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Was industrialization an escape from the commodity lottery? Evidence from Italy, 1861-1940

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Abstract: the specialization in exporting primary products is frequently deemed harmful for long-run development, because it increases volatility of terms of trade and thus the number and frequency of macroeconomic shocks. One would expect modern economic growth to solve the problem by changing the composition of trade. This paper tests this hypothesis with a new series of Italian terms of trade from 1861 to 1939, a period which spans the first stage of the industrialization of the country. The results do not tally with the hypothesis. The change in composition improved marginally the terms of trade, but it did not help much in terms of volatility.

JEL Classification: N10, N70; F10
Keywords: Italian trade, Terms of trade, Economic growth, Volatility.

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1. Introduction

In a well-known paper, Sachs and Warner (2001) argue that the abundance of natural resources is a "curse" for LDCs. Their main evidence is a negative correlation between the rate of growth and the share of export of primary products on GDP. Ding and Field (2005) and Brunnschweiler and Nulte (2008) challenge this interpretation: abundance per se is positive, and the "curse", if any, is the specialization of exports in primary products. Their view harkens back to a very long-run intellectual tradition. In the 1950s, Prebisch and Singer (Prebisch 1950, 1959; Singer 1950) strongly advised exporters of primary products to change their specialization as soon as they could, because their terms of trade were bound to fall and their income to decline for the combination of stagnant productivity and falling demand for their wares. This hypothesis spawned a huge theoretical (Spraos 1983) and empirical literature. Diakosavvas and Scandizzo (1991) list 54 works published from 1960 to 1990, and Consigliere (2009) adds 26 further references. Yet, the issue has not been convincingly settled. The results differ according to the period, the sample of countries and commodities, the price series and the statistical methods (Lederman and Maloney 2007a, 2007b; Razzaque *et al.* 2007a). Almost all these works cover the period after 1900, but the issue has an obvious historical interest. Hadass and Williamson (2003) show that terms of trade have improved in most countries from 1870 to 1913, thanks to fall in transportation costs, and argue that this trend has had (small) positive effect on growth in Core countries and (small) negative effects on the Periphery. Williamson (2008) extends the data-base further back in time and argues that improvement in terms of trade of peripheral countries had negative effects on their long-run growth. The gains from exports of primary products fostered further specialization in agriculture and mining, away from manufacturing which only guaranteed long-run growth – an early instance of the so-called "Dutch disease" (The Economist 1977).

A more recent literature shifts the attention from the negative effects of long-term trends in terms of trade on economic growth to the negative effects of their volatility. Macroeconomic shocks are a major drag on economic growth, and volatility of terms of trade is a major source of those shocks in small open economies (cf. e.g. Turnovsky and Chattopadhyay 2003; Romero-Avila 2009, Poelhekke and van der Ploeg forthcoming). Indeed, terms of trade volatility comes out to be negatively correlated to rate of growth after World War Two (Mendoza 1997, Turnovsky and Chattopadhyay 2003) and also before 1939 (Blattman *et al.*

2007)[1]. This latter paper finds that the negative effect of volatility on growth was very substantial: a 1% increase in volatility reduced growth rate by 0.08 percentage points. They also argue that the problem was more serious for countries in the Periphery than in the Core. Exports from Core countries were more diversified and consisted mainly in manufactures. Diversification by itself would help even if "world" prices for all products were equally volatile, provided that prices of different goods were poorly correlated. A specialization in manufacturing would reduce further volatility as prices of industrial products are structurally less volatile than those for primary products (Jacks *et al.* 2009). In fact, Blattman *et al.* (2007) find a positive, albeit not very high (0.38), correlation between volatility of terms of trade and the share of primary products on exports in 1870. This result has an important implication. Modern economic growth should trigger a virtuous circle, to the extent that it causes a country to diversify its exports and increase the share of manufactures (Kuznets 1967). This change in the trade structure would reduce volatility and the decrease in volatility should foster further growth. The positive effects of this virtuous circle cannot be fully appreciated in the multi-country, cross-section approach which prevails in the current literature. One needs to trace the long-run change for a single country. This paper opens up this line of research.

The case-study is Italy from its political unification (1861) to the eve of World War Two. In those eighty years, the country experienced the first stage of its modern economic growth, which was to be completed its "economic miracle" in the 1950s and 1960s (Zamagni 1993, Cohen-Federico 2001). As sketched out in Section Two, the GDP per capita rose, the share of primary production on GDP declined and the composition of Italian exports and imports changed substantially. Not by chance, authors find it difficult to nail Italy down in a simple dichotomy between Core and Periphery: Blattman *et al.* (2007) list it among the Core countries, alongside with the United Kingdom, while Williamson (2008) demotes Italy in European periphery, with Russia and Spain.

Which effects had this structural transformation on its terms of trade? Did it improve or worsen them? Did it reduce volatility as expected – thereby fostering economic growth- or not? This paper answers to these questions with a new comprehensive data-base of Italian trade, based on the very detailed official sources

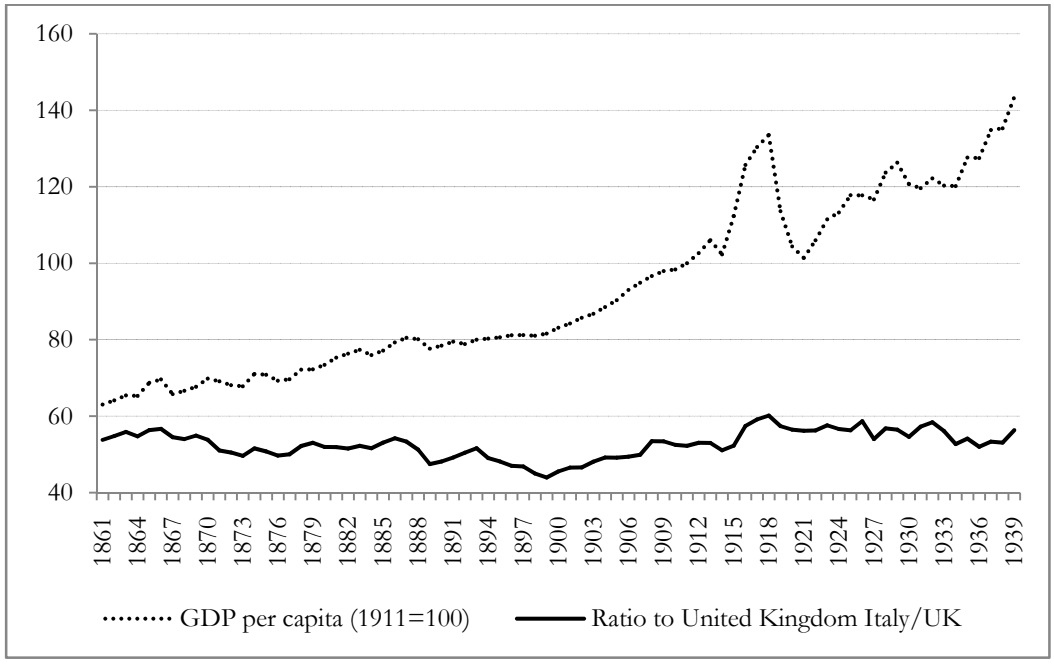
[1] As it is well known, the growth regressions industry suffers of over-determination – too many variables vying for attention. Sala-i-Martin et al (2004) test the relevance of many of them with a meta-Bayesian approach, but unfortunately volatility of terms of trade is not in their list. The rate of change in terms of trade in the 1960s fares very poorly.

