Dipartimento di Economia Politica

Materiali di discussione

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Exports, imports and growth. New evidence on Italy: 1863-2004

Barbara Pistoresi[1]
Alberto Rinaldi[2]

October 2011

Università di Modena e Reggio Emilia
Dipartimento di Economia Politica
and ReCent,
Via Berengario, 51
41100 Modena, Italy
1 e-mail: barbara.pistoresi@unimore.it
2 e-mail: alberto.rinaldi@unimore.it

ISSN: 2039-1439 a stampa
ISSN: 2039-1447 on line

Exports, imports and growth.
New evidence on Italy: 1863-2004

Barbara Pistoresi and Alberto Rinaldi*

Dipartimento di Economia Politica and ReCent, Università di Modena e Reggio Emilia, Viale Berengario 51, 41100 Modena, Italy

Abstract

The nexus between trade and economic growth in Italy has been widely debated by historiography. However, there are not long run analysis on this topic that cover the whole span from Unification to present days. This paper contributes to fill this gap by investigating the relationship between real exports, imports and GDP in Italy from 1863 to 2004 by using cointegration analysis and causality tests. The outcome suggests that these variables comove in the long run but the direction of causality varies across time. In the period prior to the First World War import growth led GDP growth that in turn led export growth. Conversely, in the post-Second World War period we have a strong bidirectionality between imports and exports consequent on the increase in intra-industry trade. We also find a weak support for export-led growth and growth-led imports. This suggests that exports were not the only or the main driver of economic growth. There was probably a multiplicity of factors at work, among which high rates of capital formation and the expansion of internal demand probably stood out.

JEL Code: F43; O11; N1; N7

Keywords: Trade, economic growth, Italy, unit root tests, cointegration analysis, Granger-causality.

* Corresponding author. E-mail: alberto.rinaldi@unimore.it. The authors would like to thank Giovanni Federico and Michelangelo Vasta for letting them have access to the new official series of Italian foreign trade of the Bank of Italy before they were published.

1. Introduction

Italy is a late-comer nation which caught up with industrialization in the late 19^{th} century and exhibited such an excellent economic performance in the second half of the 20^{th} century that enabled it to join the G-7 group [1].

Historiography explained Italy’s late industrialization by stressing that the nation’s economic growth was curbed by some “fundamental traits”, among which the limited size of the domestic market, the general shortage of capital, the lack of natural resources, and the weakness of the entrepreneurial class [2, 3, 4, 5, 6]. In the face of such constraints, the nation had to rely on those Gerschenkron-type “substitution factors” to catch up with more industrialized countries. Among these, German-type mixed banks and the state stood out. The two larger mixed banks played a paramount role in prompting Italy’s economic boom in the 20 years prior to the First World War, by providing financial support and managerial advice to the major companies, especially in modern sectors such as steel, electricity, engineering, chemicals, and motor-vehicles [7, 8, 9].

During the period from Unification to the First World War the state fostered development through substantial outlays for the creation of a national railway system and other forms of social overhead capital. The state also supported directly the industry through protection, purchases of its output, and the occasional bail-out of ailing firms. In the 1930s it enacted one of the most massive bail-outs in European history as it took over the ailing mixed banks and their equities and conferred them to the big state-owned holding Iri. The result was the substitution of the state for the mixed banks, as the linchpin of the system of financial intermediation [1, 10, 11, 12, 13].

This view on Italian economic growth was challenged by more recent historiography. The role of the mixed banks was questioned by stressing that – at least until 1914 – these were more concerned with normal banking activities than with crafting an overall industrial strategy. They lent money on a project-by-project basis and not as part of some larger development scheme. Moreover, the mixed banks tended to attach themselves to large, established companies instead of providing venture capital to promising small ones, and firms attached to the mixed banks did not invest more than the unattached ones [14, 15, 16, 17, 18, 19].

Also the role of the state was reconsidered. It was argued that early scholars had exaggerated the importance of the efforts by the government to sustain a robust national industry and that the latter led to a misallocation of resources and thus to a negative or negligible impact on economic growth [20].

As a result, the focus of historiography shifted to consumer goods small-scale firms in competitive industries reliant on cheap labor and labor-intensive techniques. These industries had been able to exploit the comparative advantage of a backward nation whose only abundant productive factor was labor and were now seen as the real driver of Italy's long-term economic growth [21]. Within this context, a paramount influence was exerted by the so-called Bonelli-Cafagna model [5, 22]. According to these two authors, a long wave of growth and accumulation began early in the 19th century well before Unification, sustained by exports of agricultural goods, particularly raw silk. The export growth also permitted imports of raw materials and semi-manufactured goods to increase without putting pressure on the balance of payments. The agrarian crisis of the 1880s effectively ended the key role for agriculture as Italy's export engine but, by that time, other sectors had taken up the slack and a mix of emigrant remittances and tourism helped to finance growth-induced imports. As Italy was a relatively backward and resource-poor country, industrialization required massive investment in plant, equipment and modern infrastructure. Since the import content of domestic output growth was large, the problem was to find the way to ease the balance of payments constraint. Thus, the growth of world trade provided an impetus for economic growth.

The Bonelli-Cafagna model was in turn challenged by assuming that the driving force was capital flows, and that the balance of trade and services adjusted to them. When capital flowed in, for whatever reason, the balance of trade was in deficit; when Italy exported capital, the balance of trade was in surplus. In particular, Fenoaltea [23, 24] proposed a financial business cycle model in which domestic economic growth was linked to international capital flows. The Italian investment cycle was supply-induced, driven by fluctuations in British capital exports that were, in turn, determined by investor sentiment in Britain. When, as in the 1880s, British investors preferred investing abroad, the world capital market was flooded with liquidity, and all peripheral countries (including Italy) imported huge quantities of capital. So, if in the Bonelli-Cafagna model Italy's balance of payments was determined by trade flows which functioned as a constraint to economic growth, according to Fenoaltea Italy's balance of payments was a function of international capital flows and the usual contention that Italy's economic growth was curbed by balance of payments constraint is invalid.

The rapid growth in exports after the Second World War, which saw Italy win an increasingly large share of the international market until the end of the 1970s, led some scholars to advocate for export-led growth [25, 26, 27, 28]. Their argument was that for a developing nation poor of raw materials and of modern production technology such as Italy, the capacity to import was the major constraint to growth. Thus, Italy needed to boost exports to ease balance of payments pressures. This time, differently from the period prior to the First World War in which exports consisted mainly of low-productivity primary goods, Italy acquired a competitive advantage in high-productivity sectors, in particular durables, machinery and transport equipment, for which international demand grew faster. The expansion of this high-productivity export sector generated those technological spillovers that triggered the export-led growth of the whole economy.

Other scholars reconsidered the export-led growth hypothesis by maintaining that the internal demand was the driving force of the economic growth at least until 1957. The rapid expansion of exports post-dated the first phase of the high-growth period by almost a decade. The situation changed after 1958, with the creation of the EEC. Trade liberalization accelerated, export growth exceeded even the blistering pace set by GDP expansion, merchandize exports outstripped tourism and emigrant remittances for the first time. So the triggering of the export-led mechanism must be postponed by at least one decade [29, 30].

However, more recent interpretations discarded the idea that the expansion of aggregate demand – led by exports or by internal demand – was the engine of Italy's economic growth in the post-Second World War years. Now emphasis was placed on the supply-side factors. The idea is that the key driver of economic growth was Italy's high rate of capital accumulation. The growth of capital stock had a number of positive spin-offs. First, it led to a rapid increase in the capital-labour ratio, which, in turn, pushed up labor productivity and total factor productivity. Second, it reduced the age of the capital stock, thus bringing Italian firms closer to the best-practice frontier. Third, it facilitated the shift of labour from low- to high-productivity activities. Another prominent feature of the period was wage moderation. As a result, productivity increased more quickly than real wages and profit rates went up, making investment attractive. Trade liberalization guaranteed Italian products access to world markets, encouraged specialization and facilitated realization of scale economies, further pushing out the long-run aggregate supply curve. There was also the possibility of technological catching up, that is, the possibility for Italian firms to import, adopt and adapt off-the-shelf technology developed elsewhere [31, 32, 33].

