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The Fruits of Disaggregation: the Engineering Industry, Tariff Protection, and the Industrial Investment Cycle in Italy, 1861-1913

Stefano Fenoaltea*

Abstract

All the extant interpretations of united Italy's early industrial development focus on the long swing in industrial investment evident in the familiar indices of the engineering industry's aggregate product. Disaggregated production series for that industry have now been compiled. The evidence they incorporate establishes that the long swing that dominates the aggregate was actually in the production of hardware, tied to investment in infrastructure. The production of machinery followed a different path: against the extant literature it shows that tariff hikes were influential, and above all that industry's purchases of (domestic and foreign) equipment grew very steadily decade after decade. Industrial investment did not grow faster than before in the 1880s or over the *belle époque*, it did not follow the long swing at all: the disaggregation of the engineering-industry product series has undercut the empirical premise of sixty years of scholarship.

JEL Classification: E01, N13, N63
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* CESMEP, Department of Economics and Statistics "Cognetti de Martiis," University of Turin.
Email: stefano.fenoaltea@unito.it

O Gods dethroned and deceased, cast forth, wiped out in a day!
Algernon Charles Swinburne, *Hymn to Proserpine*

For mighty were the auxiliars which then stood / Upon our side...
William Wordsworth, *The French Revolution*

1. Introduction[1]

The industrial production series for Italy from Unification to the Great War have long been undergoing revision, industry by industry; the most recent new, disaggregated estimates are those for the engineering industry, essentially the industry that transforms semi-finished metal into final goods (and maintains its characteristic products).[2] These estimates track physical production, and the corresponding value added at 1911 prices; other papers have documented their derivation from the sources, and discussed the pitfalls of measurement at constant prices (Fenoaltea 2015a, 2015b, 2016a). The present paper is concerned not with method but with results, with the new estimates' implications for the literature on post-Unification Italy: implications which run deep, for the evidence the new disaggregated series bring to bear is thoroughly at odds with the stylized facts we all had in mind. It does carry an implicit methodological message, as it suggests that similarly disaggregated estimates may similarly alter long-held views in other contexts as well; but that is part of an argument that has been developed elsewhere (Fenoaltea 2010), and in any case the broader literature is beyond the scope of this paper.

The new estimates concern the engineering industry alone, but it is an industry of particular significance. In the first place, in mere quantitative terms it was one of Italy's largest: by the end of the period at hand on a par with the food industry, far greater than any other branch of manufacturing, and larger even than construction. Like construction (and unlike the food industry), too, the engineering industry produced durable goods, investment goods, and the investment cycle dominated the longer-term fluctuations of the economy as a whole. Second, the engineering industry is at the center of the debate on Italy's tariff policy, and specifically on the wisdom of protecting the metalmaking

[1] The author is grateful for the comments received from the participants at seminars at the Bank of Italy, the Collegio Carlo Alberto, the Scuola Superiore Sant'Anna, the Università di Torino, the Università Commerciale Luigi Bocconi, the Università Politecnica della Marche, and the Université de Genève, and for fruitful discussions with Alberto Baffigi and Paolo Piselli.

[2] Those characteristic products include ships and railway vehicles, even if predominantly of wood. The industry is here defined as in the 1911 Italian censuses (Direzione generale della statistica 1913-16; Id. 1914-16), and corresponds very closely to *ISIC* division 38, "manufacture of fabricated metal products, machinery and equipment" (United Nations 1971). The major difference between the two is in fact in the treatment of maintenance, as the Italian censuses appear consistently to include in the industry the maintenance as well as the new production of its characteristic products, while the *ISIC* oddly includes in it the new production and maintenance of producer durables, but only the new production, and not the maintenance, of consumer durables; but our present concern is with new production alone, and this difference is here immaterial. The other differences are comparatively minor. The Italian censuses exclude from the industry the manufacture of wood carts, carriages, and sleighs (part of *ISIC* group 3849), and wood boats not built in yards (part of 3841), but include the manufacture of metal musical instruments (part of 3902), and knitting needles, pen nibs, and the like (part of 3909); they further include the manufacture of jewelry and related articles (3901), but this activity is here ignored. The present shipbuilding and railway-vehicles industries correspond essentially to *ISIC* groups 3841 and 3842; what is here called "general engineering" is the rest of the industry, spanning fabricated metal and other machinery.

industry, the producer of the engineering industry's raw materials. Third and far from least, the engineering industry produced the very stuff of modernization, the machines that equipped the growing factories: the domestic production of machines, augmented by the corresponding imports, is the most direct evidence we have of the investment that transformed Italy into an (at least partly) industrial nation (Fenoaltea 2011, pp. 38-39, 147-152, and *passim*).

Alexander Gerschenkron taught us, among many other things, to track the product of the ill-documented engineering industry by the aggregate consumption of iron and steel excluding rails (Gerschenkron 1962 [1955]). Gerschenkron himself established that in post-Unification Italy the product of the engineering industry – the "machinery industry," as he also called it, using the two terms interchangeably (Gerschenkron 1955, pp. 369-370) – grew briskly in the 1880s, fell back and recovered in the '90s, and grew again, rapidly, after the turn of the century. Metal consumption pointed to two booms in the production of machinery, in industrial investment; the interpretation of those two upswings, and the related assessment of public policy, would dominate the literature (Fenoaltea 2011, pp. 8-50).

As is well known, Gerschenkron dismissed the growth of the 1880s as a mere cyclical upswing, and identified the upsurge of the *belle époque* with Italy's industrial take-off (or "big push," as he preferred to call it); and he criticized public policy, lamenting in particular that the engineering industry never received more than negligible net protection from Italy's badly designed tariffs (Gerschenkron 1955, pp. 360-370). Soon afterwards Rosario Romeo instead emphasized the birth of large-scale industry in the 1880s, and praised the policies that permitted and sustained that early industrialization (Romeo 1959); Romeo's vision would later be perfected by Franco Bonelli and Luciano Cafagna, who placed the two upswings on a par, as successive components of Italy's slow and difficult take-off (Bonelli 1978; Cafagna 1983).

My own investigations led me quickly to abandon the stages-of-growth approach, and to interpret both those upswings, and the intervening downturn, as an ordinary investment cycle. My initial hypothesis attributed the swings in industrial investment to political changes that altered the risk perceived by industrial entrepreneurs; later, having documented the parallel swings in construction (and met Kuznets on the road to Damascus), I attributed the swings in capital formation in general to the ("autonomous") ebb and flow of foreign capital (Fenoaltea 2011, pp. 67-108). The most recent contributions by Pierluigi Ciocca, Gianni Toniolo, Emanuele Felice and Giovanni Vecchi have brought us full circle: like Gerschenkron they see the second boom as far more than the first *redux*, like Romeo they praise the public policies that underpinned industrial growth (Ciocca 2007, 2008; Toniolo 2013a; Felice and Vecchi 2015).