(*Movimento Commerciale del Regno d'Italia*) from 1863 to 1939[2]. Section Three provides the basic information about the data-base and the construction of the new index of terms of trade and discusses its long-term changes and volatility. Section Four shows that imports mattered as much as exports both for long-term trends of terms of trade and for their short-term volatility. The role of imports is totally neglected in the current literature, which focuses exclusively on the volatility of exports. Section Five explores the effects of changes in the composition of trade – and thus ultimately of modern economic growth- on trends and volatility. Section Six sums us and draws some lessons of general interest.

2. Trade and modern economic growth in Italy: a long-run view

Over the period 1861-1939, the Italian GDP per-capita more than doubled, growing at the yearly rate of about 1.0%[3]. The growth was quite slow after the Unification, accelerated in the 1880s and, after a short set-back in the 1890s, peaked in the 1900s and early 1910s (Graph 1).

Graph 1. The performance of the Italian economy, 1861-1939



Sources: Italy 1861-1913: Fenoaltea (2005); 1914-1939: Ercolani (1969 tab. XIII 1.1.A); United Kingdom: Maddison (2003).

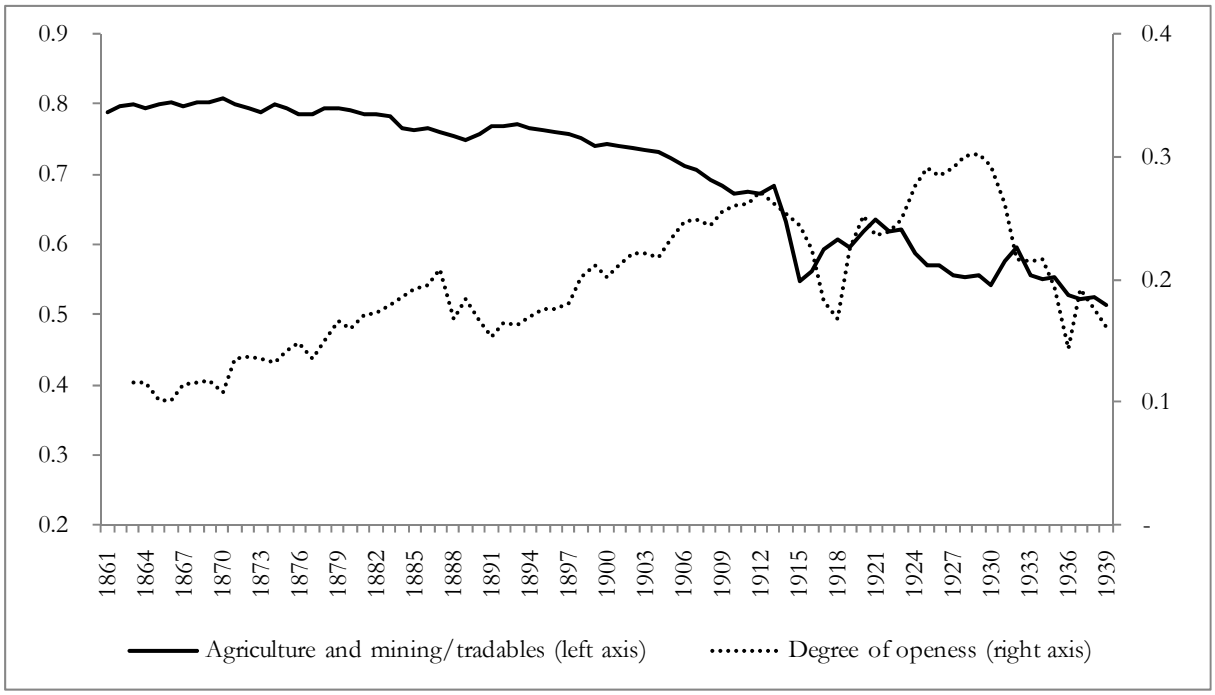
[2] This database (Bankit-FTV) was developed by G. Federico, G. Tattara and M. Vasta in a project supported by Banca d'Italia. See for details Federico-Tattara-Vasta (forthcoming).

[3] Data from Fenoaltea (2005) for 1861-1913 and Ercolani (1969 tab XIII 1.1.A) for 1914-1939. As all rates in the paper, this figure is obtained by running a log-linear regression with time, adjusting when necessary for autocorrelation. The preferred specification includes a dummy for war years 1915-1918. Omitting it does not affect results in a meaningful way.

The war-time boom is obviously spurious, but Italy enjoyed another short spell of high growth in the early 1920s before being hit by the Great Depression. In spite of these short spells of fast growth, Italy's performance was far from outstanding. As the lower (dotted) line shows, the Italian GDP per capita was about 55% the British one in the 1860s and was still about 55% in the 1930s, after having slid by ten points at the turn of the century.

Modern economic growth did bring about a structural transformation of the economy (Graph 2, solid line). In the 1860s, agriculture and mining accounted for about 80% of the Value Added of the production of tradables (and for about a half of the whole GDP). Their share declined very slowly until the 1890s, but afterwards the trend accelerated and went on quite steadily (but for a spurious collapse in war-time) until the late 1930s. By then, production of primary products was down to a half of the production of tradables (and to slightly above a quarter of GDP).

Graph 2. The structural change in the Italian economy



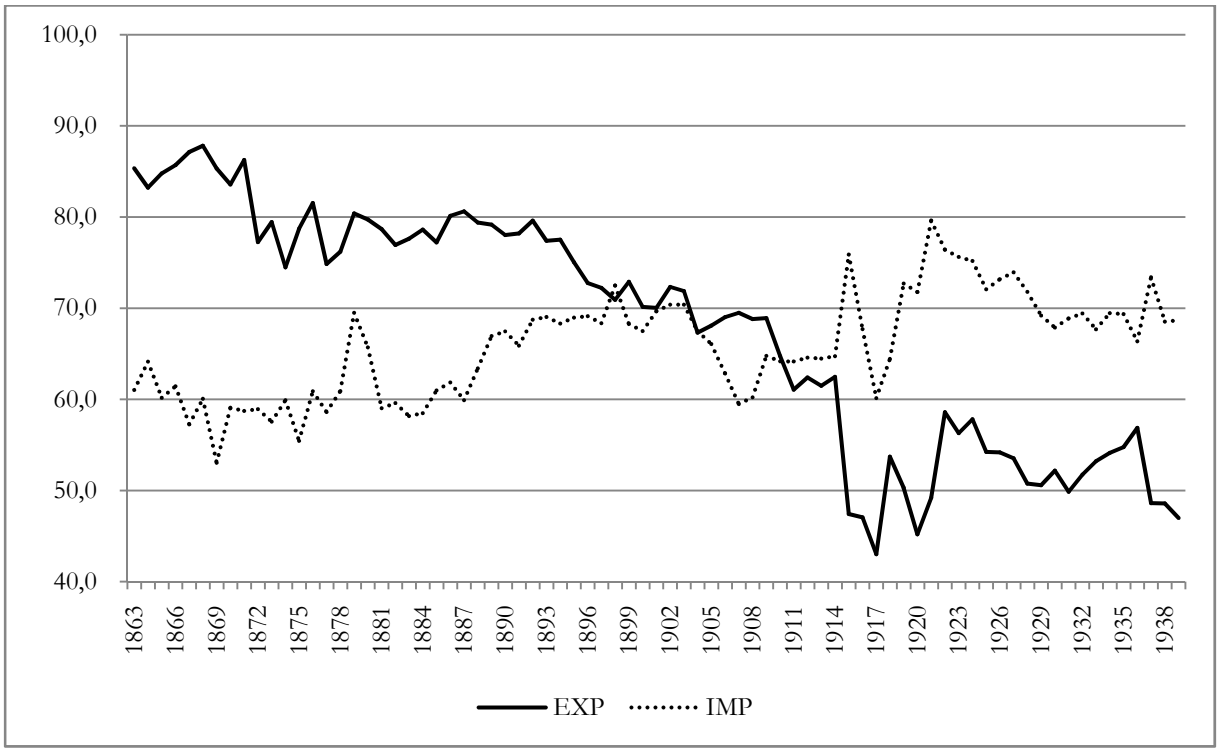
Sources: our own elaboration on Bankit-FTV database, Fenoaltea (2005), Ercolani (1969 tab. XIII 1.1.A).