This paper focuses on the nexus between trade and economic growth in Italy from 1863 to 2004. As we have seen, this is a widely debated topic in historiography. Most economists also believe that opening to international trade promotes economic growth by encouraging faster technological progress and shifting resource from low- to high-productivity sectors.[1] As a matter of fact, Italy's economic growth was accompanied by a dramatic increase in the country's integration with European and global commodity markets: foreign trade in the long run grew faster than the overall economy. However, there are not long run interpretations or econometric tests of the relationship

[1] For an updated survey of the economic literature on the relationship between trade and economic growth, see Acemoglu [34]. This book presents a survey of the theoretical models that formalize the link between trade openness and economic growth and both micro and macro empirical studies consistent with this belief. It also surveys more sceptical theoretical models that show that trade openness can induce specialization in the wrong sectors with negative effects on long-term economic growth.

between Italy's exports, imports and economic growth from Unification in 1861 to present days. The various analyses proposed are usually concerned with single and relative short phases of Italy's economic history and consist mainly of qualitative studies that have not come to conclusive results. Also the few existing econometric studies deal with relative short periods and show contrasting results [35, 36, 37, 38, 39, 40].

This paper contributes to fill this gap by investigating the causal relationship between real exports, real imports and real GDP in Italy from 1863 to 2004 by using the new official series of Italian foreign trade of the Bank of Italy. By adopting a time series approach we test if Italian real exports, real imports and real GDP are cointegrated, then if unidirectional Granger causality exists. In other words, we test if the growth of exports or the growth of imports led that of GDP or vice versa, that is, if there is evidence for the following four hypothesis: i) export-led growth (ELG); ii) growth-led exports (GLE); import-led growth (ILG); iv) growth-led imports (GLI).

In the years prior to the First World War we find evidence for ILG and GLE, triggered by substantial imports of capital goods and foreign technology that played a decisive role in propelling the productivity growth of the domestic economy. Conversely, for the post-Second World War period we have first of all a strong bidirectionality between imports and exports which was probably a consequence of the growing of intra-industry trade. We find also a weak support for both ELG and GLI which suggests that exports were not the only or the pre-eminent driver of Italy's economic growth. There was probably a multiplicity of factors at work; in particular, Italy's high rates of capital formation and the expansion of the internal demand must have played an important role in prompting economic growth.

This paper is organised as follows. After this Introduction, section 2 presents the source ad data that we have used in our analysis. Section 3 illustrates the evolution of Italian exports and imports from Unification to 2004. Section 4 estimates an econometric model to study the relationship between real exports, real imports and real GDP in Italy from 1863 to 2004 which makes use of cointegration analysis and causality tests. Section 5 concludes, while the Appendix reports further econometric evidence.

2. Sources and data

In 1957, Italy's Central Statistics Institute (Istat) published annual estimates of the country's historical national accounts for the period 1861-1956 [41]. These estimates included a detailed reconstruction of both production side and expenditure side at current prices, and of the latter alone at constant (1938) prices; 1938-price product series were also provided for core agriculture (cultivation and herding) and for manufacturing industry. However, this work lacked key series (such as output by sector at constant prices), details on methodology and sources, and an appropriate degree of scepticism about official statistical sources [33].

A first attempt to improve on the Istat estimates was made a decade later by a team of scholars led by the economist Giorgio Fuà. The team's contributions included estimates of value added by sector at constant (1938) prices, implicit deflators by sector and use, and the creation of a comprehensive series on the capital stock from 1881 onwards [42, 43, 44, 45]. Yet, the Fuà team did not attempt to rebuild the core of the work by Istat: the estimates of value added at current prices. For this reason many scholars, troubled by flaws in the original data, remained unconvinced by this revision (henceforth referred to as the Istat-Fuà series).

Anyway, in the absence of any other estimates of Italy's national accounts, the Istat-Fuà series were included in all international collections of historical statistics.[2] Meanwhile, some scholars started to present new revised series for individual sectors and industries. Fenoaltea [47, 48, 49, 50, 51, 52, 53] built new estimates of industrial production for the 1861-1913 period, while a separate index of industrial production from 1861 to 1980 was put together by Carreras [54, 55, 56].

[2] See, for example, Mitchell [46].

In 1991 Maddison [57] presented a new estimate of Italy's GDP. Maddison used Istat-Fuà series for agriculture and services and industrial series by Fenoaltea. In this fashion Maddison noticeably increased the overall growth rate of Italy's GDP: his series increases between 1861 and 1913 by a factor of 2.5, against just 2.1 for the Istat-Fuà estimates. Nonetheless, this series remained dominated by the Istat components, and apart from a trend correction its path remains extremely close to that of the Istat-Fuà aggregate.

The criticism of the Istat-Fuà series was so widely accepted that an overhaul of the historical accounts was among the projects sponsored by the Bank of Italy in view of its centenary in 1993. The Bank of Italy's project led initially to the re-estimation of aggregate product at current prices in 1911 [58]. These estimates were retouched almost a decade later, when parallel current-price estimates were compiled for 1891, 1938, and 1951 [59].

The Bank of Italy's team aimed also at re-estimating the time series of agricultural, industrial and service production. As this part of the project was not carried through, members of the team published independently each from the other the results of their sectoral value-added estimates.

Thus Fenoaltea [53, 60, 61] presented a preliminary index of industrial value added for the years 1861-1913 at 1911 prices, obtained by adding to the numerous sector-specific series he had compiled over the decades a set of preliminary estimates for the remaining sectors. Soon thereafter Federico [62] published his preliminary estimates of agricultural production from 1860 to 1910, again at 1911 prices.

Finally, Fenoaltea [24, 63] presented new estimates of GDP in Italy from 1861 to 1913 at 1911 prices: the first not to recombine the component series of the original Istat-Fuà estimates. The new GDP series incorporated Federico [62] series for agriculture, Fenoaltea [53] series for industry, and a newly derived series for services that extrapolate the Bank of Italy estimates of their value added in 1911 [59].

This new Fenoaltea series is now considered as the more accurate estimate of Italy’s annual GDP for the years from Unification to the eve of the First World War and has been used in some recent empirical works [64, 65]. We also use it in this paper.

Instead, the Istat-Fuà estimates of Italy’s annual GDP for the years from 1914 to 1939 have never been revisited and are at present the only data available on that period. So we use them in this paper in the version published by Ercolani [42].

After 1957, Istat updated its current GDP estimates to account for the so-called grey markets, that is, economic activities that were not recorded in official data. However, Istat tied them in with its previous series back only to 1970. Fortunately, Golinelli and Monterastelli [66] produced a coherent series of national income data from 1951 to 1989, based on the more recent Istat revisions available at that time.

Thus, for the period after 1951, we use the GDP data provided by Golinelli and Monterastelli for the years from 1951 to 1969, and Istat’s more recent estimates for the years from 1970 to 2004. Our analysis stops in 2004 as since 2005 Istat changed the methodology it used to calculate real GDP by passing from fixed-base to chain indexes. Data are in 1990 prices.[3]

As to the data on imports and exports, for the period from 1863 to 1939 we use the series of new comprehensive statistics of the Bank of Italy that is based on the very detailed official sources of Italy’s foreign trade (*Movimento commerciale del Regno d’Italia*) [68].[4] This series constitutes the new official statistics of Italy’s foreign trade for the period prior to the Second World War. This

[3] Italy’s GDP data at 1990s prices from 1951 to 1996 are published in Di Palma and Carlucci [67]. For the years from 1997 to 2004 we have relied on Istat’s official publication *Annuario statistico italiano*.