The interpretations of the stylized facts widely diverge. On the facts themselves, on the long swing in industrial investment, we all agreed; and as it turns out we were all egregiously in error.

The aggregate-metal-consumption index of the engineering industry's production movements has at last been superseded.[3] The State was heavily involved, as a regulator and more, with maritime and railway transportation: shipbuilding and railway rolling stock production can be reconstructed directly from the abundant data in the sources, and these industries are now tracked by a few dozen annual series (Ciccarelli and Fenoaltea

[3] The superseded measures I refer to as "first-generation" estimates, the new disaggregated constant-price measures as "second-generation" estimates; on their (multi-dimensional) differences (and the prospective "third-generation" estimates) see Fenoaltea (2010) or, succinctly, (2015b).

2009, 2011).[4] The bulk of the industry, the residual "general engineering" group, is instead very poorly documented; its product too has at length been reconstructed, albeit of necessity in less detail, and it is now tracked by a further (baker's) dozen annual series (Fenoaltea 2015b). These incorporate much historical evidence the implications of which we had not grasped – and which warrant a radical revision of our views.

The engineering industry was very different from what we once thought. Half a century ago, following Gerschenkron, we identified it with the production of machines (Fenoaltea 1967, 1969; similarly, within a 5 percent margin, Toniolo 1977, p. 668). A quarter of a century ago, we had come to realize that it was as much a maintenance industry as a new-production industry, and as much a fabricated-metal (hardware) industry as a machinery industry (Fenoaltea 1992, pp. 147-156).[5] Next to new production, maintenance uses almost no metal at all; and while new production is tied to the *changes* in the extant stocks, maintenance is tied directly to the stocks themselves, which varied, in relative terms, altogether less. The significance of the industry's maintenance activity means that the metal-consumption indices of the engineering industry's aggregate product vastly overstate its cyclical variability, and long-term growth rate; but these considerations have been developed elsewhere (Fenoaltea 2015b), and need not detain us here.

Metal consumption tracks, at best, new production alone; and until recently that was the best we could do (Fenoaltea 2003). But metal consumption is a poor index even of new production, for it masks the changes in the *composition* of output. The new, disaggregated output series are the first to illustrate those changes, the first to separate hardware and machinery (and more), the first to shed light, allowing for imports, on the path of investment in the one and in the other.

As it turns out, the major components of the general engineering industry display very different trend growth rates: the metal-consumption share of hardware dropped from over ninety percent at Unification to sixty percent or so in the run-up to the Great War, that of ordinary machinery and equipment rose from some five percent to thirty percent and more. Moreover, the transition was not slow and progressive, but concentrated in the years that followed the increases in net protection granted machinery. The aggregate metal-tonnage measure suggested that tariff reform was ineffective, as Gerschenkron had argued; the new, disaggregated estimates point to the exact opposite.

The major components of the general engineering industry also display very different cycles. Aggregate metal consumption is characterized by the same "Kuznets" cycle as construction, with a sustained upswing from the late 1870s to the late 1880s, a collapse followed by a slow recovery through the turn of the century, and a new surge over the final decade of the *belle époque* (Fenoaltea 2011, pp. 36, 102). The new evidence that has been brought to bear documents that long cycle in the (dominant) hardware sector (and in the small precision-equipment sector as well), but not in the production of machinery and the like; allowing for imports, investment in industrial (and agricultural) equipment appears to have grown quite steadily over the half-century at hand, with no more than relatively brief setbacks at roughly decadal intervals. Interestingly, investment in equipment turned down well before the War, even as construction and hardware production continued to surge: the new, disaggregated estimates of the engineering

[4] These papers include the regional estimates; see Ciccarelli and Fenoaltea (2014).

[5] There was of course precedent for this; see for example Field (1985).

industry's product document a real-side counterpart to the financial "crisis of 1907" which the earlier aggregate series altogether missed.

What is even more interesting, indeed exciting, is that the newly recovered evidence pulls the rug out from under the related historiography of the last half century and more. To a first approximation the long cycle in "aggregate engineering" turns out to have been a hardware cycle, not so much parallel to, as simply part of, the construction cycle: what we all took to be the path of investment in industry was in fact the very different path of investment in infrastructure. The extant interpretations of Italy's industrial progress from Unification to the Great War share that foundation error: what in their different ways they all attempt to explain never happened at all, and they all collapse together.

2. Production and protection: the burden of the evidence

The derivation of the new estimates for the engineering industry has been described elsewhere (Fenoaltea 2015a; also, in brief, 2015b). As noted, the shipbuilding and railway rolling stock industries were abundantly documented, and the new time series are derived very directly from the available data. As also noted, the rest of the industry, the "general engineering" group, was very poorly documented, and the new time series are perforce derived from partial or indirect evidence. The latter includes, in particular, product prices and technical coefficients; these constrain the estimates of value added per unit at "base year" (1911) prices. It includes the detailed data on the labor force at four demographic-census benchmarks (1871, 1881, 1900, and 1911), and detailed but partial evidence on employment, shop size, and power in use, for 1911 alone, in Italy's first, badly incomplete industrial census; these constrain the estimates of the industry's composition, and derivatively the component-specific production estimates, in those years.[6] It includes annual series on the stocks maintained; these constrain the time path of (1911-price) value added, employment, and metal consumption in maintenance. It includes annual series on international trade and tariff rates; these yield census-benchmark estimates of the relative shares of the Italian market captured by domestic products on the one hand and imports on the other, and correspondingly constrain the (interpolated) time path of domestic production.[7] It includes an annual series on the "general engineering" industry's total metal consumption that independently constrains the group's aggregate product (Fenoaltea, 2015a).

Table 1 collects the new general-engineering physical-product estimates, which separately track the output of fabricated metal ("hardware"), truss-structure components, machines merely assembled from imported parts, other general equipment (machines produced from metal, plus other structural components), precision instruments (from metal), clocks and watches merely assembled from imported parts, and clocks and watches produced from metal; it also includes the corresponding aggregate metal-consumption

[6] Direzione generale della statistica (1874-76, 1883-85, 1902-04, 1913-16, 1914-16). Unlike the other censuses, the 1901 census was taken early in the year; it is taken to illustrate the labor force reached in 1900. The limited coverage of the industrial census of 1911 is in fact a matter of ongoing controversy: see Giordano and Zollino (2015), Fenoaltea (2015c, 2016b), Zamagni (2016).