Trade increased faster than total GDP, at least until the Great Depression. From the mid 1860s to 1929 peak, exports increased by 6.1 times and imports by 7.3, and the degree of openness (Graph 2, dotted line) almost tripled. The depression did cause trade to fall, but even at their historical minimum in 1936,

exports and imports were still 3.6 and 3.2 times higher than seventy years before and the degree of openness was substantially higher.

As expected, this growth in trade was accompanied by a massive change in its composition (Graph 3 and Appendix, Table I)[4].

Graph 3. The structural change in Italian trade: the share of primary products



Sources: our own elaboration on Bankit-FTV database.

Indeed, the hypothesis of equal composition in 1863-1867 and 1935-1939 is soundly rejected[5]. Yet, the change did not tally wholly with expectations, especially

[4] The Italian trade statistics reported, for each product ("voce"), price, quantity and value of total trade and of trade with all trading partners (although the data-base covers only the ten main ones and the colonies). Until 1921 prices were determined by an Official Committee, on the basis of a wide-ranging enquiry among businessmen, Chamber of Commerce and other state agencies (see for details Federico-Tattara-Vasta, forthcoming). The classification of flows has changed several times in the period, with a growing level of detail (up to thousands of different "voci" since the late 1900s). Thus, they have been re-classified according to the SITC classification (Revision 2) at four-digit level, with one major exception, raw silk. The SITC includes it with other textile fibers in manufactures (class 65), but with the 19th century technology, raw silk was clearly a primary product. The agricultural raw material, the silk cocoons, accounted for about 80% of the sale price (Federico 1997). Table I, Appendix, reports the shares of one-digit SITC categories: primary products in graph 3 are defined as the classes 0 to 4 plus raw silk.

[5] A χ^2 test (on two-digit SITC categories) rejects the hypothesis for both exports and imports at 0.00%. The hypothesis of constant composition between 1935-1939 and 1963 (the end of the "economic miracle") is likewise rejected at 0.00% (data from United Nation, *UN Comtrade*, http://comtrade.un.org, accessed in May 2009).

on the import side. The share of primary products was high in the 1860s because Italy had to import a lot of them – not only colonial wares, oil and cotton, but also all the coal it needed. Since then, the share increased only by few percentage points, in spite of the start of massive imports of wheat in the 1880s and the huge increase in imports of cotton and coal related to industrialization. Modern economic growth affected much more the composition of exports. In the early 1860s, primary products (silk, wine, olive oil, sulphur and so on), accounted for 85% of the total. Italy depended on primary products as much as the poorest Third World countries in the 1980s and 1990s (Razzaque *et al.* 2007b). Furthermore "manufactures" were more often the product of artisanal workshops than of modern factories. The share of manufactures (mostly textile products – cotton yarns and fabrics, silk cloths and so on) started to inch upwards in the 1890s, and the process was fastened by the World War One and the subsequent collapse of German exports. In the late 1930s, manufactures accounted for about half total exports, and Italy succeeded to sell abroad (and to its colonies) also machinery and other more sophisticated products. Thus the composition of Italian exports was converging towards the norm for "advanced" countries. In 1870 the share of primary products on Italian exports was double the average of Core countries, which included the United States, while by 1939 it was "only" a third higher (Blattman *et al.* 2007). The share of primary products declined further after World War One. Since the 1970s manufactures, including substantial quantities of mechanical and engineering products, have accounted for around 85% of total exports (Vasta 2009). Imports and exports differed also for the level of diversification of trade flows (Table 1).

Table 1. Diversification of Italian trade (four-digit SITC categories)

Export	share of the main primary product	share of the top 3 primary commodities	share of the top 5 primary commodities	share of the top 5 all commodities	HHI (primary products)	HHI (all commodities)
1863-1867	28.7 (raw silk)	46.0	53.8	53.9	0.156	0.115
1909-1913	18.3 (raw silk)	23.6	28.4	30.8	0.099	0.047
1925-1929	10.9 (raw silk)	16.9	22.2	28.9	0.067	0.032
1935-1939	4.3 (dried fruit)	11.3	16.5	18.6	0.039	0.017

Import	share of the main primary product	share of the top 3 primary commodities	share of the top 5 primary commodities	share of the top 5 all commodities	HHI (primary products)	HHI (all commodities)
1863-1867	13.0 (wheat)	26.4	32.3	37.4	0.092	0.044
1909-1913	9.1 (cotton)	23.5	31.7	31.7	0.065	0.029
1925-1929	10.3 (cotton)	28.5	34.9	34.9	0.066	0.036
1935-1939	13.2 (coal)	24.9	30.6	31.0	0.067	0.034

In the 1860s, the most important primary product, silk, accounted for about a quarter of total exports [6]. Its share on exports declined steadily since the late 1890s and on the eve of World War Two silk lost its position of main staple to dried fruits, while cotton fabrics became Italy's most important export, accounting for 4.6% of the total. Even at the beginning of the period, Italian exports were much less concentrated than those of typical peripheral countries: the average Herfindhal-Hirschman index for African countries was 0.48 in 1962 and 0.35 in 1995 (Cashin-Pattilo 2006: tab. 2). Primary products have always been the most important single item (with several changes in ranking among them) also on the import side. However, none of them ever exceeded a sixth of total imports and the sum of the top five products accounted for a third. Furthermore, imports do not show any trend towards less concentration. Thus, they were more diversified than exports in the 1860s, but less diversified in the late 1930s. This fact seems important to the extent that concentration in few products, ceteris paribus, increases volatility.

3. The terms of trade: change and volatility

The introduction of new products and the repeated changes in classification of existing ones makes it impossible to single out a sample of products which can be both sufficiently representative and constant over the whole period. Therefore the new index is computed in three stages. In the first stage, we have built Paasche and Laspeyres price micro-indexes for 64 two-digit SITC categories[7]. We have used prices of single products or unit values for four-digit SITC categories, aiming at covering a sufficiently high share of the total value of each two-digit SITC category [8]. We have been quite successful, as the products we consider account for 60% to 70% of total imports throughout the whole period, while the share for exports

[6] These figures would be marginally higher (31.5 in 1863-67, 21.5 in 1909-13 and 11.6 in 1925-29) if we add adding exports of silk waste, a by-product used to produce inferior fabrics. It is classified under a different SITC number (2614 instead of 6511).