[4] More in general, on the reliability of foreign trade statistics for the period prior to the First World War, see Federico and Tena [69].

new source calculates real imports and real exports by using a specific deflator for tradable goods which is different from the GDP deflator that is used in the Istat-Fuà series.[5]

For the period from 1951 to 2004 data on real imports and real exports are taken from OEEC, *Foreign trade series*, for the years 1951-1961, and from United Nations, *UN Comtrade*, for the period from 1962 to 2004. Also in this case a specific deflator for tradable goods is used.

Finally, as no reliable data on Italy's trade are available for the 1940-1950 years, this period has been omitted from the analysis. Thus, this paper tests the relationship between export, import and GDP growth for Italy by focusing on two separate time spans: 1863-1939 and 1951-2004.

3. The evolution of Italian exports and imports

Italy's trade balance was negative after Unification, improved in the early 1870s and then stayed negative uninterruptly until 1939 with wide fluctuations from one year to another (see Figure 1). The annual rate of growth of exports during the 50 years after Unification was of the order of 3.1 per cent, while that of imports was equal to 2.7 per cent. There were two cycles of expansion of exports during this period: 1867-76, with a growth rate of 3.7 per cent, and 1895-1912, with a growth rate of 4.5 per cent; in between these two cycles, there were 20 years in which the situation remained more or less stagnant, with a decline in exports after the outbreak of the trade war with France in 1888 [1, 71].

As expected, given its low level of development, Italy exported mainly primary products, which represented about 85 per cent total exports. Among them, raw silk stood out with about one third of total exports. However, trends on imports do not tally with the view of a typical backward country that imported mostly manufactures. Its poor resource endowment forced Italy to import a lot of

[5] Preliminary data drawn from these series have been used in Federico and Vasta [65]; Vasta [70]; Federico and Wolf [71].

primary products: manufactures accounted for almost 40 per cent of imports and their share on total imports fluctuated around this level for more than a century, which clearly contributed early on to the country's negative trade balance [70, 71].

The 20 years or so that preceded the First World War saw the beginning of a change in the composition of Italian exports. In fact, on the eve of the war the share of primary products had fallen to 64 percent and, within them, raw silk had dropped to 18 per cent. Conversely, the share of manufactures had risen from 15 per cent in 1861 to 36 per cent in 1913: among them, textiles (silk fabrics and cotton fabrics) and transport equipment stood out [70].

A closer analysis of both imports and exports shows just how much the productive structure of the country changed during this period. In 1886, Italy still imported substantial amounts of linen yarn and cotton cloth; by 1913 these imports had completely disappeared, and instead Italy had become a net exporter of cotton yarns and finished fabrics (equal to 9 per cent of total exports). Similarly, imports of woollen textiles fell by nearly 50 per cent during the same period, and the country slowly began to export woollen products. Finally, exports of metallurgical and engineering products were non-existent in 1886 and had only begun to emerge by 1913. Imports, on the other hand, were very substantial and rising continually [1].

Italy imported substantial amounts of foreign technology, both as patents and embodied in machinery. Imported equipment dominated some markets (cotton spinning machinery until the 1920s) while in others, such as steam boilers before 1910, imports provided the more advanced types of equipment (for example, multi tubular boilers) while domestic firms supplied the less sophisticated models. In some industries a process of import substitution was triggered by the passage from free trade to protectionism in 1887. Thus, locomotives bought from Italian producers rose from 18 per cent of the total in the 1861-64 period to 77 per cent in the years 1905-14, while the electromechanical industry, which was nearly non existent at the beginning of the 1890s, was able to supply some 40 per cent of internal demand just before the First World War. [72, 73, 74, 75, 76].

The ratio of real exports to real GDP was just above 5 per cent in 1863. In the following 20 years it showed many ups and downs within a general trend of growth which led it to reach 8.4 per cent in 1883 (see Figure 2). Then a swing brought it down to 6.5 per cent in 1890. Since 1891 it returned to grow and reached 11 per cent in 1906, a value around which it remained until the outbreak of the First World War. As Italy faced a permanent trade deficit, the ratio of imports to GDP was constantly higher. A 13 per cent peak was reached in 1887, which was followed by a sharp decline after the outbreak of the trade war with France. Only in 1907 the ratio of imports to GDP returned to the 1887 level and reached a new 16 per cent peak in 1912. So, due the level and composition of Italy's trade, in the period prior to the First World War we can hardly expect to find ELG, while a more open scenario can be envisaged for both the ILG and GLE hypotheses.

During the First World War, exports more than halved since all available resources were mobilised for the war effort, while imports continued to grow thanks to the supplies Italy received from its allies [77]. Once the post-war re-conversion was completed in the early 1920s, exports recovered quickly and reached a peak in 1929 when they accounted for 12 per cent of national output.

International trade collapsed in the 1930s as a consequence of the Great Depression and a return to protectionism became a generalized practice all over in the world. The Italian depression was comparable to that of the other major industrialized countries and was the combined result of the contraction in world demand and the restrictive monetary policies followed by the Italian government in adherence to the rules of the Gold Standard. Italy's trade was severely affected by these events and both exports and imports slumped between 1929 and 1932. Even though almost all countries underwent a recovery after 1932, Italy's trade continued to decrease in both absolute terms and as a share of the GDP, probably because of the protectionist measures adopted by all countries. The fall in trade led to a drastic reduction in trade deficit in the second half of the 1930s [78].

The fall in the degree of trade openness of the Italian economy during the crisis was also a consequence of the autarky policy the fascist government adopted to reduce the nation's trade deficit. In 1925 Mussolini launched the "battle for wheat": the goal was to make the nation self-sufficient in the production of wheat despite most agricultural experts held that Italy had increasingly to specialize in the cultivation of exportable products to finance to imports of wheat, since so much Italian farmland was considered to be unsuitable for cereal production. Then, in the early 1930s protectionist measures were strengthened with the introduction of higher tariffs on all goods, quotas and a compulsory governmental import permit [1, 75].

The years between the two world wars saw a change in the composition of Italian exports: natural silk products plummeted and their place was taken by artificial silk. More generally, the share of primary products on total exports significantly decreased and on the eve of the Second World War they had been superseded by manufactures, especially textiles [70].

Anyway, the increasing divergence between the dynamics of Italy's trade and GDP during the First World War and in the 1930s makes us hardly believe to even find cointegration between export, import and economic growth in the years from 1914 to 1939.