[7] The primary source on trade and tariffs is Direzione generale delle gabelle (1861ff.); the most useful secondary source, Federico, Natoli, Tattara, and Vasta (2011).

series.[8] These production estimates are constrained by partial or indirect evidence, but tightly constrained all the same; as will be seen below their most significant features are notably robust.

Table 2 collects the aggregate net import series for fabricated metal (including, in the trade statistics, structural components), general equipment (again machines and the like, excluding ships and railway rolling stock), precision instruments, and clocks and watches.[9] These aggregates mask the underlying detail, but the latter too is occasionally intriguing. In particular, the data on rifle and pistol imports and exports point to significant, politically motivated purchases of French weapons in the earliest years following Unification: something Italy's political historians may wish to add to the familiar list of measures designed to obtain the support of Napoleon III.[10]

Table 3 provides evidence on tariffs, from 1861 to 1913, omitting the years over which the rates changed. The main message of Table 3 is that the net protection the tariffs provided the engineering industry was as variegated as the industry itself. Fabricated metal was protected, significantly and throughout. Precision equipment was protected at best briefly, as the (algebraic) gain in 1878 was largely undone a decade later. Ordinary machinery was protected at rates that steadily increased, again in algebraic terms: net protection passed from markedly negative to negligible with the tariff of 1878, and was clearly positive, even if quite moderate, from 1888.

Before the evidence on the composition of general-engineering output and trade was thus brought to bear, all we knew was the behavior of the corresponding aggregates, here captured by Figure 1. Panel A illustrates the path of total output – aggregate tons, estimated as metal consumption (Table 1, col. 8) divided by the average input-output ratio

[8] This last excludes both the metal the engineering industry did not consume at all (rails, rebars, and the like), and that which it consumed elsewhere, in shipbuilding and railway-rolling-stock work, and of course in general-engineering maintenance. That maintenance does not concern us here; the (six) new time series that now represent it may be found in Fenoaltea (2015b), Table 2. The disaggregated 1911-price new-production value added series are simply the physical-product series in Table 1, each multiplied by value added per unit at 1911 prices (415 lire per ton of fabricated metal; 350 lire per ton of truss-structure components, 300 lire per ton of machinery assembled from imported parts, and 900 lire per ton of other general equipment; 16,500 lire per ton of precision instruments, 8,000 lire per ton of clocks and watches assembled from imported parts, and 15,000 lire per ton of clocks and watches from metal). For present purposes these estimates at constant prices are thoroughly adequate, as the rate of productivity growth seems to have been very similar in the various branches of new production (mere-assembly activity alone excepted); for further discussion see ibid., pp. 29-31.

[9] Trade statistics for the entire Kingdom were not compiled for 1861; the present estimates for that year simply repeat the figures obtained for the following one. The series presented here are corrected for border changes, and for inventory movements from anticipated tariff increases; assembled machines and machine parts were reported together until 1887, and the breakdown provided here is also an estimate (Fenoaltea 2015a, chapter F04).

[10] That list of course includes the cession of significant territory and, not least, the provision of *la Castiglione* as mistress to the French Emperor. The trade statistics yield, normally, minor net imports of pistols and rifles, presumably of sporting weapons, but a string of significant imports, specifically of French rifles, appears in the earliest years following Unification. Sporadic, significant net exports also appear quite early on. These last suggest orders by a foreign government, and point to the technical adequacy of Italian rifles (compared to the imported French rifles, which were in any case too early to be *Chassepots*); given also the evidence of excess capacity in such production within Italy itself (Giordano 1864, p. 356), it is hard to escape the conclusion that the orders placed in France reflected not just market opportunities but considerations of foreign policy, as is indeed typical of military procurement in our own day.

(here set at 1.325) – and of output plus imports ("purchases," rather than "consumption," as these are in essence investment goods).[11]

Two features of that graph hit the eye. One is the long cycle in production (which we first attributed entirely to machinery, and subsequently, absent evidence to the contrary, to both hardware and machinery); the other is the closely parallel path of purchases and production, which in turn has a host of implications. The first is the arithmetic (*rectius* logarithmic) implication that domestic industry's market share remained roughly constant over the decades at hand, and was ever relatively high – as is illustrated directly by panel B.[12] In particular, there is no visible import-substituting surge in the wake of the tariff increases of the late 1870s and late 1880s: this suggested, as Gerschenkron had argued, that these never actually increased the industry's *net* protection.[13]

The broad stability of domestic industry's market share pointed to an elastic supply curve; but the market share line is not absolutely flat. It drifts down in the aftermath of Unification, perhaps reflecting the running down of the South's once highly protected industry as the mild Piedmontese tariff was immediately applied nation-wide. But after that the market share of domestic production seems to have varied contracyclically, dropping when purchases surged and vice-versa – suggesting a domestic supply curve that was indeed elastic, but not as elastic, in the short run, as the ("infinitely elastic") world supply curve. This point is illustrated by panel C, which compares the year-to-year growth rates of (aggregate) imports on the one hand and of (aggregate) domestic production on the other. The domestic-production growth rate follows a heavily damped version of the import growth rate's path. Domestic production could grow at spectacular rates, in the high teens and more, but for all that it could not keep up with demand when the latter really surged; on those occasions imports would grow far more, by 40 percent, even 60 percent in the *annus mirabilis* 1906.[14]

The fruits of disaggregation are evident in Figure 2. The left-hand graphs illustrate engineering-industry constant-price value added embodied in the goods produced and purchased in Italy, the right-hand graphs the ratios of these figures.[15] These graphs are

[11] For convenience, the series illustrated in Figure 1 are based on the new estimates, but a virtually identical graph appeared long ago in the author's dissertation; see Fenoaltea (1967), Figure 24. The average input-output ratio obtained by comparing total output from domestic or imported metal (Table 1, cols. 1-2, 4-5, and 7) to the corresponding metal consumption (Table 1, col. 8) actually drifted down, from 1.342-1.343 in 1861-71 and 1.332-1.336 in 1873-87 to 1.305-1.310 in 1897-1913; this reflects the evolution of the composition of the product, about which more forthwith.

[12] For a virtually identical graph, once again, see Fenoaltea (1967), Figure 25.