[7] Actually, there are only 63 categories at two-digit level in SITC, revision 2. We add raw silk as the 64th category, given its importance in Italian trade. The Paasche and Laspeyres indexes are obtained as:

$$\mathrm{IP}_L = \frac{1}{\sum v_{it}\frac{p_{i0}}{p_{it}}} * 100 \qquad \mathrm{IL}_P = \sum v_{i0}\frac{p_{it}}{p_{i0}} * 100$$

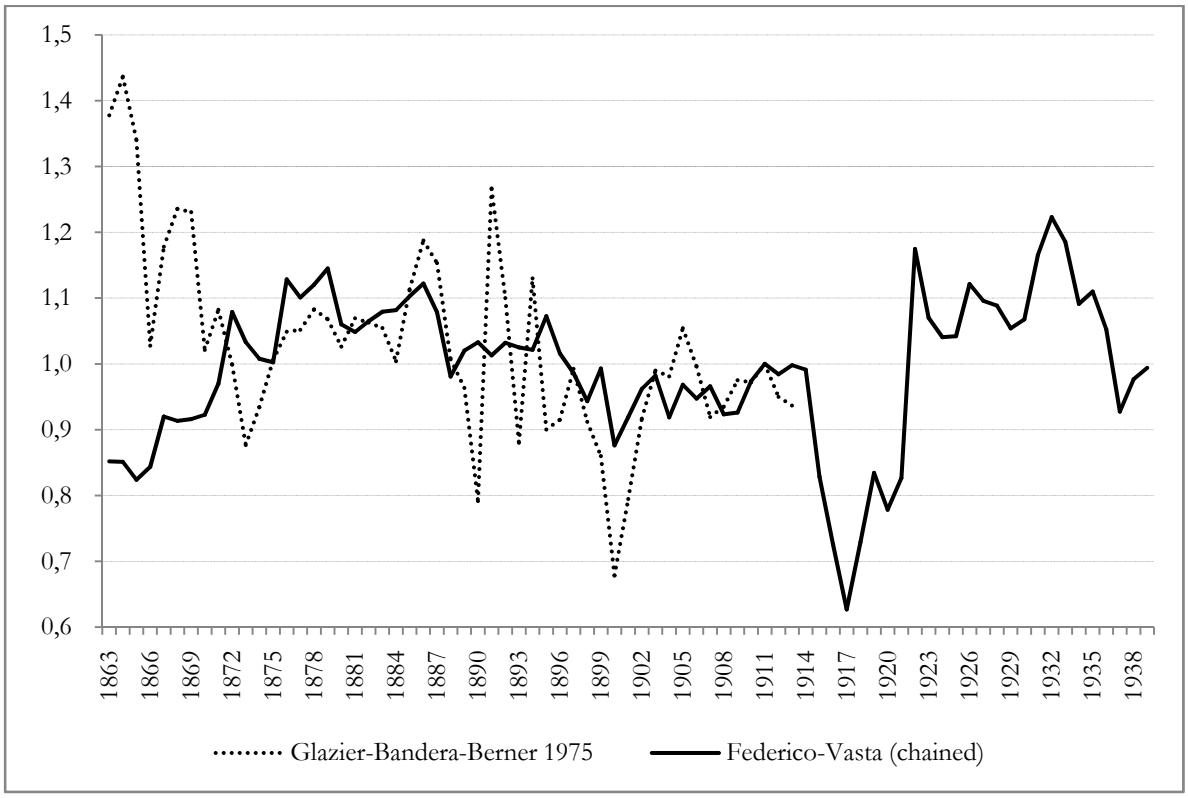
where v_{i0} is the share of value of product *i* on total value at time *0* (base period) and v_{it} is the share of value of product *i* on total value at time *t* (the period for which the index is calculated); p_{i0} is the price of product *i* at time *0*; and p_{it} is the price of product *i* at time *t*.

[8] Prices of single products usually refer to commodities, such raw silk and olive oil on export side, coal, cotton and wheat on import side. These products account on average for 36.6% and 46.7% respectively of total exports and imports.

ranges between 70% and 80% up to the 1920s, to fall to 50-60% only in the final years. In the second stage, we have obtained Laspeyres and Paasche indexes for the whole trade, weighting the 64 category-specific indexes with the shares of these categories on total trade. Finally, we have computed the final (Fisher) index as a geometric average of aggregate Laspeyres and Paasche indexes.

Graph 4 reports the new index alongside with the series by Glazier *et al.* (1975), which is the standard reference in the international literature, including Blattman *et al.* (2007) and Williamson (2008)[9].

Graph 4. Italian terms of trade



Sources: our own elaboration on Bankit-FTV database; Glazier, Bandera, Bemer (1975).

The new series is stationary (at 5%) and trendless: the yearly rate of change in log-linear regression with time is -0.15% from 1863 to 1913, 0.83% from 1914 to 1939 and 0.002% over the whole period. None of these coefficients is significant [10]. In contrast, the Glazier *et al.* (1975) index features a steady decline over the period

[9] One should mention a third series of terms of trade (Ercolani 1969), which however does not bring much additional information. Indeed it is essentially flat over the whole period and changes by over 5 percentage points in three years only, all during wartime or its aftermath. Unfortunately, the author only states that they are Laspeyres indexes (pp. 466-7), without any further information.

[10] The hypothesis of stationarity is rejected for the period 1914-1939, while it comes very close to be accepted (a t-stat of -2.58, corresponding to a 10.4% significance) for the years 1863-1913.

1863-1913 (at a remarkable -0.45% yearly rate, corresponding to a 20% cumulated change). As the graph shows, trends diverged markedly before 1875. Thereafter long-terms rates are very similar, but short term movements remain very poorly correlated [11]. In all likelihood, this divergence between the two indexes reflects technical differences in the coverage and methods[12]. In comparative perspective, the Italian performance is not impressive. Over the period 1870-1939, most countries of the Hadass-Williamson sample experienced an increase in terms of trade[13].

Volatility is usually measured with the standard deviation of yearly changes. These latter can be computed as the first difference from logs of unadjusted series (Jacks *et al.* 2009) or as residuals from trends. Table 2 reports results from three different methods of extracting trend, a log-linear interpolation and two versions of Hodrick-Prescott filter, unadjusted (λ=100) and adjusted (λ=6.25) for annual data (Ravn and Uhlig 2002).

Table 2. Volatility of terms of trade, Italy

	Residuals			
	HP (λ=100)	HP (λ=6.25)	Log trend	First differences
1863-1913	4.00	3.02	7.87	4.74
1919-1939	7.72	6.12	11.90	6.99
1863-1939	6.22	4.40	11.12	7.36

As expected, the volatility of Italian terms of trade comes out to have been higher after than before the war. But how did Italy compare with other countries? Both Blattman *et al.* (2007) and Williamson (2008) measure volatility with the standard deviation from an adjusted Hodrick-Prescott filter – and thus their data are strictly comparable with the figures in column HP (λ=6.25). Blattman *et al.* (2007) cover 35 countries over the period 1870-1939. In the same period, volatility

[11] The hypothesis of equal rates of change over the whole period 1863-1913 is rejected at 10%. In 1875-1913, the rates are almost identical (-0.41% for the Glazier et al and -0.44% for Federico-Vasta) but the coefficients of correlation are 0.57 for levels and 0.157 for first differences.