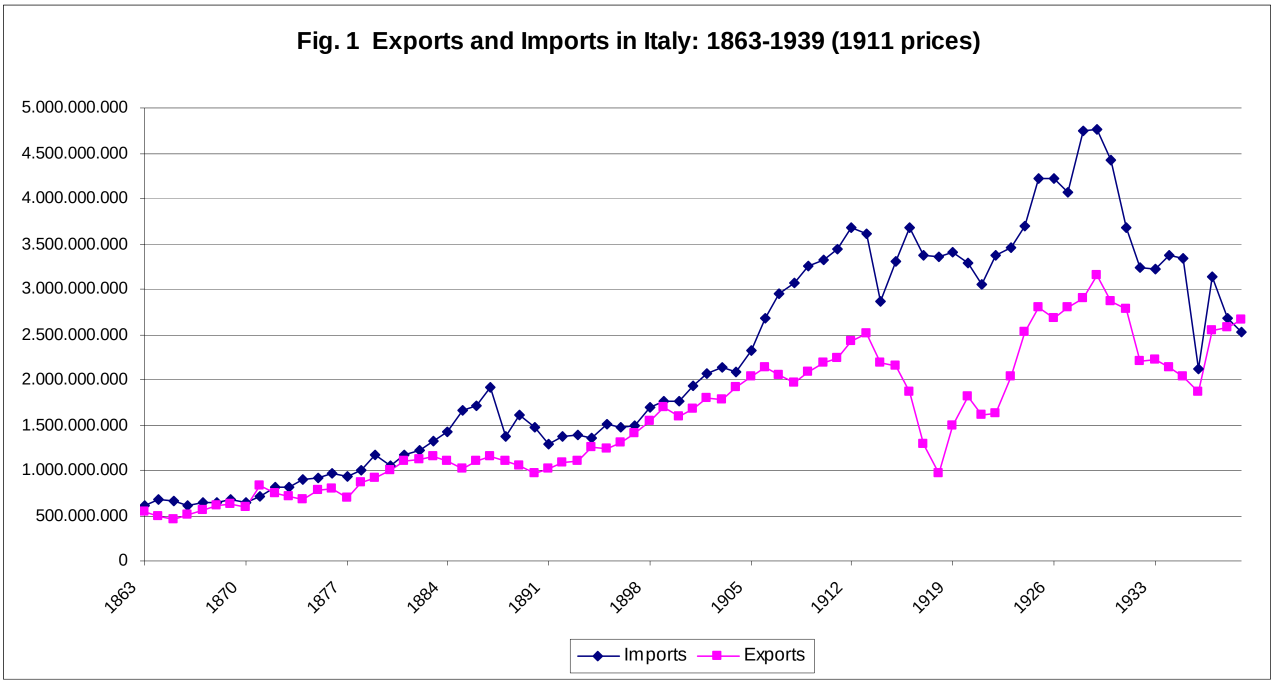
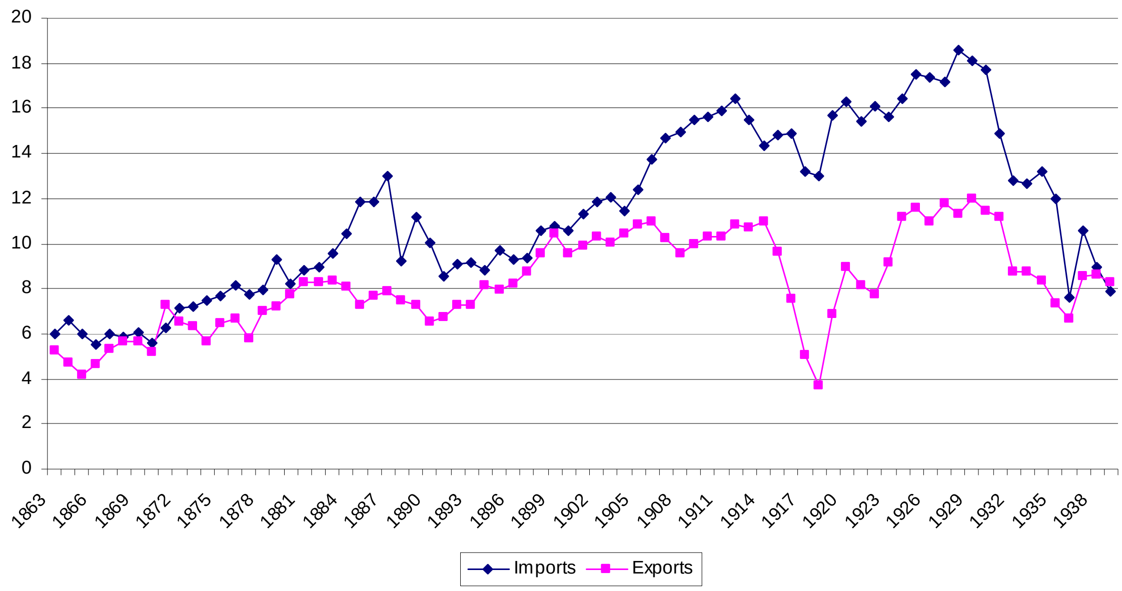


Fig. 2 Ratio of imports to GDP and exports to GDP in Italy: 1863-1939



After the Second World War, Italy drastically changed its trade policy by breaking with protectionism and opting for trade liberalization. In 1951 Italy was the first country in the OECD to abolish all quotas on imports. In the same year, Italy took a decisive step towards trade liberalization by joining the European Community for Steel and Coal. In 1957 Italy was one of the founding states of the EEC, which opened up the European market to Italian exports [20, 75].

Trade liberalization laid the basis for an impressive and long-lasting growth of both Italian real exports and imports from the 1950s onwards (see Figure 3). From 1951 to 2001 real exports grew at a staggering average rate of 8.1 per cent year. This long phase of growth of Italian exports seems to have come to an end at the beginning of the 21st century and since 2002 the 2001 peak was no longer reached. Conversely, the annual growth rate of real imports was equal to 7.3 per cent. Since the early 1990s real exports constantly exceeded real imports.

Over the 1951-2001 period both real exports and imports grew much faster than national output and this had the consequence of progressively enhancing the openness of the whole economy (see

Figure 4).[6] It is worth noticing that in the immediate post-Second World War years the ratio of real exports and real imports to real GDP was much lower not only than the late 1920s peak, but also than that of the 1930s.[7] In fact, in 1951 real exports accounted only for 4 per cent of Italy's real GDP and real imports for 5 per cent, for a total degree of trade openness of 9 per cent. The pre-Second World War peaks were crossed only in 1969 for exports and in 1991 for imports. In the following years, the weight of real exports and real imports on real GDP continued to grow principally as a consequence of a significant increase in intra-industry trade and reached new peaks of 30 per cent and 26 per cent respectively at the beginning of the 21st century [71].

After the Second World War, the change in composition of exports resumed, and continued steadily up to the early years of the 21st century, when manufactures exceeded nine-tenths of total exports. The "Golden Age" featured a shift in specialization from textiles to engineering products. Since the mid-1970s Italian exports became polarized in two categories, the first one pertaining to the sectors of the "Made in Italy" (which includes personal and household goods such as textiles, clothing, leather, footwear, wood, tiles, furniture, jewellery, cosmetics, musical instruments, toys and sports items), and the second one to some specialized engineering products (mostly machinery to make "Made in Italy" goods) [70, 71].

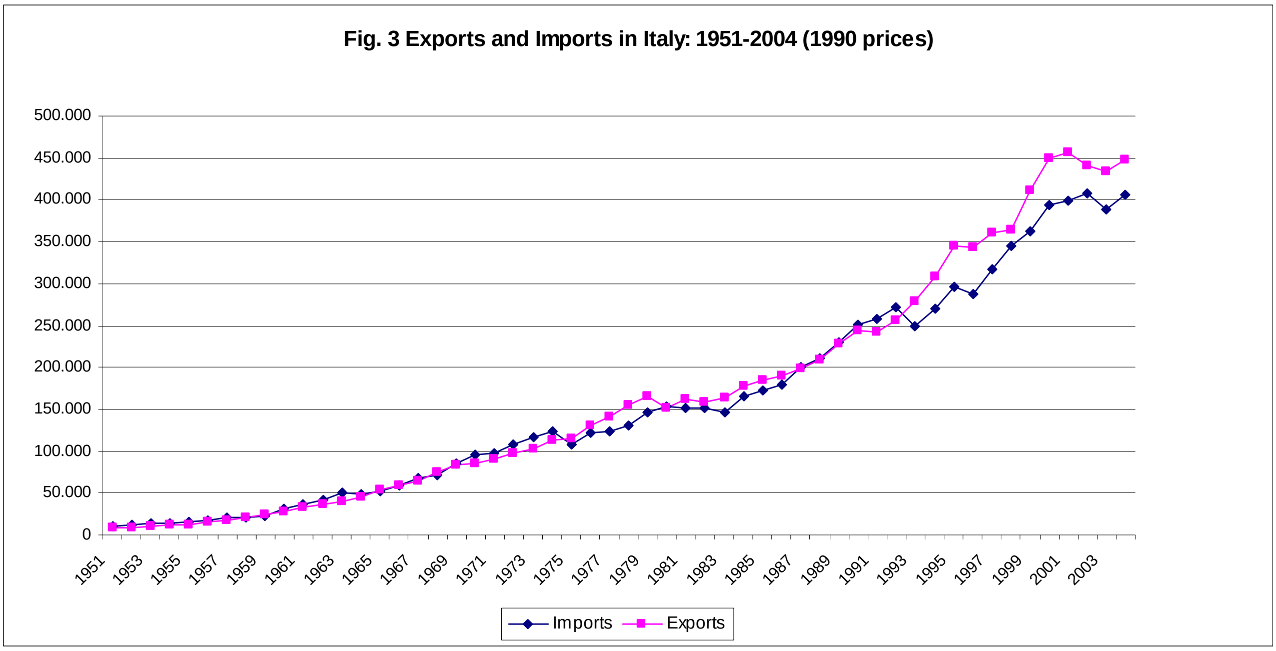
Also the imports of manufactures boomed after the Second World War. In particular, starting from the late 1980s Italy has become a net importer road vehicles, chemicals and high-tech products such as computers, office machinery and other ICT equipment [71].

