 6.5 million cantars, and exceeded 7 million in 1910 (see Table 2). The data clearly demonstrate the impact of the American civil war in the expansion of cotton production.

Table 2 Cotton production in select years between 1821 and 1910	
Year	*Quantity in cantars*

[46] TNA, 'Supply of raw cotton: interim report of the Board of Trade Textiles Committee, CO 323/707/78', p. 606.

1821	944
1863	1181000
1864	1710000
1865	2001000
1875	3007000
1901	6526000
1910	7477000
Source: Schanz, M. (1913). Cotton in Egypt and the Anglo-Egyptian Sudan. Taylor, Garnett, Evans & Co., Ltd.	

To expand the production of the extremely labour- and water-intensive cotton, it obviously requires the assignment of large swaths of land, water resources and labour. For example, Egypt dedicated by 1915 about three fourths of its summer cultivated land to the production of cotton.[47] And in 1950, a third of its agricultural labour power and cultivated land were expended to the cultivation of cotton.[48]

In addition to labour pressure for growing the crop itself, there was an immense need for labour power to develop canal networks to make the irrigation system suitable for wide-scale cotton production. Cotton is a summer crop–whose cultivation was very limited at the time–and is not suitable for flood irrigation and requires drastic changes in water systems. It therefore required expansion of canals and the redevelopment of the irrigation system. All of Muhammad Ali's irrigation projects were aimed at providing water throughout the summer months in canals or storing it for use in cotton irrigation. Some estimates suggest that Muhammad Ali mobilized 400,000 farmers (about 9 per cent of the total population of Egypt at the time) annually for irrigation projects, completing 40 million square metres of excavation and filling works in a year.[49]

Even if the rate of profit dropped for textiles–which it has throughout the 19th century as a result of increased productivity–the mass of profits would more than compensate for the falling rate.

[47] TNA, 'Annuaire Statistique de l'Egypte (1915), FO 633/102'.
[48] See Tables 4.2 for cotton area to cultivated area statistics and 6B-2 for the labour input of different crops in Richards (2018).
[49] El Nour, 'al-basha wi al-qadir wi al-'ayyan'.

Harley demonstrates through the analysis of three Lancashire textile firms that profit rates had already started falling by 1810.[50] David Harvey argues, however, that capital often cares more about the mass of profit than the rate; he contends that the mass is what really matters and is often ignored by mainstream neoclassical economics. [51]

For example, the British cotton industry went from producing an annual average of 109.5 million linear yards of piece goods in 1800-9 when margins were high to producing 977 million linear yards by the mid 19th century as margins were getting progressively lower.[52] Also gross output increased by 305 per cent while real output increased by 569 per cent between 1834 and 1886.[53] In this way the totality of profits in the sector will more than compensate for the drop in profit margins.

As discussed above, this could not be done with cotton–or any agricultural commodity for that matter–due to the natural limit and the high opportunity cost of growing the mass of profit to compensate for the decline in the rate. Also attempts to push natural limits can result in ecological disaster. A memorandum on land tax in Egypt written by the famous diplomat, financier and colonial administration Sir Edgar Vincent dated 1884 already expressed concerns about soil damage due to a switch to a two-year crop rotation scheme.[54] The memorandum reads:

> Whereas, formerly, cotton was planted every three years, it is now planted by many proprietors every two years. An exhaustion of the soil must result from this practice. The theory that it does so is borne out by the decreasing amount of the annual crop.[55]

The French civil engineer and secretary general of the Egyptian ministry of public works Julien H. E. Barois, wrote in his 1889 *Irrigation in Egypt* book, on the ecological limitation of cotton production expansion:

> If we wish to apply irrigation to the whole of Egypt [...], there would be needed [...] a supply [...] which often exceeds the discharge of the Nile at low water. It is evident, then,

[50] Harley, 'Prices and profits in cotton textiles'.
[51] Harvey, 'Rate and mass'.
[52] Broadberry & Gupta, 'Shifting competitive advantage in cotton textiles'.
[53] Blaug, 'The productivity of capital'.
[54] In canal irrigation areas, the most common cropping pattern often involved a two-year rotation, beginning with cotton followed by wheat in the first year, and subsequently transitioning to corn and berseem in the second year (Norris, 1934).
[55] TNA, 'EGYPT: Memo. Land Tax. Cotton and other Crops, etc. (Mr. Edgar Vincent), FO 881/4987', p. 2.