[12] Glazier et al. (1975) measures British terms of trade with Italy, which differs from (total) Italian terms of trade for a number of reasons. Goods are valued at British ports and thus imports into Italy exclude transportation costs and exports from Italy include them. The composition by product differed: Italy exported to England comparatively little silk (Federico 1979) and imported no wheat from it, although it did import most of its coal and cotton. Last but not least, until 1904, the British statistics registered imports and exports according to the country of consignment rather than to the actual country of origin and destination (Federico-Tena 1991). Thus, Italian lemons embarked in Le Havre were registered as import from France.

[13] The authors thank Jeffrey Williamson for having shared his data with us.

exceeds the Italian one (a SD of 4.56) in all countries except Sweden (4.09), but including Germany (4.75) and the United Kingdom (4.83). The standard deviation is about three fifths of the average for the peripheral countries in Europe (including Sweden) and less than half of the average for peripheral countries outside Europe. However this comparison is subject to two conflicting biases. From one hand, Blattman *et al.* (2007) omit the years 1911-1920, while our series includes them. Terms of trade fluctuated widely during the war, and indeed omitting the 1910s, the Italian volatility falls further to 4.10 – i.e. as low as the Swedish one. On the other hand, for most Peripheral countries, Blattman *et al.* (2007) have to build their own series of terms of trade, using a common index of import prices and computing country-specific indexes for export prices, which cover only a selected range of commodities. This method is bound to overestimate volatility of terms of trade for countries with fairly diversified exports, if price shocks are not correlated across commodities. Indeed the standard deviation of a "Blattman-type" index of Italian terms of trade is 6.31 – i.e. 50% higher than the actual one, according to the index[14]. However, even in this case, Italian terms of trade would remain less volatile than the average for Peripheral countries. Williamson (2008) uses country-specific sources rather than *ad hoc* indexes, and reports data for the United Kingdom, as the sole representative of Core countries, and 20 "peripheral" countries, for the period 1870-1913. The average volatility for these latter is 6.88 – i.e. more than double the Italian one (3.15) in the same years according to the new index. The Italian terms of trade were less volatile than those of any country in Williamson's sample, but the United Kingdom (2.0).

In a nutshell, both comparisons show that Italy did not fit at all with the conventional view of a high-volatility Peripheral country. In the standard framework, as outlined in the Introduction, low volatility is much more beneficial to long-term growth than improving terms of trade. From this point of view, Italy was lucky.

4. Imports: the neglected factor

[14] The export price index is a weighted average of prices of silk, hemp, olive oil and rice on the London market provided by Blattman (http://www.chrisblattman.org/, accessed February 2009). These four products accounted for about a half of total Italian exports in the 1860s but then their share declined steadily to less than 10% in the 1930s. Following Blattman *et al.* (2007), this export price index is then divided by a series of American manufactures export prices. The standard deviation of residuals of the resulting index from a HP filter (λ=6.25) is 6.31. The difference with the volatility of the chained index is significant at 1%.

The whole debate on terms of trade and the "natural resource curse" focuses almost obsessively on the export side. However, by definition, terms of trade depend as much on price of imports as on price of exports. Terms of trade can improve (worsen) even if export price remain perfectly stable if import prices fall (rise). By definition, imports and exports prices must have changed roughly at the same rate to keep terms of trade stable in the long run (Table 3, third row). However, the rates of changes in prices differ rather substantially between primary products and manufactures on both import and export sides, although differences are never significant. Thus, overall trends in terms of trade differ quite sharply between primary products only (Table 3, first row) and manufactures only (Table 3 second row). The cumulated change over the eighty years corresponds to 20% improvement for terms of trade for primary products and to a massive 60% worsening for manufactures.

Table 3. Rates of change, 1863-1939

	Imports	Exports	Terms of trade	Diff IMP/EXP
Primary products	2.66*	3.27*	0.26**	0.737
Manufactures	4.95*	2.72	-1.15***	0.329
Total	3.04**	3.33	0.002	0.849
Diff PP/MAN	0.416	0.808	0.00	

* significant at 10%** significant at 5%; *** significant at 1%.

A similar reasoning holds true for volatility as well[15]. Fluctuations in import prices would affect terms of trade as much as fluctuations in export prices of the same width, unless of course import and export prices are correlated. How much did exports and imports contribute to overall volatility? Answering to this question is straightforward if volatility is measured by the standard deviation of differences (Table 2). In almost 80% of cases, prices of imports and exports move in opposite directions (e.g. import price rise and export fall or vice-versa) and imports drive 37 out of a total of 76 movements. However, this simple computation may be biased to the extent that the yearly total changes include the effect of long-term trends in imports and exports. Residuals from de-trended series are not subject to this bias, but in this case total volatility is the sum of four components - i) volatility of residuals of exports from de-trended series; ii) volatility of residuals of imports from de-trended series; iii) divergence among de-trended series, if filtered separately; iv) co-variance of residuals. Total volatility is positively related to the first three components and negatively to covariance.

[15] In what follows, unless otherwise stated, volatility is always measured with residuals from a Hodrick-Prescott filter with λ=6.25.

*Table 4. Volatility terms of trade, imports and exports, 1863-1939 (*100)*

	Terms of Trade	Exports	Imports	F-test variance EXP-IMP
i) Total	4.40	25.0	38.6	0.00
ii) Primary products	5.31	29.1	45.0	0.00
iii) Manufactures	6.76	25.1	29.5	0.16
F-test variance ii)/iii)	0.04	0.19	0.00	

As Table 4 shows, imports are significantly more volatile than exports, and the difference reflects mainly the high volatility of prices of imported primary products. They were significantly more volatile than prices of manufactures, as expected, but also than prices of exported commodities. Indeed, prices of the three main imported commodities (wheat, coal and cotton), which jointly accounted on average for about one quarter of total imports, were significantly more volatile than prices of the three main staples (silk, olive oil and wine), which accounted for a similar proportion of exports[16].

The contribution of different sources of volatility can be estimated by regressing the squared residual of terms of trade on the squared residuals of imports and exports and co-variance.

Table 5. Decomposition of volatility: import and exports

a) Primary products
RESID^2= 0.002 + 0.033 RESIDEXP^2+0.027 RESIDIMP^2 - 0.063COV (4.96)*** (4.25)*** (11.5)*** (-7.83)*** F stat=50.8 (0.000) R^2=0.663 Wald-test=0.83 (0.37)
b) Manufactures
RESID^2= 0.001 + 0.197 RESIDEXP^2+0.094 RESIDIMP^2 -0.298 COV (0.43) (9.13)*** (5.80)*** (-8.13)*** F stat=27.9 (0.000) R^2=0.515 Wald-test=35.1 (0.00)
c) Total trade
RESID^2= 0.010 + 0.037 RESIDEXP^2+0.032RESIDIMP^2 -0.073 COV (5.49)*** (9.72)*** (22.4)*** (17.3)*** F stat=175.95 (0.000) R^2=0.873 Wald-test=3.27(0.074)

As all series are expressed in the same units, the interpretation of results is straightforward: a 1% increase in volatility of imports or exports, taking into account covariance, augments total volatility by the coefficient. The coefficient for exports is somewhat higher in all three regressions, but the hypothesis of equality is

[16] The standard deviation of residuals is respectively 67.5, 120.8 and 45.1 for imports and 37.7, 39.1 and 36.5 for the exports.

clearly rejected only for manufactures. Furthermore, the lower coefficients for imports are compensated by the greater absolute value of the variable.