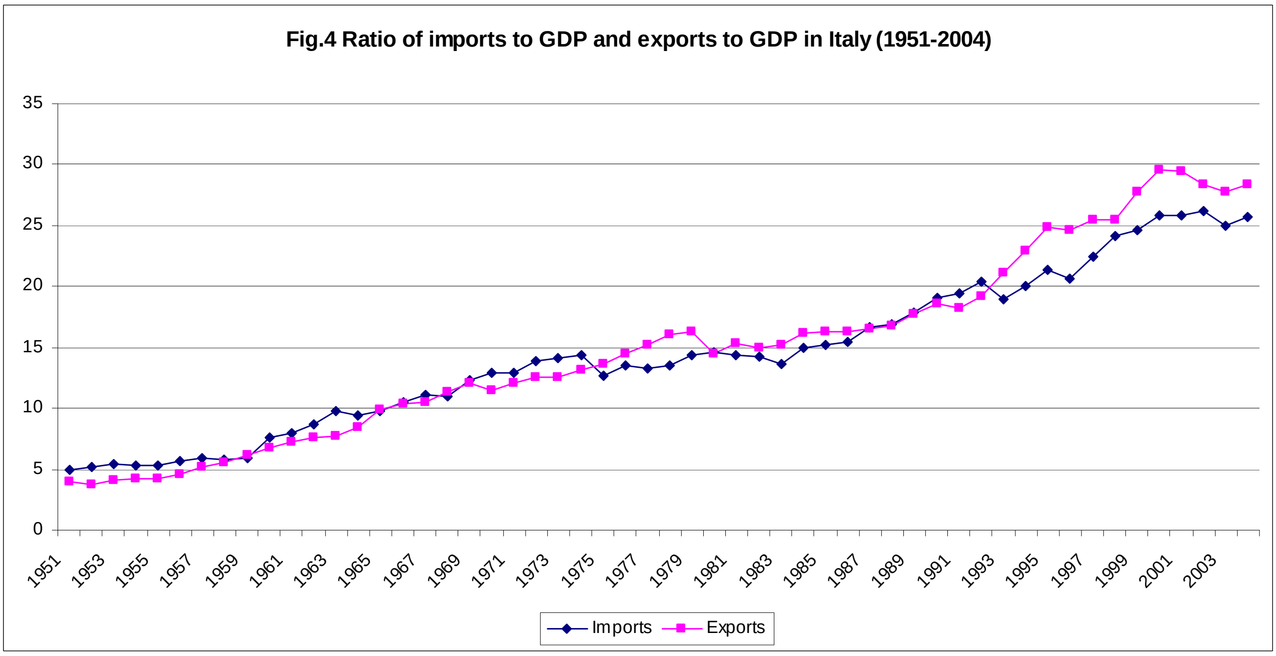
The staggering export growth – which exceeded that of imports – and the change in the composition of exports with an increasing share of high-productivity manufactures and capital goods makes us

[6] An economy's degree of trade openness is the ratio of total merchandise trade (imports plus exports) to GDP.

[7] Of course, our data on the share of exports to GDP are affected by the fact that we calculated real exports by using a specific deflator for export goods which was different from the GDP deflator. If the exports and imports to GDP ratios had been calculated at current prices – as it was commonly the case in the literature [71, 77, 79] – for the year 1951 they would have amounted to about 11 per cent and 13 per cent respectively.

expect to find evidence for ELG and GLI. We also predict bidirectionality between export and import growth as a consequence of the increasing intra-industry trade.





4. The Empirical Model

The nexus between the degree of trade openness and GDP growth is a long run relationship whose analysis requires techniques appropriate for estimating long run equilibrium. A statistical test of a long run relationship must take into account the characteristics of time series data involved in the analysis, in our case imports, exports and GDP. These data should be tested for comovement over time prior to test for causality between them. Hence, in this section, by adopting a time series approach, we test if Italian real export, real import and real GDP are cointegrated, then if unidirectional Granger causality exists, in other word if the ELG,[8] GLE,[9] ILG,[10] GLI[11] hypotheses are supported by available data for Italy.

4.1. Granger causality and cointegration

[8] Export growth can lead economic growth because: i) it directly increases the aggregate demand and then real output; ii) by loosening the foreign exchange constraint, it makes easier to import inputs that meet domestic demand, and so enables output expansion; iii) it may promote the reallocation of resources from low productivity non-export to high productivity export sectors; higher productivity may in turn lead to output growth; iv) it may promote the diffusion of technical knowledge and enhance efficiency through the international competition; v) it may allow the exploitation of scale economies if domestic markets are too small for optimal scale [80, 81, 82, 83, 84, 85, 86].

[9] Economic growth can lead export growth because: i) it leads to enhancement of skills and technology, with this increased efficiency creating a comparative advantage for the country that facilitates exports; ii) it enables the realization of scale economies which in turn prompt export growth [87, 88, 89].

[10] Import growth can lead economic growth because: i) it stimulates innovation by reducing the monopolist profits derived from not innovating; ii) it improves productivity by increasing the variety of intermediates for domestic firms; iii) it provides domestic firms with access to technologies that are embodied in foreign capital goods that are not available domestically; iv) it stimulates emulation in domestic competing firms [86, 90, 91, 92].

[11] The theretical foundation of growth-led imports is in the Keynesian macroeconomic model that sees imports as a function of GDP.

In the case of time series data a test for the direction of causation is suggested by Granger [93]. For simplicity, Equations (1) to (4) present the testing strategy for the bivariate case. A variable X improves the prediction of a variable Y, that is X Granger causes Y, if current Y can be predicted better by using past values of X than by not doing so, given that all other past information in the information set is used. Suppose X and Y are linear *covariance stationary* time series.[12] Thus X and Y can be written as follows:

(1) $$X_t = \sum_{i=1}^{m} a_i X_{t-i} + \sum_{j=1}^{n} b_j Y_{t-j} + \varepsilon_t$$

(2) $$Y_t = \sum_{i=1}^{m} c_i Y_{t-i} + \sum_{j=1}^{n} d_j X_{t-j} + u_t$$

where ε_t, u_t are zero mean and finite covariance matrix random vector. The *causality test* is

a) X causes Y if $H_0 : d_j = 0, j = 1,...,n$ is rejected

b) Y causes X if $H_0 : b_j = 0, j = 1,...,n$ is rejected

[12] Time series are said to be covariance stationary if their moments up to the second order do not depend on time. Hence, for instance the mean must be constant and the shocks affecting stationary series have only temporary effects. These time series are also said I(0). By contrast a series is said to be difference stationary if its first difference is stationary but the series itself is not. A property of difference stationary series is that they do not have necessarily constant means and the variance grows with time without limit, moreover the shocks affecting them are permanent. These series are also said I(1).