[13] In fact, there is no visible import-substituting surge at all, such as one would expect in the context of a "big push" unleashed by the late creation of (substitutes for) previously missing prerequisites. The path of the engineering industry dominated that of my earliest index, and if the prerequisite-creation/substitution story didn't fit that industry it didn't fit at all. The evidence pointed rather to a demand cycle – a cycle in the demand for producer durables ("machines"), in short a simple investment cycle – interacting with an ever-elastic supply side; and on that note I abandoned the stages-of-growth approach of the then-extant literature (Fenoaltea 2011, pp. 22-28).

[14] This pattern, apparent in the aggregate, is built into the algorithms used to infer the product-specific output time paths, between and beyond the census-based benchmarks, from those of the corresponding imports (Fenoaltea 2015a, chapter F04).

[15] In the case of goods assembled in Italy from imported parts, therefore, the value added in manufacturing the parts is considered imported, that in assembly domestic production.

divided, for clarity, into three panels; but they share their vertical scales, and each set of three graphs can be reduced to one simply by (judicious) superimposition. Panel A refers to the sum of fabricated metal (hardware) and truss-structure components. The latter were combined with the former in the trade statistics; like much hardware, too, truss-structure components were provided to the construction industry, and entered investment in infrastructure rather than in (industrial and agricultural) equipment. Production corresponds to Table 1, cols. 1 – 2, domestic purchases further include the net imports transcribed in Table 2, col. 1, all of them weighted by 1911-price value added per unit.[16] Panel B refers to (residual) general equipment; production corresponds to the value-added-weighted sum of Table 1, cols. 3 – 4, domestic purchases further include the (again value-added-weighted) net imports in Table 2, cols. 2 – 3.[17] Panel C refers to precision equipment: production corresponds to Table 1, cols. 5 – 7 (again weighted by unit value added), domestic purchases further include the (similarly weighted) net imports in Table 2, cols. 4 – 6.[18]

Given that the fabricated-metal industry dominated general engineering even in the early twentieth century, in tonnage terms, and practically coincided with it over the earlier decades, the two graphs in Figure 2, panel A unsurprisingly resemble those in Figure 1. They tell the same story as the aggregate tonnage figures, the story we inferred long ago from metal consumption alone: production fluctuated very strongly, but the share of the market captured by domestic producers remained very high, at four-fifths and more, albeit with a general tendency to fall when purchases surged, and to rise when they decelerated or fell outright.[19] That steady dominance of the domestic market was in fact buttressed, if not altogether created, by the significant net protection "fabricated metal" always enjoyed (Table 3): the industry the tariffs (long) mistreated was the "general-equipment" industry, the "machinery" industry, not the entire, altogether broader, base-metal-processing "engineering" industry.[20]

But the graphs of panels B and C do not much resemble those of panel A: the story once told for the entire industry is now told for the fabricated-metal/construction-related sector alone, and different stories emerge for the others. The right-hand graph of panel C, for example, shows that the precision equipment industry's share of the domestic market was ever far lower than that of the fabricated metal industry, one fifth or less against the four-fifths and more of the latter: a difference surely due in part to relatively lower rates of

[16] Since the structural-components industry was able to export its products made from duty-free metal, and (given the trade categories) received tariff protection, its imports should have been negligible, save perhaps very early on; for simplicity, all net imports are attributed the domestic fabricated-metal value added of 415 lire per ton. The production of fabricated metal far outweighed that of structural components, and the graphs presented here are barely distinguishable from their equivalents that omit the latter (domestic) goods.

[17] Imported parts and assembled machines are attributed 600 and 900 lire per ton, respectively, like (implicitly, in the case of parts) the corresponding domestic product.

[18] Imported precision instruments are attributed 16,500 lire per ton, like the corresponding domestic product. In the case of clocks and watches, to reflect the apparently superior average quality of the imported goods, imports are attributed a value added of 30,000 lire per ton of parts, and 38,000 lire per ton of assembled pieces.

[19] A sudden surge in exports of tin cans in 1904-05 reduced net imports, and generated the exceptional local peak in domestic producers' market share evident in the right-hand graph of Figure 2, panel A.

[20] Let alone the shipbuilding and railway-vehicles industries, which variously benefited from protection, subsidies, and non-competitive procurement policies (Ciccarelli and Fenoaltea 2009, 2011, Ciccarelli and Nuvolari 2015).

net protection (Table 3), but mainly, it would seem, to the presence of well-established foreign hegemonies in clocks and watches (Switzerland) and in (optical and other) precision instruments (Germany). The competitive position of domestic producers appears to have been much improved by the single major increase in protection, in 1878; but it soon weakened again, over the 1880s in general as purchases surged and imports poured in, and in 1887 in particular as imports of optical and measuring equipment briefly trebled (perhaps to satisfy a military requirement). The subsequent downturn in purchases may have affected imports more than domestic producers, temporarily offsetting the decline in net protection (Table 3); but that apart domestic producers seem generally to have been losing ground, perhaps, as was suggested at the time (Direzione generale della statistica 1906, p. 57), because the diffusion of electricity played to foreign (and again German) strength.

The left-hand graph of panel C suggests that the precision-equipment industry displayed a long cycle not too unlike that of the fabricated-metal industry. Both can perhaps be linked to the infrastructure-investment cycle, but surely, even then, through very different paths. Infrastructure absorbed hardware (and truss-structure components): the fabricated metal industry appears tied to construction by Leontief's input-output coefficient. Time pieces are largely consumer goods, and the clock-and-watch industry appears tied to construction by Keynes's multiplier; and if the military were traditionally the main consumers of precision instruments, the boom-and-bust of the latter industry over the 1880s and early '90s is tied to construction only because both it and deficit spending were first encouraged and then discouraged by the long swing in the supply of capital (Fenoaltea 2011, pp. 70-104).