Summing up, the lack of resources forced Italy to pick two tickets at the commodity lottery, one for its exports and one for its imports. The latter was fairly good in terms of long-run growth but it was decidedly poor in terms of volatility.

5. The effect of industrialization

As said in the Introduction, the change in composition of trade brought about by modern economic growth should, ceteris paribus, reduce volatility and thus foster further growth. The composition of the Italian trade changed a lot (Section 2): did this change reduce volatility as hypothesized? It is possible to answer by computing counterfactual terms of trade with different sets of (fixed) weights. The underlying price series being always the same, any difference between these counterfactual series would reflect solely the effects of changes in weights – i.e. in the composition of trade and thus ultimately of modern economic growth. The two obvious choices for weights are the first (1863-1867) and the last (1935-1939) years of the period. We add also the five years 1909-1913 at the end of the longest and fastest spell of industrial growth in the whole period.

Table 6. Rates of change in terms of trade, fixed weights

	1863-1913	1914-1939	1863-1939
Weights 1863-1867	0.21**	-0.84**	-0.32**
Weights 1909-1913	-0.33	-0.21	-0.37**
Weights 1935-1939	0.17	1.37	0.11
Chained index	-0.15	0.83	0.00

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

The rates of change come out substantially different (Table 6). The null hypothesis of rates equal to the chained index is rejected at 5% for counterfactual estimates with 1863-1867 and 1909-1913 weights, but not for the 1935-1939 one. Given the difference in lengths between the two periods (50 versus 25 years), the extent of the changes can be better understood if the rates are cumulated over the three periods (Table 7)[17].

Table 7. The effect of industrialization on the trends of terms of trade: counterfactual estimates

	1863-1913	1914-1939	Chained
Chained	-7.2	+23.0	+0.2

[17] The figures are obtained as [(exp(r*n)-1)]*100, where r is the rate of change from Table 6 over the relevant period and n is the number of years. The sum of cumulated changes in 1863-1913 and 1914-1939 differ from the total 1863-1939 because the rates are obtained with a stochastic procedure.

Weights 1863-1867	11.0		-21.8
Weights 1909-1913	-15.4	-5.1	
Weights 1935-1939		+40.9	+8.6

The first row reports, for sake of comparison, the cumulated change of the chained index. As already said, the terms of trade worsened somewhat in the period to World War One and improved substantially in the period after 1914. If the composition had remained constant since the Unification ("weights 1863-1867"), they would have improved by 11% before 1913. This implies that the share of products whose relative prices were declining has increased on the export side and/or has decreased on the import side. In fact, the deterioration in terms of trade would have been even greater if, by some miracle, Italy had had the pre-war structure of trade since the 1860s ("weights 1909-1913"). If the latter composition had remained constant up to the end of the period, the terms of trade would have declined by a further 5%. Luckily for Italy, this did not happen, and the change in composition after World War One helped to reverse the downward trend. Indeed the 1935-1939 composition ("weights 1935-1939") proved to be the most favorable of all three sets. The terms of trade would have improved by 41% after 1914 and by almost a tenth since Unification[18]. The difference between the fall in terms of trade with 1863-1867 weights and the improvement with the 1935-1939 ones is a crude estimate of the effect of modern economic growth[19].

In contrast, industrialization did not reduce volatility, as hypothesized in the Introduction. The volatility comes out at least 80% higher, and possibly more than double, if computed with the 1935-39 weights than if computed with the 1863-1867 ones (Table 8).

Table 8. The effects of industrialization on volatility of terms of trade: counterfactual estimates

	Residuals			First difference
	HP (λ=100)	HP (λ=6.25)	Log trend	
Weights 1863-1867	3.85	2.66	8.24	4.90
Weights 1935-1939	8.48	5.66	14.63	9.82
%Change	+120	+113	+77	+101
F-test equal variance	0.00	0.00	0.00	0.00

[18] Terms of trade with the 1925-1929 weights (Appendix I) would have increased from 1914 to 1939 by 21% - midway between the fall with the 1909-1913 weights and the rise with the 1935-1939 ones. This suggests that the change unfolded over the whole period 1914-1939.

[19] The estimates would measure accurately the gains if: i) all price changes were exogenous (Italy was a small country) and ii) all changes in composition of trade could be attributed to modern economic growth. The first condition is surely met, while the second is of course debatable.

This increase does not depend on changes in volatility of residuals, as table 9 shows. For both aggregate imports and exports, the volatility of residuals is not higher with 1935-1939 weights than with the 1863-1867 ones. The volatility of prices of imported commodities did increase by a fifth, but this rise was not large enough to affect overall variability of imports. The table shows no change at all on the export side, in spite of the massive change in specialization and the very substantial diversification (Graph 2 and Table 1).

Table 9. The effect of industrialization on volatility of prices: counterfactual estimates by category

	Weights 1863-67	Weights 1935-39	F-test variance
Imports			
All products	57.3	60.5	0.64
Primary products	35.5	44.0	0.06
Manufactures	32.4	31.7	0.85
Exports			
All products	28.4	24.8	0.24
Primary products	29.1	26.8	0.47
Manufactures	26.8	25.6	0.68

By default, the increase in volatility in terms of trade must reflect greater fluctuations of the filtered series and/or a lower covariance between the residuals of import and exports. Both effects have the right sign. The volatility of ratio of filtered series of exports to imports is 5% higher and covariance is 12% lower with the 1935-1939 weights than with 1863-1867 ones. The decrease in covariance reflects mostly the growing divergence between the composition of imports and exports[20]. The coefficient of correlation between the shares of 2-digit SITC groups in imports and exports was as high as 0.40 in 1863-1867 and it more than halved to 0.17 in the late 1930s.

The analysis so far lump together all changes in composition of trade, most notably including the growing diversification of exports. It is nevertheless possible to show how much diversification reduced volatility by computing the terms of trade, under the alternative assumption that Italy exported only four products. To minimize any potential selection bias, we have considered the four most important

[20] One cannot attribute all changes in covariance between imports and exports to differences in composition because they might reflect also different short-term movement in prices for the 2-digit SITC categories. Prices of individual products sometimes differed between imports and exports and, above all, the micro-indexes for 2-digit SITC categories have often been computed with different products, which have been selected in order to maximize the coverage of these indexes.

products in 1863-1867, 1935-1939 and on the average over the whole period (Table 10).

Table 10. The effect of diversification on volatility of terms of trade: four top products

	1863-1867 °	1935-1939 °°	Top average °°°
Volatility, four products	6.67	8.86	17.41
Volatility, all products	2.66	5.66	4.40
Ratio i)/ii)	2.51	1.56	3.96
F-test equal variance	0.00	0.00	0.00

° Imports 65 (textile products), 04 (cereals), 6511 (silk) and 06 (sugar). Exports 6511 (silk) 42 (vegetable oils -olive oil) 04 (cereals- wheat) and 05 (fruit).
°° Imports 32 (coal) 26 (textile fibers -cotton), 33 (oil), 04 (cereals). Exports 05 (fruit) 65 (textile products) 26 (textile fibers - hemp) 78 (road vehicles).
°°° Imports 26 (textile fibers -cotton), 04 (cereals) 65 (textile products), 32 (coal). Exports 6511 (silk), 65 (textile products), 05 (fruit) and 26 (textile fibers - hemp).