Bidirectional causality occurs if both (a) and (b) hold. Unidirectional causality from X to Y occurs if (a) holds but (b) does not. In order to test these null hypothesis in (a) and (b), F statistics are calculated for jointly significance of the d_j in equation (1) and for b_j in equation (2).

For the Granger causation test, the hypothesis of covariance stationarity of the time series used is crucial to avoid spurious results. In general, the levels of the time series are not covariance stationary while their first difference are stationary. The growth rate of these variables (ΔX and ΔY) are stationary, while X and Y are not. If these are the statistical properties of the variables, we can only test for Granger causation by using first difference stationary models, that is

$$(3)\ \Delta X_t = \sum_{i=1}^{m} a_i \Delta X_{t-i} + \sum_{j=1}^{n} b_j \Delta Y_{t-j} + \varepsilon_t$$

$$(4)\ \Delta Y_t = \sum_{i=1}^{m} c_i \Delta Y_{t-i} + \sum_{j=1}^{n} d_j \Delta X_{t-j} + u_t$$

However, the nexus among macroeconomic variables may be a long run relationship. If this long run nexus exists but we do not include it in the estimation of model (3) and (4) we have mis-specification and "spurious causality". Hence, we have to test for Granger causation, to take into account the possible long run relationship among *the levels (values)* of exports, imports and GDP and not only among the short run dynamics of export, import and GDP growth. Granger type causality tests for a long run relationship are valid if the relevant variables are found to be *cointegrated*, that is they move together so closely over the long run that they share a stochastic (and possibly also deterministic) trend in common. In this latter case, as stressed by Granger [94], there is a presumption for causality to run in at least one direction.

Suppose X is the Italian real exports (*in logs*), Z the Italian real imports *(in logs)* and Y is the Italian real GDP (*in logs*). Moreover suppose these series are not covariance stationary, but they are cointegrated co-moving over time. In this case a three variables generalization of the Granger causality test, as in point (a) and (b) stated before, must be performed on the following ECM models:

$$(5) \qquad \Delta X_t = \sum_{i=1}^{m} a_i \Delta X_{t-i} + \sum_{j=1}^{n} b_j \Delta Y_{t-j} + \sum_{k=1}^{K} e_k \Delta Z_{t-k} + \delta ECT_{t-1} + \varepsilon_t$$

$$(6) \qquad \Delta Y_t = \sum_{i=1}^{m} c_i \Delta Y_{t-i} + \sum_{j=1}^{n} d_j \Delta X_{t-j} + \sum_{k=1}^{K} f_k \Delta Z_{t-k} + \delta ECT_{t-1} + \varepsilon_t$$

$$(7) \qquad \Delta Z_t = \sum_{i=1}^{m} g_i \Delta Z_{t-i} + \sum_{j=1}^{n} h_j \Delta Y_{t-j} + \sum_{k=1}^{K} l_k \Delta X_{t-k} + \lambda ECT_{t-1} + \eta_t$$

where ECT is the error correction term derived by cointegration analysis representing the long run equilibrium among the variables.

To conclude, the causality testing procedure involves three steps. The first step is to test if real exports (in logs), real imports (in logs) and real GDP (in logs) are not covariance stationary (*integration analysis*). If the variables are not stationary, the second step is to *test for cointegration* using Johansen [95] multivariate procedure to check for a common trend. As shown by Kremers *et al*. [96] this procedure is currently the most reliable test for common trends. Finally, if cointegration exists, then either unidirectional or bidirectional *Granger causality* must exist in at least the stationary variables and causality F-test must be performed on the ECM models above.

4.2. Integration and cointegration analysis

Before testing for causality we check for stationarity by using Dickey Fuller tests (ADF) for the levels and first differences of the variables. We also use tests with stationarity as null (KPSS test) to confirm the results of the usual Dickey Fuller tests of non stationarity. If both reject their nulls then we have no confirmation, but if test ADF rejects the null but test KPSS does not (or viceversa) we have confirmation (see Table 1).

Table 1 – Tests and confirmation analysis

Test ADF (Dickey Fuller)*	Test KPSS**
$H_0 : y_t$ non stationary series (unit root)	$H_0 : y_t$ stationary series (no unit root)
$H1 : y_t$ stationary series	$H1 : y_t$ non stationary series (unit root)

Notes: * see Dickey Fuller [97]. ** see Kwiatkowski, Phillips, Schmidt and Shin [98].

The results of the ADF tests and KPSS tests are reported in Tables A1 and A2 in the Appendix. As shown in these Tables, for real exports, real imports and real GDP *in levels*, stationarity is rejected with different KPSS window sizes and the non stationarity is not rejected with different lags of the ADF. For the *first differences* of the variables the vice-versa holds. We conclude that real exports, real imports and real GDP are non stationary series, while their growth rates are stationary both for the period 1863-1939 and the period 1951-2004.

The next step is to test for cointegration to check for a common trend in export, import and GDP. The Johansen's maximum likelihood method [95], using the Maximum Eingenvalue and Trace statistics, finds no cointegration on the period 1863-1939, while it suggests a significant long run relationship between real exports, real imports and real GDP on the sub-sample 1863-1913, that is excluding the years of the First World War and of the collapse of international trade in the 1930s. Cointegration is also the outcome for the period 1951-2004. Such results are robust to varying the length of the model. The statistics of Johansen's cointegration analysis for a VAR with three lags are presented in Table 2, as suggested by information criteria.

Table 2 – The results of Johansen's cointegration procedure (maximum lag in the VAR =3). Variables included in the cointegrating space: Real GDP, real import and real export *(logs)*

		1863-1939		
Rank	Eigenvalues	Statistics: Trace	Statistics: λ-max	***Conclusion***
0	0.23	27.08	19.48	
1	0.07	7.60	5.96	No cointegration:
2	0.02	1.64	1.64	No long run equilibrium
		1863-1913		
Rank	Eigenvalues	Statistics: Trace	Statistics: λ-max	***Conclusion***
0	0.42	40.37*	26.06*	
1	0.20	14.30	11.03	Cointegration:
2	0.06	3.29	3.29	A long run equilibrium exists
		1951 – 2004		
Rank	Eigenvalues	Statistics: Trace	Statistics: λ-max	***Conclusion***
0	0.45	44.84*	31.87*	
1	0.19	12.96	11.27	Cointegration:
2	0.032	1.69	1.69	A long run equilibrium exists

Notes: The variables under consideration seem to follow a linear trend then we use a VAR with any restriction on the constant. Critical values for this case in Osterwald-Lenun [99: Table 1.1*, unrestricted constant). The 95% critical values for Trace are: 31.52, 17.95 and 8.18, while for λ-max are: 21.07, 14.90 and 8.18. An asterisk indicates significance at the 5% level. The statistics are from a VAR(3), as suggested by information criteria. However, the results are robust to varying the length of the VAR. In particular, VAR(1) and VAR(2) produces the same conclusion.

If cointegration is rejected, suggesting no long run comovements among exports, imports and GDP in the period 1914-1939, it may be possible to analyse short run comovements among these variables and test for Granger causation by using the first difference stationary models (3) and (4). However, the turmoil due to the First World War and to the consequences of the Great Depression in the 1930s induced parameter instability and some significant structural breaks in the time series.[13] Because of this parameter instability we do not perform causality tests on the period 1863-1913.

Instead, if exports, imports and GDP are cointegrated, Granger causality test must be performed on the coefficients of VECM models as described by equations (5), (6) and (7) above. In our case,

[13] QLR test for a break at unknown date on models (3) and (4) suggest a significant break in 1917 and in 1920. The outcome for the QLR statistics is: F(4,17) = 5.98 for 1917 and F(4,17) = 4.96 for 1920. In both cases the null of no break is rejected. Critical values in Andrew [100].

three ECM models with two lags are estimated and the results of the F-statistics are presented in Tables 3 and 4. The casual inference in the latter column of these Tables summarizes the results.