Again, the detailed international trade statistics tell us more. The number of watches imported each year surged from a few tens of thousands through the 1860s and 1870s to a few *hundred* thousand from the 1880s. Their sheer volume, and their declining average values, are evidence that this boom was fueled not by luxury pieces for the (relatively thin) upper crust but by cheap (Roskopf) watches for the laboring classes. The new estimates for the engineering industry thus unexpectedly supply yet another nail to secure the coffin of the formerly dominant view that the sharp fall in the price of grain in the (early) 1880s generated an economy-wide crisis and a decline in the working classes' consumption.[21]

The most interesting graphs are surely those for the general-equipment industry, in panel B. From 1861 to 1913 the physical output of such equipment grew nearly fifty-fold, against less than tenfold for precision equipment, and just sixfold for fabricated metal (and truss-structure components).[22] Above all, it followed a different path, apparently growing,

[21] The early historiography, close to the period in question, remembered the 1880s as a decade of prosperity and increasing consumption; the post-war literature invented the economy-wide "crisis of the 1880s," with consumption falling despite the growth of industrial production and of investment, on the presumption that the "grain invasion" hurt Italy's essentially agricultural economy. The argument was blithely a-ricardian, but it was apparently supported by the (flawed) official reconstruction of Italy's historical national accounts (Istituto centrale di statistica 1957; Fenoaltea 2011, pp. 8-50), and that was largely that. These views now seem largely to have been abandoned even by their former champions, apparently convinced by recently presented evidence of *rising* consumption in the 1880s (Fenoaltea 2011, pp. 109-134). The most recent literature includes additional material supporting the new consensus (Ciccarelli 2012), and the Oliphant-call of the preceding one (Cerrito 2012).

[22] In the later 1870s the estimated production of machines was much less, on a tonnage basis, than that of truss-structure components (Table 1); this sits well with the emphasis on the latter in the literature of the day, e.g., Corpo delle miniere (1881), p. 141.

after 1880, with only brief setbacks at roughly decadal intervals.[23] The long cycle so visible in the production of fabricated metal and precision equipment is altogether absent: in the thirty years from 1880 to 1910, general-equipment value added at 1911 prices (and the weight of the industry's physical product) apparently reached a new high in four years out of five, failing the mark only in 1891-93 and 1901-03, as it would again in 1913. The qualifier is *de rigueur*, as the lack of a census in 1891 means that the allocation across the 1880s and 1890s of the census-documented growth between 1881 and 1900 is a judgment call; but as will be confirmed forthwith the evidence points to the pattern embodied in the present estimates.

The *purchases* of general equipment are our nearest measure of "business" investment in industrial and agricultural machinery; and such purchases apparently grew even more regularly than domestic production, again with short cycles but no trace of a long one.[24] As is obvious from Figure 2 in 1878-87 and 1896-1913 (respectively the "Depretis years" and the "Giolitti years," from the dominant prime ministers of the time) purchases of hardware and precision equipment grew at above-average rates, purchases of general equipment did not.[25] The new, disaggregated estimates further suggest that these last purchases peaked in 1908: they show a real-side trace of the notorious "crisis of 1907," altogether absent from the preceding, aggregate series for "engineering" as a whole, and correspondingly from the interpretations derived from those aggregate estimates.[26]

Gerschenkron had condemned the Italian tariff for protecting metalmaking rather than "engineering," and complaints of negative protection on machinery are a *leitmotiv* in the literature of the day.[27] The complaints appear fully justified in the 1860s and '70s, but in point of fact the path of tariff reform was clearly ameliorative. For general machinery, the reform of 1878 meant passing from negative to practically zero net protection, that of 1887 from zero to positive (Table 3); and the evidence available at the census-year benchmarks suggests that both changes markedly raised the steady-state ratio of domestic

[23] The estimates are in fact perceptibly sturdier after 1880, as iron and steel production data become available. In the early decades the production of iron and steel is also estimated, and the cycle in metal consumption may be distorted by the failure adequately to allow for production from domestic scrap, notably in the early 1870s. It is of course tempting to impute to the 1860s and 1870s the patterns evident over the subsequent decades, and to back out metal-consumption and production estimates for those decades consistent with that assumption; but that temptation has here been resisted.

[24] Contemporary observers had noted the shorter cycle, and it turns up in a spectral analysis of the extant aggregate GDP series; see Sella and Marchionatti (2012).

[25] These observations are readily confirmed by simple OLS regressions of the growth rates of the "purchases" series illustrated in Figure 2 on time dummies for the Depretis and Giolitti years.

[26] See Bonelli (1971); compare Fenoaltea (2011), *s.v.* "crisis of 1907." A possible qualifier here is that the railways' nationalization in 1905 spawned a reequipment surge that also peaked in 1907 and then rapidly fell off, as orders were filled; but its quantitative significance seems minor. From 1906 to 1913 railway-related general-equipment value added estimated as 10 percent of the construction value added in railway renovations plus 10 percent of the engineering value added in rolling stock purchases equals a small and virtually constant 3-to-5 percent share of total purchased general-equipment value added, and the time path of the residual is entirely parallel to that of the latter. See Fenoaltea (1984) and Ciccarelli and Fenoaltea (2011).

[27] Gerschenkron (1955), p. 369; Giordano (1864), pp. 418-422; Corpo delle miniere (1881), p. 151; Comitato nazionale per le tariffe doganali e per i trattati di commercio (1917b), pp. 16-17.

production to total purchases.[28] The present interpolations of those benchmarks accordingly tie the rise in that ratio to the increase in the tariff, even as they allow for a reduction in the year-specific ratio in the presence of sudden surges in purchases and, consequently, in elastically supplied imports (and of course vice-versa when purchases suddenly collapsed). The ratio of production to purchases is accordingly taken to have grown sharply after 1887, when tariff protection improved and purchases decelerated; similarly, in later years, that ratio is taken to have drifted down as the market recovered, dropped when it exploded, and finally recovered as purchases stopped growing. The assumptions that underlie the present time-series estimates appear reasonable.[29]

Alternative estimates could of course continue to attribute the long cycle to business investment too: purchases of "general equipment" can be assumed to have fallen sharply after 1888, and remained depressed through the end of the century, just like the "general engineering" aggregate illustrated in Figure 1. But that assumption would *not* be reasonable. The census-based estimate for 1900 yields machinery purchases of some 128 million lire, 79 of them domestic, on a 1911-price value added basis (from Table 1, cols. 3 and 4, Table 2, cols. 2 and 3, and the above-noted value added weights). Extrapolate those purchases back to the 1888 peak with the aggregate-tonnage-purchased series (the dotted line in Figure 1): in 1888, on the same value-added basis, purchases would have been some 141 million lire, for a domestic value added, allowing for imports, of some 113 million lire. But the again census-based estimates for 1881 yield a domestic value added of just 7.7 million lire, and purchases of 26 million lire. To have purchases of machinery follow the post-1888 long cycle, that is to say, we must be willing to accept as plausible that from 1881 to 1888 domestic production rocketed up from 7.7 million lire to 113 million lire, at near 50 percent annually, compounded, with domestic producers' share of the market shooting up from 30 percent to 80 percent, thanks presumably to the elimination of negative protection with the tariff of 1878 – and that after 1888, despite the introduction of *positive* protection, despite the decline in total purchases, that share instead drifted *down*, back to 62 percent in 1900: that is to say, that domestic producers were first spectacularly helped, *and then hurt*, by the successive increases in net protection – or, discounting the effects of tariff reform, that the domestic short-run supply curve was *more* elastic than the ("infinitely elastic") world supply curve, despite the evidence to the contrary from the aggregate figures reviewed above. In the light of the census, trade, and tariff-rate data incorporated in the new, disaggregated estimates, the long cycle in investment in *machinery* can be dismissed: it is simply not present in reasonable estimates, and the estimates on which it is imposed have preposterous implications.[30]

[28] Not by chance, perhaps, the 1878 increase in the tariff on machinery corresponds to that which Giordano (1864, pp. 352, 418-422) indicated, and advocated, as sufficient to offset the tariff on metal and render machine production profitable in (low-wage) Italy.