As expected, volatility would have been significantly greater if Italian trade had been highly concentrated, and this result is robust to differences in the set of products. Italy avoided the worst effects of the commodity lottery because it could draw several tickets, both on import and export side, rather than one or two.

6. Conclusion

This paper is the first outcome of a large research project on Italian trade. It has provided some basic information about long-term trends and focuses on terms of trade. Its results can be summed in a single sentence. The change in trade composition improved the Italian terms of trade, but it did not reduce volatility. In contrast with expectations, this latter was very low when Italy was a poor and backward country, but it doubled during the first stage of its process of modern economic growth. This latter forced Italy to import a growing amount of basic commodities, whose prices are usually more volatile, at a time when prices in international markets were becoming more volatile. As a result, in volatility terms, Italy moved from the Core to the (low rank) of Peripheral countries. This result implies just the opposite of the virtuous circle hypothesized in the Introduction. If conventional wisdom about the harmfulness of high volatility is right, we have to conclude that low volatility should have helped modern economic growth at its beginning but it harmed it afterwards. If this was the case, the actual 1% yearly growth rate in GDP per capita would appear under a rather different light – as a quite good performance in spite of not-so-good odds.

The case of Italy suggests three important qualifications to the conventional wisdom:

i) timing matters. An exogenous increase (decline) in price volatility on international markets can augment (reduce) the volatility of terms of trade, with positive (negative) effects on modern economic growth. This statement, of course, holds true only if the country is a price-taker, but this was by far the most common case.

ii) imports matter. Long-term changes and short-term volatility depend as much on import side as on export side, and on the co-variance between the two. Imports can be a major source of macroeconomic shocks if they feature a high proportion of highly volatile commodities. Abundance of natural resources would reduce, *ceteris paribus*, this risk, although it may have other negative consequences including the Dutch disease. In contrast, development per se would not help much, although it is likely to increase the capacity of a country to withstand a given shock.

iii) diversification matters. The more diversified trade is, the lower the impact of fluctuations of prices of any specific commodity on imports or export prices and thus the lower volatility of terms of trade. Furthermore, the more similar imports and exports are in terms of product composition, and thus the higher the covariance of their prices is, the lower overall volatility must be. In other words, all estimates of import and export prices (and hence of terms of trade) based on partial product coverage are likely to overestimate volatility (Bidorkota and Crucini 2000). By definition, *ceteris paribus*, the bias is bound to be greater the lower the share of covered products on total trade is.

In short, modern economic growth does not necessarily reduce volatility. The changes in composition of trade flows may reduce the covariance in prices between import and exports and thus increase volatility. Furthermore, industrialization may increase volatility by forcing a resource-poor country to import growing quantities of highly volatile raw materials and agricultural products, possibly compensating the decline in volatility from changes of composition of exports. Volatility of terms of trade is likely to fall permanently only when both import and export consist mainly of manufactures. This case has become much more common as of late, with the great increase in intra-industry trade and, quite recently, of outsourcing of industrial processing.

None of these qualifications rules out the possibility that conventional wisdom could be true in some cases, or perhaps in the majority. However, they suggest the need for additional empirical work before drawing inferences.

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Appendix:

Table I. Trade (export and import) distribution by one digit SITC

Export	1862-67	1890-94	1909-13	1925-29	1935-39
0 - Food and live animals	21.6	20.2	24.0	22.8	28.2
1 - Beverages and tobacco	2.7	5.3	4.1	2.3	4.7
2 - Crude materials	18.7	19.1	14.9	13.6	13.9
3 - Mineral fuels	0.0	0.0	0.1	0.4	0.7
4 - Animal and vegetable oils.	12.0	5.9	2.4	2.6	1.5
5 – Chemicals	6.9	4.6	3.8	3.8	4.8
6 - Various manufactured goods	35.1	38.5	39.8	42.2	29.5
6 (except raw silk)	5.2	11.0	21.6	31.3	27.2
6511 - raw silk	29.9	27.6	18.2	10.9	2.4
7 - Machinery and transport equipment	0.0	0.3	2.8	5.5	11.1
8 - Miscellaneous manufactured articles	3.0	5.9	8.0	6.5	5.1
9 - Commodities n.e.c.	0.0	0.1	0.0	0.2	0.5
Primary	84.8	78.1	63.7	52.7	51.3
Manufactured	15.2	21.9	36.3	47.3	48.7

Import	1862-67	1890-94	1909-13	1925-29	1935-39
0 - Food and live animals	28.7	24.7	20.7	24.9	15.5
1 - Beverages and tobacco	4.1	2.0	1.3	0.7	0.6
2 - Crude materials	14.6	24.9	27.1	30.6	30.1
3 - Mineral fuels	2.8	9.9	10.2	13.1	21.0
4 - Animal and vegetable oils.	1.3	0.8	1.3	2.0	2.0
5 - Chemicals	2.9	5.1	5.4	3.9	5.1
6 - Various manufactured goods	39.4	25.4	22.1	16.8	15.0
6 (except raw silk)	30.1	19.8	18.2	16.1	14.9
6511 - raw silk	9.3	5.6	3.9	0.6	0.1
7 - Machinery and transport equipment	1.1	2.8	6.1	5.2	7.8
8 - Miscellaneous manufactured articles	4.3	4.0	5.6	2.6	2.8
9 - Commodities n.e.c.	0.8	0.3	0.2	0.1	0.1
Primary	60.8	67.9	64.4	72.0	69.3
Manufactured	39.2	32.1	35.6	28.0	30.7

Table II. Price indexes for imports and exports and terms of trade, all products (1911=100)

Years	Exports	Imports	Terms of Trade
1862	127.0	145.9	0.870
1863	123.3	146.3	0.843
1864	122.7	145.7	0.842
1865	123.1	147.2	0.836
1866	120.3	141.1	0.853
1867	127.9	138.3	0.925
1868	128.1	139.6	0.918
1869	127.8	139.2	0.918
1870	128.1	138.8	0.923
1871	129.9	134.1	0.969
1872	157.4	146.3	1.076
1873	157.8	153.5	1.028
1874	144.1	144.0	1.001
1875	131.0	131.6	0.995
1876	152.1	135.8	1.120
1877	135.2	123.7	1.093
1878	123.3	110.9	1.112
1879	128.6	113.1	1.137
1880	123.9	117.8	1.052
1881	116.4	111.8	1.041
1882	114.0	107.7	1.058
1883	109.5	102.1	1.072
1884	104.0	96.8	1.074
1885	99.8	91.1	1.095
1886	99.5	89.3	1.114
1887	94.2	87.5	1.077
1888	88.6	90.5	0.979
1889	94.5	92.4	1.022
1890	96.3	93.5	1.030
1891	90.1	89.3	1.009
1892	89.3	86.8	1.028
1893	88.0	86.0	1.023
1894	82.5	81.0	1.019
1895	84.8	79.2	1.070
1896	81.3	80.3	1.013
1897	78.6	80.0	0.983
1898	78.6	83.6	0.941
1899	85.4	86.1	0.992
1900	84.4	96.4	0.876
1901	82.2	89.5	0.919
1902	82.7	86.1	0.962
1903	85.5	87.1	0.982