In the period 1863-1913 there is strong evidence ILG and GLE, that is import growth causes GDP growth and the latter in turn causes export growth. For the 1951-2004 period the most statistically significant evidence is the strong bidirectionality between imports and exports. Here we find a weak confirmation for the ELG hypothesis (but only at the 10 per cent significance level) and also a weak GLI nexus (also only at the 10 per cent significance level).

Table 3 – Granger causality tests: *1863-1913*

ECM models (from equations 5, 6, 7)	**F test**	**Results**	**Conclusion**
GDP growth (Y) on Export growth (X)…	F (2,40) = 0.31 p-value = 0.70	Fail to reject H_0	GDP causes Export
Export growth (Y) on GDP growth (X)…	F (2,40) = 3.41 p-value = 0.04	Reject H_0	
GDP growth (Y) on import growth (X)…	F (2,40) = 2.75 p-value = 0.06	Reject H_0	Import causes GDP
Import growth (Y) on GDP growth (X)…	F (2,40) = 0.22 p-value = 0.79	Fail to reject H_0	
Import growth (Y) on Export growth (X)…	F (2,40) = 2.06 p-value = 0.14	Fail to reject H_0	No causal link between exports and imports
Export growth (Y) on Import growth (X)…	F (2,40) = 0.66 p-value = 0.50	Fail to reject H_0	

Notes: H_0 is the null that X does not cause Y. The statistics are from a VECM(2), because the cointegration analysis is based on a VAR(3). The results are robust to varying the length of the VECM. In each ECM model, all the variables (real GDP growth, real Export growth and real import growth) are included performing the Granger causation tests. *Weakly* indicates that the results are obtained by the rejection of a null hypothesis at the 10% significance level.

Table 4 – Granger causality tests: *1951-2004*

ECM models (from equations 5, 6, 7)	**F test**	**Results**	**Conclusion**
GDP growth (Y) on Export growth (X) …	F(1, 48)= 3.46 p-value = 0.06	Reject H_0	Export *weakly* causes GDP
Export growth (Y) on GDP growth (X)…	F(1, 48)= 2.18 p-value = 0.14	Fail to reject H_0	
GDP growth (Y) on import growth (X)…	F(1, 48)= 1.57 p-value = 0.21	Fail to reject H_0	GDP *weakly* causes Import
Import growth (Y) on GDP growth (X)…	F(2, 44)= 3.24 p-value = 0.07	Reject H_0	
Import growth (Y) on Export growth (X)…	F(1, 48)= 6.14 p-value = 0.016	Reject H_0	Bidirectionality
Export growth (Y) on Import growth (X)...	F(1, 48)= 4.14 p-value = 0.04	Reject H_0	

Notes: H_0 is the null that X does not cause Y. The statistics are from a VECM(1), because the cointegration analysis is based on a VAR(2). The ELG result is robust to varying the length of the VECM. In each ECM model, all the variables (real GDP growth, real Export growth and real import growth) are included performing the Granger causation tests. *Weakly* indicates that the results are obtained by the rejection of a null hypothesis at the 10% significance level.

4.3. Interpretation of the econometric results

On the basis of our econometric test we conclude that Italian real exports, real imports and real GDP are cointegrated in the periods 1863-1913 and 1951-2004 and therefore casually related. In particular, in the years prior to the First World War we find an unidirectional Granger-causality from real imports to real GDP and from the latter to real exports.[14]

Thus, our evidence discard the ELG hypothesis for the 50 years from Unification to the First World War. As we have shown in Section 3, at that time the size of the exporting sector of the Italian economy was too small and did not grow fast enough to trigger ELG. Moreover, the leading exporting sectors were those that produced primary goods – especially raw silk – which were not sophisticated enough to generate those technological spillovers that could translate into higher innovation capacity and higher productivity growth of the whole domestic economy which could in turn trigger higher GDP growth.[15]

Conversely, in the years prior to the First World War we find evidence for ILG. At that time the ratio of real imports to real GDP was constantly higher than that of real exports and, above all, imports consisted mostly of raw materials (i.e., coal), capital goods and machinery embodying foreign technology that played a decisive role in prompting the productivity growth of the domestic economy.

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[14] Our results are the reverse of those obtained by Thornton's [39] econometric study that finds evidence for ELG for the same period. Such a circumstance is due to the fact that we use new and more accurate estimates of both exports and GDP and, above all, to the different methodologies used to estimate real exports. In fact, Thornton [39] derives not only real GDP but also real exports by using the same GDP deflator, which increases the co-movement of the two aggregates. On the contrary, we derive real exports by using a specific export goods deflator with the consequence of reducing the co-movement of the two variables.

[15] Federico [101] argues that raw silk might have been a leading sector in the smaller state of Lombardy-Veneto prior to Unification but agrees that after 1861 it was too small to lead the growth of the whole Italian economy.

So our results give only a partial support to the Bonelli-Cafagna model, which is limited to ILG. In fact, ILG is consistent with the Bonelli-Cafagna contention that imports of foreign technology and capital goods were the driver of Italy's productivity growth. Conversely, the absence of bidirectionality between export and import growth and our evidence for GLE are not consistent with the model's claim that low-productivity primary goods exports finance productivity-enhancing imports and therefore function as a constraint on economic growth.

Our evidence seems more in line with Fenoaltea's model that links Italy's economic growth to international capital inflows. All our results (ILG, GLE, absence of bidirectionality between export and import growth) are consistent with Fenoaltea's contention: the decisions of international investors boosted investments in industry and infrastructures in Italy which relied to a large extent on the imports of foreign technology and goods. More modern plants, higher production capacity and higher productivity of the domestic economy in turn prompted Italy's capacity to export. GLE in that period was fostered by Italy's tariff policy: by taxing imports Italy expanded domestic production for the home market and prompted import-substitution in capital intensive sectors. GDP growth and a larger domestic market enabled Italian firms to realize scale economies. Italian firms could gain the competitive edge and cost advantage in some products and so entered the world market thereby triggering GLE.

The results for the post-Second World War period are more intriguing and complex to interpret. As we have seen, the most significant evidence is a strong bidirectionality between imports and exports, which is a consequence of the increasing intra-industry trade. We find also a weak support for the ELG and GLI hypotheses. The impression is that a multiplicity of factors was at work, which does not support the thesis that export growth was the only or the main engine of Italy's economic growth for the whole or most of the post-Second World War period. The increasing openness of the Italian economy certainly was certainly an important driver that prompted economic efficiency and shifted resources from low- to high-productivity sectors. The higher and increasing real exports to real GDP ratio together with a change in the composition of Italian exports, with a strong rise of the share of mechanical engineering and capital goods that could more easily generate those technological spillovers that spread throughout the economy and translated into a higher overall economic growth, give support to the ELG thesis.[16] However, we must also stress that – due to the surging intra-industry trade – exports had a higher import content and so imports were a powerful driver for export growth as well.

Anyway, as we have only a weak support for ELG, it is plausible there have been some other factors – in addition to export growth – at work that propelled economic growth. This points to the expansion of the internal demand and above all – as stressed by the more recent historiography [31, 32, 33]– to Italy's high rates of capital formation for most of the second half of the 20th century that pushed up domestic productivity growth and GDP expansion.

5. Conclusions

This paper has investigated the causal relationship between real exports, real imports and real GDP in Italy from 1863 to 2004 by using cointegration analysis and causality tests.

The outcome suggests that in the period 1863-1913 there is strong evidence for ILG and GLE, that is import growth caused GDP growth and the latter in turn caused export growth. For the 1951-2004 we find a strong bidirectionality between imports and exports, while there is also a weak support for ELG and GLI. For the years from 1914 to 1939 we find no long run relationship between export and economic growth, as a consequence of the fall of Italian exports during the First World War and of the collapse of both the world's and Italy's trade in the 1930s.