[29] The estimated ratios of production to purchases illustrated in Figure 2, panel B dovetail nicely with the available micro-data on the distribution of boilers (by years of construction, to 1904, and country of origin), which suggest that the share of the market captured by domestic firms rose from some 40 percent through the 1870s to 50 percent in the 1880s and near 65 percent by the turn of the century. See Comitato nazionale per le tariffe doganali e per i trattati di commercio (1917a), p. 5.

[30] Further evidence can now be brought to bear: as it turns out, the labor-force age-distribution figures in Direzione generale della statistica (1914-16) also point to a long cycle in construction, in the production of related non-metallic materials, and in the production of hardware, but not in the production of machinery: see the pioneering investigation of these data in Pezzuto (2017).

The time path of aggregate metal consumption illustrated in Figure 1, once attributed to the engineering industry as a whole, reappears as noted in Figure 2 only in panel A, that for (or at least dominated by) the fabricated-metal industry. But the output of that industry is essentially hardware, the hand tools of artisans and farm workers, the bits of metal consumed in construction work; and of the two, the latter component seems much the more cyclically volatile. The new estimates thus sit well with the assertions of contemporary observers, who attributed the cycle of the engineering industry after 1880 to that in public works and residential construction (Direzione generale della statistica 1896, p. 398).

The aggregate-tonnage market share of the domestic engineering industry was ever high, and varied little (Figure 1, panel B); but the import of that time path is now clear. It does not signify, as we thought, that tariff increases didn't have any net effect. *Au contraire*: the relative constancy of the aggregate share is the arithmetic result of the falling relative weight of the fabricated-metal part, with continuous net protection and an always high market share (Figure 2, panel A), and the rising weight of the machinery part, with improving net protection and a market share that sharply increased as a result, but remained below that of the fabricated-metal sector (Figure 2, panel B). Where they occurred, improvements in net protection had very significant effects: the new, disaggregated estimates reveal what the earlier, aggregate estimates altogether masked.[31]

The new estimates also shed light on the potential effects of the engineering-industry protection advocated by Gerschenkron. Toniolo, addressing the issue long ago, argued that even "complete import substitution ... would have resulted in a maximum possible increase in engineering production of 50%, in total manufacturing and GDP of about 7.3% and 1.4% respectively" on the eve of the Great War: not, as he put it, the stuff of "a radical change" (Toniolo 1977, pp. 666, 672). In fact, the estimates in Tables 1 and 2 imply that with only brief exceptions purchases remained between 1.4 and 1.6 times domestic production, nicely extending Toniolo's estimate of the potential gain from a prohibitive tariff to the entire period at hand. But those estimates refer only to the ("general engineering") industry's new production, and over the cyclical ups and downs non-import-competing maintenance represented on average half the industry's value added (Fenoaltea 2015b, p. 30). Half of new production corresponds to a quarter of the industry's total product, and correspondingly to reduced percentage increments in total manufacturing and GDP: Toniolo's conclusion that protection of the engineering industry was not the royal road to anything is clearly reinforced.

But there is more to this strand of the literature. Italy's engineering firms had agitated, from the early 1870s, to be allowed to process duty-free imported metal for the export market; machine-makers effectively obtained that right some thirty later, and by the eve of the Great War numerous firms were advertising their success in world markets (Fenoaltea 2011, pp. 150-151; Grioni 1914). The obvious suggestion was that the tariff on steel destroyed the engineering industry's natural (free-trade) comparative advantage, and that the loss of access to the ("infinite") world market may well have damaged it far more than any loss of competitiveness in the ("small") domestic market; Toniolo undercut it with the argument that the export potential of Italy's engineering industry was limited first and foremost by its "technical and organizational backwardness," and his objection has been widely repeated.[32] The new estimates do not speak to the relevant counterfact, but

[31] There is precedent for this: the impact of the rising tariffs on cotton goods is also visible in the most recent estimates, but not in the earlier ones. See Fenoaltea (2011), pp. 142-147.

[32] Toniolo (1977), p. 672; on the subsequent literature, and the counterarguments, Fenoaltea (2011), p. 150. Federico and Wolf (2013) seem curiously not to mention the issue at all.

the underlying sources do. Giordano, in particular, listed machine-making firms by name, shortly after Unification: many were, unsurprisingly, foreign, and there is surely no reason to assume that these expatriate businessmen were any less competent than their peers in their home countries.[33]

3. The path of investment: the evidence and the literature

Over the decades following Unification the growth rate of the Italian economy fluctuated, with a short agricultural cycle, and a long industrial cycle located in the production of durables: the construction industry, the engineering industry, and those that supplied them with their raw materials (Fenoaltea 2011, pp. 32-47). Our understanding of this long cycle, with its characteristic upswings in the 1880s and the *belle époque*, is central to our interpretation of Italy's economic development.