1904	84.1	91.6	0.918
1905	86.0	88.9	0.968
1906	90.9	96.0	0.947
1907	96.6	100.1	0.966
1908	89.0	96.4	0.924
1909	90.0	97.2	0.926
1910	97.1	99.7	0.974
1911	100.0	100.0	1.000
1912	100.5	102.1	0.984
1913	102.1	102.3	0.998
1914	102.4	103.3	0.991
1915	118.7	143.2	0.829
1916	166.9	230.0	0.725
1917	260.8	416.0	0.627
1918	350.2	480.1	0.729
1919	407.7	488.4	0.835
1920	650.2	834.9	0.779
1921	573.0	696.6	0.823
1922	573.7	496.0	1.156
1923	546.1	513.4	1.064
1924	568.5	554.4	1.026
1925	659.1	636.7	1.035
1926	712.1	640.0	1.113
1927	570.1	524.1	1.088
1928	519.2	480.8	1.080
1929	486.2	463.9	1.048
1930	430.4	406.1	1.060
1931	372.0	321.1	1.158
1932	311.0	255.5	1.217
1933	272.3	231.1	1.179
1934	245.0	227.5	1.077
1935	261.6	233.6	1.120
1936	303.7	285.7	1.063
1937	415.7	444.2	0.936
1938	414.5	420.7	0.985
1939	411.5	407.2	1.010

Table III. Price indexes for imports and exports and terms of trade, primary products (1911=100)

Years	Exports	Imports	Terms of Trade
1862	118.5	144.9	0.818
1863	117.8	145.4	0.810
1864	117.5	145.0	0.810
1865	117.6	144.6	0.813
1866	111.0	139.1	0.798
1867	121.2	132.8	0.913
1868	121.1	133.2	0.909
1869	120.8	132.8	0.910
1870	121.8	132.5	0.920
1871	123.7	128.7	0.962
1872	134.2	138.5	0.969
1873	138.8	144.3	0.962
1874	124.1	130.4	0.952
1875	111.1	116.7	0.952
1876	134.4	124.3	1.082
1877	116.3	109.4	1.063
1878	106.2	99.6	1.066
1879	113.3	108.4	1.045
1880	108.5	115.6	0.939
1881	102.1	110.5	0.924
1882	99.1	105.5	0.938
1883	94.9	98.7	0.961
1884	94.2	93.2	1.011
1885	92.2	87.3	1.056
1886	92.7	85.9	1.079
1887	87.8	85.4	1.028
1888	81.9	89.4	0.916
1889	88.8	91.1	0.975
1890	91.2	91.6	0.997
1891	84.8	87.3	0.972
1892	85.5	83.8	1.020
1893	83.5	83.1	1.005
1894	78.6	76.6	1.027
1895	80.3	75.0	1.070
1896	75.4	76.5	0.985
1897	74.3	76.6	0.970
1898	75.5	81.3	0.928
1899	84.1	81.2	1.037
1900	83.4	94.9	0.879
1901	81.7	87.3	0.936
1902	82.7	82.4	1.003

1903	85.6	84.2	1.017
1904	82.8	90.3	0.916
1905	84.2	84.7	0.994
1906	89.7	91.2	0.984
1907	95.1	96.5	0.986
1908	86.0	93.5	0.920
1909	88.6	93.5	0.948
1910	94.1	99.8	0.943
1911	100.0	100.0	1.000
1912	101.2	101.6	0.996
1913	103.7	101.3	1.023
1914	103.9	103.4	1.005
1915	115.2	144.6	0.797
1916	169.9	232.7	0.730
1917	254.9	427.6	0.596
1918	349.5	506.8	0.690
1919	441.2	513.3	0.860
1920	718.8	938.2	0.766
1921	579.3	747.9	0.775
1922	564.3	508.6	1.110
1923	533.4	521.8	1.022
1924	563.4	570.6	0.987
1925	654.6	667.0	0.981
1926	710.6	656.9	1.082
1927	581.1	522.6	1.112
1928	533.7	468.7	1.139
1929	492.1	446.6	1.102
1930	397.0	371.8	1.068
1931	321.3	280.4	1.146
1932	287.7	212.7	1.352
1933	244.0	192.8	1.266
1934	226.5	194.0	1.167
1935	241.4	196.6	1.228
1936	287.8	241.6	1.191
1937	390.3	378.4	1.031
1938	399.3	353.8	1.129
1939	392.3	336.6	1.165

Table IV. Price indexes for imports and exports and terms of trade, manufactures (1911=100)

Years	Exports	Imports	Terms of Trade
1862	158.0	154.1	1.026
1863	135.5	154.2	0.878
1864	133.4	153.2	0.871
1865	135.4	158.0	0.857
1866	157.5	150.8	1.045
1867	141.6	153.6	0.922
1868	145.1	156.4	0.928
1869	144.3	156.0	0.925
1870	140.4	155.4	0.904
1871	140.8	149.0	0.945
1872	269.0	165.6	1.624
1873	240.8	175.7	1.371
1874	236.0	174.0	1.357
1875	225.9	163.5	1.382
1876	222.2	161.5	1.376
1877	217.4	154.9	1.404
1878	197.6	135.8	1.456
1879	189.8	122.5	1.549
1880	187.4	120.7	1.552
1881	175.0	113.3	1.545
1882	176.9	110.6	1.600
1883	171.7	106.9	1.607
1884	139.0	101.9	1.364
1885	124.3	96.6	1.286
1886	119.8	94.0	1.275
1887	113.9	90.1	1.264
1888	110.1	91.3	1.205
1889	109.8	93.8	1.171
1890	108.8	96.2	1.132
1891	103.9	92.0	1.130
1892	96.7	91.9	1.052
1893	98.5	91.0	1.083
1894	91.1	89.8	1.015
1895	95.3	87.5	1.089
1896	97.6	87.4	1.116
1897	89.5	86.0	1.040
1898	86.0	86.6	0.992
1899	87.1	96.0	0.907
1900	85.6	98.3	0.871
1901	82.2	92.9	0.885
1902	81.6	93.2	0.875
1903	83.9	92.4	0.908

1904	86.0	93.0	0.924
1905	88.9	96.6	0.920
1906	92.0	104.8	0.878
1907	98.5	106.9	0.921
1908	94.8	102.0	0.929
1909	91.8	104.2	0.881
1910	102.4	99.5	1.028
1911	100.0	100.0	1.000
1912	99.4	103.1	0.964
1913	99.6	104.2	0.956
1914	100.0	103.2	0.969
1915	122.6	141.0	0.870
1916	165.4	226.1	0.732
1917	267.4	398.4	0.671
1918	352.3	440.0	0.801
1919	376.6	450.9	0.835
1920	589.0	653.5	0.901
1921	561.9	621.8	0.904
1922	580.4	520.5	1.115
1923	557.9	553.9	1.007
1924	569.5	575.6	0.990
1925	657.7	630.1	1.044
1926	706.7	668.6	1.057
1927	552.0	592.9	0.931
1928	497.9	577.9	0.862
1929	473.8	574.8	0.824
1930	461.4	561.1	0.822
1931	427.2	491.1	0.870
1932	332.8	434.3	0.766
1933	301.8	390.8	0.772
1934	262.0	366.4	0.715
1935	280.3	388.3	0.722
1936	314.7	470.1	0.669
1937	435.7	717.2	0.608
1938	424.5	700.6	0.606
1939	425.5	704.7	0.604