This paper only partially supports the Bonelli-Cafagna model. On the one hand, ILG is consistent with the Bonelli-Cafagna contention that imports of foreign technology and capital goods were the

[16] This evidence is in line with Hausman *et al.* [102] who found a positive relation between an index of export sophistication, which capture the quality of exported goods, and the rate of GDP growth.

driver of Italy's productivity growth. On the other hand, the absence of bidirectionality between export and import growth and GLE do not confirm the Bonelli-Cafagna claim that exports of low-productivity primary goods financed productivity-enhancing imports and therefore constrained economic growth.

Converesely, all our results (ILG, GLE, absence of bidirectionality between export and import growth) support Fenoaltea's contention that links Italy's economic growth to international capital inflows which boosted investments in industry and infrastructures. More modern plants, higher production capacity and higher productivity of the domestic economy in turn prompted Italy's exports.

For the post-Second World War period we find a strong bidirectionality between imports and exports, due to the increasing intra-industry trade. We find also a weak support for ELG and GLI. The impression is that a multiplicity of factors was at work. The increasing openness of the Italian economy – due principally to European integration – prompted economic efficiency and shifted resources from low- to high-productivity sectors, and the change in the composition of Italian exports, which became increasingly specialized in mechanical engineering products and capital goods that could generate technological spillovers that spread throughout the economy and prompt higher overall economic growth, support the ELG thesis.

However, as we find only a weak confirmation for the ELG hypothesis, it is plausible that also some other factors fostered economic growth. The expansion of internal demand and, above all, Italy's high rates of capital formation for most of the second half of the 20th century probably played a paramount role in this respect.

Appendix

Tables A1 and A2 in this Appendix show the results of the ADF tests and KPSS tests. In particular, Table A1 summarises the non stationary results for the period 1863-1939, while Table A2 shows the corresponding results for the period 1951-2004. Both ADF and KPSS depend on a parameter (*k* or *w*) which must be chosen in advance depending on the autocorrelation structure of the data: we write ADF(*k*) and KPSS (*w*), where *k* indicates the lags while *w* the window sizes. We apply both ADF and KPSS for different values of *k* and the KPSS for different *w*.

Table A1 – Integration analysis, 1863-1939

Variable (levels): Real GDP (logs)#					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-3.29	Not reject the null of non stationary series	KPSS(0)	0.24	Reject the null of stationary series
ADF(1)	-3.80^	Not reject the null of non stationary series	KPSS(1)	0.14	Reject the null of stationary series
ADF(4)	-2.51	Reject the null of non stationary series	KPSS(4)	0.09	Not reject the null of stationary series
Variable (first differences): Δ Real GDP (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-8.01	Reject the null of non stationary series	KPSS(0)	0.04	Not reject the null of stationary series
ADF(1)	-6.83	Reject the null of non stationary series	KPSS(1)	0.03	Not reject the null of stationary series
ADF(4)	-4.39	Reject the null of non stationary series	KPSS(4)	0.06	Not reject the null of stationary series
Variable (levels): Real Export (logs)#					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-2.62	Not reject the null of non stationary series	KPSS(0)	0.64	Reject the null of stationary series
ADF(1)	-3.10	Not reject the null of non stationary series	KPSS(1)	0.35	Reject the null of stationary series
ADF(4)	-3.52^	Not reject the null of non stationary series	KPSS(4)	0.18	Reject the null of stationary series
Variable (first differences): Δ Export (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-7.95	Reject the null of non stationary series	KPSS(0)	0.05	Not reject the null of stationary series
ADF(1)	-7.09	Reject the null of non stationary series	KPSS(1)	0.05	Not reject the null of stationary series
ADF(4)	-3.61	Reject the null of non stationary series	KPSS(4)	0.06	Not reject the null of stationary series
Variable (levels): Import (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-1.22	Not reject the null of non stationary series	KPSS(0)	0.87	Reject the null of stationary series
ADF(1)	-0.26	Not reject the null of non stationary series	KPSS(1)	0.48	Reject the null of stationary series
ADF(4)	-1.22	Not reject the null of non stationary series	KPSS(4)	0.11	Not reject the null of stationary series
Variable (first differences): Δ Import (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-11.27	Reject the null of non stationary series	KPSS(0)	0.24	Not reject the null of stationary series
ADF(1)	-6.99	Reject the null of non stationary series	KPSS(1)	0.33	Not reject the null of stationary series
ADF(4)	-3.84	Reject the null of non stationary series	KPSS(4)	0.33	Not reject the null of stationary series

Notes: # Model with constant and trend included: the 95% critical values for the ADF tests is -3.5 and the 99% is -4.15. The 95% critical values for the KPSS tests is 0.14. * Model with constant included: the 95% critical values for the ADF tests is -2.93 and for the KPSS tests is 0.46. ^ do not reject the null of non stationary series at the 1% significance level. For the ADF tests see Fuller [103] and for the KPSS tests Kwiatkowski, Phillips, Schmidt and Shin [104].

Table A2 – Integration analysis, 1951-2004

Variable (levels): Real GDP (logs), I(1)					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-2.54	Not reject the null of non stationary series	KPSS(0)	1.39	Reject the null of stationary series
ADF(1)	-1.72	Not reject the null of non stationary series	KPSS(1)	0.68	Reject the null of stationary series
ADF(4)	-2.58	Not reject the null of non stationary series	KPSS(4)	0.30	Reject the null of stationary series
Variable (first differences): ΔReal GDP (logs), I(0)					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-7.27	Reject the null of non stationary series	KPSS(0)	0.12	Not reject the null of stationary series
ADF(1)	-4.95	Reject the null of non stationary series	KPSS(1)	0.11	Not reject the null of stationary series
ADF(4)	-4.40	Reject the null of non stationary series	KPSS(4)	0.13	Not reject the null of stationary series
Variable (levels): Real Export (logs), I(1)					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-1.22	Not reject the null of non stationary series	KPSS(0)	1.22	Reject the null of stationary series
ADF(1)	-0.45	Not reject the null of non stationary series	KPSS(1)	0.63	Reject the null of stationary series
ADF(4)	-2.28	Not reject the null of non stationary series	KPSS(4)	0.28	Reject the null of stationary series
Variable (first differences): ΔExport (logs), I(0)					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-6.75	Reject the null of non stationary series	KPSS(0)	0.11	Not reject the null of stationary series
ADF(1)	-5.02	Reject the null of non stationary series	KPSS(1)	0.11	Not reject the null of stationary series
ADF(4)	-2.51	Not reject the null of non stationary series	KPSS(4)	0.10	Not reject the null of stationary series
Variable (levels): Import (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-1.91	Not reject the null of non stationary series	KPSS(0)	0.33	Reject the null of stationary series
ADF(1)	-1.41	Not reject the null of non stationary series	KPSS(1)	0.62	Reject the null of stationary series
ADF(4)	-1.92	Not reject the null of non stationary series	KPSS(4)	0.27	Reject the null of stationary series
Variable (first differences): ΔImport (logs)*					
Non stationarity tests: ADF			**Stationarity tests: KPSS**		
ADF(0)	-6.58	Reject the null of non stationary series	KPSS(0)	0.80	Reject the null of stationary series
ADF(1)	-4.31	Reject the null of non stationary series	KPSS(1)	1	Reject the null of stationary series
ADF(4)	-2.19	Not reject the null of non stationary series.	KPSS(4)	0.72^	Not Reject the null of stationary series

Notes: # Model with constant and trend included: the 95% critical values for the ADF tests is -3.5 and the 99% is -4.15. The 95% critical values for the KPSS tests is 0.14. * Model with constant included: the 95% critical values for the ADF tests is -2.93 and for the KPSS tests is 0.46. ^ do not reject the null of non stationary series at the 1% significance level. For the ADF tests see Fuller [103] and for the KPSS tests Kwiatkowski, Phillips, Schmidt and Shin [104].

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