The new ("second-generation") estimates for the construction industry were compiled now decades ago (Fenoaltea 1988, and references therein). The newly completed ("second-generation") estimates for the engineering industry include those recently compiled for the shipbuilding and railway rolling stock industries, referred to above; the corresponding new-production series are illustrated in Figure 3 (to the same semi-logarithmic scale used in Figures 1 and 2). Panel A refers to the construction of naval ships. The long cycle is readily apparent, especially in the production of ships for the *Regia marina*; it bears notice that over the decade straddling the turn of the century the shipyards managed to maintain their output on a relatively smooth growth path by turning to export work.[34] Panel B refers to merchant shipbuilding, distinguishing sailing-ship and steam-ship production.[35] The construction of (wooden) sailing ships enjoyed a unique boom in the wake of Unification (tied perhaps to the opening of the Suez canal), and then dropped to low levels. The construction of (metal) steamships also went much its own way: negligible into the early 1890s, it shot up to a peak in 1900 thanks to the introduction of subsidies, and then stagnated. Panel C illustrates the new production of railway rolling stock; the long cycle is obvious, and obviously related to the long swing in the construction of the rail lines themselves.[36]

The aggregate new production of the (base-metal-working) engineering industry is illustrated in Figure 4, panel A: the long cycle obvious in a number the industry's major components (Figure 2, panel A; Figure 3, panels A and C) is obvious there as well.[37] Figure

[33] Giordano (1864), pp. 354-373. Those of us who lived through the space race recall the phrase "our Germans beat their Germans"; the point here is simply that Italy's Germans (or Britons, or Frenchmen) were presumably as able as Germany's (or Britain's, or France's). A discordant element in the tariff debate is the "Bologna school" (Fenoaltea 2015c, Zamagni 2016) claim that the tariff on steel actually *benefited* the engineering industry; that it visibly lacks logic has been pointed out, but it continues to be asserted as uncontested fact. See Zamagni (1993), p. 116, Fenoaltea (2011), pp. 151-152, Zamagni in Carter (2013), p. 87, and again, most recently, Felice (2015), pp. 151-152.

[34] Naval vessels were then at the cutting edge of technical progress, much as military aircraft are in our own day; compare above, footnote 32 and related text.

[35] The latter is indicated only as a residual (the illustrated total less the illustrated sailing-ship component), as it was initially nil, and therefore not amenable to separate representation on a logarithmic scale.

[36] For further discussion see Ciccarelli and Fenoaltea (2009, 2011).

[37] It is equally obvious, albeit much damped by the inclusion of trend-dominated maintenance, in the total

4, panels B and C allocate that new production to two groups. The larger group, illustrated in panel B, includes the components that belong to two overlapping categories. One refers to infrastructure-related work: the new production of hardware, of truss-structure components, of railway rolling stock. The other includes the (other) components of the industry's new production directly tied to public procurement and public subsidies: vessels for the *Regia marina* and merchant steamships, and also, not that they matter, precision instruments (presumably used mainly by such public bodies as the military, laboratories, and universities). The line between the two is blurred, but since they are here combined that hardly matters.

What matters rather more is that all hardware is included here, even though much of that went into the hand-tools used by farmers and artisans: much, surely, but *how* much the sources ("so far recovered") do not tell us.[38] On the other hand, one can presume, with fair confidence, that construction and the production of related hardware were far more cyclically sensitive than the production of tools: the "infrastructure/government work" line in panel B is surely too high, but there is no reason to believe that its time path is distorted.[39]

Figure 4, panel C refers to the (residual) "market-oriented" production of the engineering industry. The lower (solid) line tracks the new production (including the mere assembly) of residual "general equipment" (in essence, ordinary machinery) on the one hand and clocks and watches on the other; the upper (dotted) line further includes "open-market" shipbuilding, that is, the construction of sailing ships and of exported naval vessels. Clearly, in the 1860s and '70s the path of this "market-oriented" group was dominated by the cycle in the construction of sailing ships; after that, it closely follows that of residual "general equipment" alone (Figure 2, panel B). Again, the long cycle is simply absent, and the long depression from the late 1880s through the turn of the century is nowhere to be seen.

The inclusion of the shipbuilding and rolling-stock industries rounds out the picture of the production of durables. The long swing was present, as we had understood, in the product of the construction industry, in investment in infrastructure. It was present, as we had understood from the path of metal consumption, in the *aggregate* product of the engineering

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product of the engineering industry; the latter is also illustrated in panel A, superimposed, for future reference, on the time series in Fenoaltea (2003) that enters the GDP estimates in Fenoaltea (2005, 2012). The total-product series further include the working of precious metals; its share of the total declined relatively smoothly from some seven percent of the total in 1861 to half that in 1913.

[38] There seems to be no useful evidence on the production of hand tools, not even in the censuses, presumably because blacksmiths were indifferently devoted to tools and other hardware. The sources include fabricated-metal output figures, e.g., Corpo delle miniere (1896), pp. XXXVIII-XXXIX, 198-199, (1902), pp. 264-265, (1915), pp. LXX-LXXI, CI; but these rarely separate out tools, and even when they do they are no more than (very low) lower bounds, as they refer only to the output of vertically integrated metalmaking firms. Some orders of magnitude might be obtained from the reported numbers of cultivators and craftsmen, but the stocks held depended on their specific activities, and the exploitation of that evidence has not even begun.

[39] Or at least distorted in favor of the present interpretation. The production of agricultural tools may have also followed the long cycle, as the openness of the Italian economy did, with production shifting between import-competing field crops and export-oriented tree crops. Absent more direct evidence the regional estimates of the maintenance performed by smiths in 1911 (which can be considered an index of the use of tools) were compared to the regional acreage devoted to field, tree, and mixed crops in 1911. OLS regressions suggest that maintenance was significantly related only to field-crop acreage; and this implies that any trade-related cycle in tool production would tend to sharpen the construction-related hardware-production cycle. On the cycle in the openness of the economy see Fenoaltea (2012), p. 293; for the maintenance and acreage figures see, respectively, Ciccarelli and Fenoaltea (2014), Table E.068, and Direzione generale della statistica (1912), pp. 102-104.

industry. But contrary to what we had presumed it was not present in the product of each of that industry's major components: it was present in those that supplied the construction industry, in those others also tied to investment in infrastructure, and in those additional ones that were (also) closely tied to government spending; it was markedly absent from those that produced ordinary machinery, the stuff of investment in manufacturing industry.

As is clear from Figure 2, panel B, and again Figure 4, panel C, the production of ordinary machinery appears to have followed a path at variance with that of the engineering industry as a whole. It shows no sign of the long-swing depression through the 1890s; it is characterized rather by a sharp acceleration in the late 1870s, and then continued (if slowly decelerating) growth decade after decade. But as seen above the output surge through the 1880s was fueled in good part by rising protection, and the industry's attendant capture of a growing share of the Italian market for general machinery; if we add machinery imports to domestic output the total grows quite steadily from decade to decade, with no visible acceleration – or deceleration – at all.