> that it is not possible to increase indefinitely summer culture in Egypt, unless we change the regimen of the Nile by creating pools and immense reservoirs which would store the flood water in order to return it during low water. [56]

Concluding remarks

I argue in the article that the barter terms of trade of raw cotton followed a highly contingent and delusive pattern that could not have been predicted beforehand. Cotton exchange value was on a generally upward trend–despite some typical volatility–between 1821 and 1865 as demand for the "white gold" was consistently growing to meet the needs of a rapidly growing Lancashire textile industry. In the beginning, the falling prices of manufactured textiles meant that the barter value of cotton relative to manufactured textile was increasingly favourable to cotton.

This enticed Egypt to increase the land and resources dedicated to cotton cultivation. However, after the end of the American civil war and due to British efforts to expand its cotton cultivation throughout the empire, absolute and relative prices of cotton started to consistently drop except for a short period at the turn of the 20th century and until the end of World War I. This consistent fall of prices was mostly due to Britain using its political influence to expand cotton production throughout 'its' empire.

This shows that even if value is determined by supply and demand, supply and demand themselves could often be determined politically, challenging neoclassical assumptions about utility-based supply and demand being the ultimate determinants of value. Prebish and Singer often leave out political causes as determinants of deteriorating BTT for Global South economies, namely that core countries have immense political leverage to keep prices of their imports low and prices of their exports high.

The article also argued for the contingency of the events underlying price volatility and changing terms of trade. The most notable example is the American civil war which had a short-term but also a lasting impact on cotton prices, first by causing it to spike and then to collapse after the war was over. Napoleonic wars and World War I also had a great impact on cotton value in the long 19th century. The British expansion of cotton production throughout the empire, namely in India, was also a direct consequence of the civil war. However, other contingent factors were also prominent, namely unprecedented Kondratiev-style capitalist waves driven by rapid technological changes. Once this cyclical behaviour has become obvious and perhaps could be to a certain extent predicted, calls for the elimination of cotton dependency that made the economy

[56] Barois, 'Irrigation in Egypt', p. 32.

so vulnerable to such cycles gained momentum as demonstrated by the calls to diversify the economy in the interwar period.

I would like to make one last remark on the limitation of the barter terms approach employed in this article and how to overcome it for future research. BTT disregards the evolution of biophysical resources embodied in different commodities. Despite the breakthrough that the PSH created in understanding the Global South/North divide, and despite its implication that Global South countries might need to export incrementally more primary commodities to import the same amount of manufactured goods, it does not directly address the transfer of embodied biophysical resources and will not capture the changing levels of productivity, technology and resource efficiency needed to produce different commodities.

For example, if the barter value of Commodity A halves in relation to Commodity B, the exchange might still require the same amount of biophysical resources if it now takes half the resources to produce Commodity A. Conversely, if the barter value of Commodities A and B remain the same, but the biophysical efficiency of producing Commodity A improves with no corresponding improvement in the production of Commodity B, it means Commodity A can now be exchanged for less underlying biophysical resources despite maintaining the same barter value. This hypothetical scenario is not detached from reality since manufacturing tends to become more resource efficient over time as shown above.

However, an emerging approach to trade exchange known as Ecologically Unequal Exchange (EUE) can address these gaps. EUE looks at the underlying biophysical resource exchange of international trade as evaluating trade in terms of monetary value alone is insufficient to assess all dimensions of value transfers. Hornborg, for example, argues that money veils asymmetric labour and resource flows, and 'obscures the global flows of embodied labour and land'.[57]

Applied historically, the ecological exchange approach can provide new insights into the pressure placed on resource and labour as a result of intensified international trade during Britain's occupation of Egypt, especially that cotton as the main export crop (constituting at times over 90 per cent of Egyptian exports to Britain) is extremely resource and labour intensive. However, applying EUE historically can come with a large set of challenges, mostly because it relies on Environmentally-Extended Multi-Regional Input-Output (EEMRIO) databases that use consumption footprint data which does not exist for periods before 1990.[58]

[57] Hornborg, 'The commodification of human life'.
[58] Dorninger et al., 'Global patterns of ecologically unequal exchange', p. 3.

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