That total is our index of investment in machinery, to a first approximation our index of investment in industry, of the additions to its physical capital.[40] The path of that investment is reproduced, for emphasis, in Figure 5, panel A – directly in tonnage terms, without involving value added weights at all; panel B illustrates its year-to-year growth rate.[41] The newly recovered evidence tells us that investment in machinery grew relatively

[40] The very limited mechanization of Italian agriculture that I myself recall from the early postwar years suggests that in the period at hand the machinery produced and purchased was "essentially" industrial machinery; the present discussion assumes as much, but like any assumption this one may one day come back and bite us. The available quantitative evidence is limited, but what there is seems consistent with that impression. There is unfortunately no evidence at all on the production side, as the censuses never distinguish between industrial and agricultural machinery. The trade statistics make that distinction only from 1888; of the (assembled) machinery total in Table 2, col. 3, agricultural machinery represented 10 to 15 percent through 1909, rising to 20 percent in 1910 and some 25 percent in 1911-13. Horsepower figures provide similar magnitudes. On the eve of the World War water supplied about one million horsepower (overwhelmingly to industry), steam engines as much again to industry and agriculture; mobile steam engines (used to drive threshers and the like) accounted for some 22 percent of the steam figure, or half that of the steam-plus-water total. In 1890 some 160,000 steam horsepower were attributable to agriculture and industry together. Agriculture accounted for 20 percent of that; one notes that two-thirds of the steam power in agriculture came from mobile engines, and conversely that two thirds of the total power of mobile engines was employed in agriculture. See Direzione generale della statistica (1915), p. 172, (1913-16), vol. 4, pp. 522-523; Bardini (1998), pp. 110-111. An error of say 20 percent in our measure of industrial investment, in any one year, is not small in itself; compared to the variation in the entire series (some 3000 percent from end to end, 6000 percent from minimum to maximum) it is without significance, and the essential features of the series at hand are again robust.

[41] Figure 5, panel A illustrates the purchased tonnage of machinery (and other "general equipment"), obtained by summing that imported (Table 2, col. 3) to that produced in Italy (from imported parts or from metal, Table 1, cols. 3-4); its time path is identical to that of the "purchases" line in the left-hand graph of Figure 2, panel B. The latter illustrates purchases of machinery in 1911-price value added terms, that is, as will be recalled, as tonnages weighted by unit value added at 1911 prices. Reckoned in 1911 lire of engineering-industry value added (*V*), those total purchases of assembled machines (*VPM*) sum the tonnages of domestic machines produced from metal (*DM*: Table 1, col. 4), of domestic machines assembled from imported parts (*AP*: Table 1, col. 3), of imported assembled machines (produced from metal, *MM*: Table 2, col. 3), and imported machine parts (produced from metal, *MP*: Table 2, col. 2), each weighted by the corresponding value added per unit (respectively *vdm*, *vap*, *vmm*, and *vmp*): $VPM = vdmDM + vapAP + vmmMM + vmpMP$. To a first approximation, as here, (1) $vdm = vmm = vap + vmp = v$ and (2) $AP = MP = P$: substituting and rearranging, $VPM = vDM + vapP + vMM + vmpP = v(DM + MM + P)$. The purchases (gross investment) series in value added terms in Figure 2, panel B is in fact the simple tonnage series in Figure 5, panel A weighted by a constant (1911-price value-added per ton of machine from metal): its *level* depends on the base year, but its time path

steadily throughout the half-century at hand, with only limited (mild or brief) setbacks, notably after 1874, 1890, 1900, and 1908: it did not follow the long metal-consumption cycle at all, much less accelerate sharply at the end of the nineteenth century, *pace* Gerschenkron and the neo-Gerschenkronians.[42]

This empirical result of the disaggregation of the engineering-industry production series warrants a measure of comment. On the one hand, it can be seen as no more than a detailed refinement that does not much alter the "big picture" captured by the summary national accounts. This is true of the preliminary second-generation accounts for the period at hand, presented a decade ago for the production side and since extended to the expenditure side (Fenoaltea 2005, 2012): the industry-level production aggregates are not much affected (Figure 4, panel A), and neither therefore are the expenditure aggregates, obtained directly from the industry-level production aggregates and the corresponding international trade. It is true *a fortiori* for the relevant parts of the national accounts, from Unification to the present, recently generated for Italy's sesquicentenary under the auspices, not least, of the Bank of Italy.[43] For the period at hand the industrial production aggregates are based on Fenoaltea (2003), and again little affected; the expenditure side even less, for the benchmark estimates of consumption and investment are there interpolated and extrapolated on the basis of import flows alone. By construction, the cycles attributed to the expenditure series are totally unaffected by (the revision to) the estimated path of domestic production; but this feature of the underlying algorithm need not be considered a virtue.[44]

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does not. Index-number problems, Gerschenkron effects, *et hoc genus omne* are here simply irrelevant; they could be reintroduced by relaxing assumption (1), but would remain second-order effects with no impact on the central result that the long swing is simply absent from the investment-in-machinery series reconstructed from the data newly brought to bear. Similar considerations apply to assumption (2): it is warranted by the evidence (Fenoaltea 2015b, footnote 33 and related text), but the path of machinery purchases is little changed if these are calculated from Table 1, col. 4 and Table 2, col. 3 alone (i.e., assuming, apparently wrongly, that imported parts were replacement parts used in maintenance rather than components of new machines). So too, again, any correction for the secularly increasing complexity and efficiency of machines: the simple tonnage series obtained here would be rotated counterclockwise (further reducing the already mild periodic downturns), but no reasonable tinkering could alter its fundamental shape.

[42] The annual growth rates illustrated in Figure 5, panel B average 8.7 percent in 1862-1895, and 7.9 percent in 1896-1913 (the "Giolitti years"). As a measure referred to investment in industrial (and agricultural) machinery the later figure is in fact an overstatement, as the production of bicycles, motor vehicles, pressure pipelines, and the like was very small around the turn of the century, and reached perhaps 40,000 tons in 1911 (Fenoaltea 2015a, p. 112).

[43] See Baffigi (2013a). These estimates correspond to version 1.0; version 2.0 is now (July 2017) on-line (http://www.bancaditalia.it/statistiche/tematiche/stat-storiche/stat-storiche-economia/index.html?com.dotmarketing.htmlpage.language=1 - "DATA").

[44] See Baffigi (2013b), pp. 176-183 (further clarified in private conversation, for which I thank him). The production-side estimates of GDP retain, as noted, the second-generation commodity-production series. The revision to these may somewhat alter the expenditure-side benchmarks calculated for 1871, 1891, and 1911, and therefore the inter-benchmark trend growth rates, but not the deviations from steady growth. These are obtained by extrapolating and interpolating the three benchmarks using the import series alone, and then rescaling the resulting annual estimates to sum to the aggregate obtained from the production side. Over the 1880s the procedure appears to overstate the growth rate of consumption (as with the "grain invasion" imports grew faster than domestic production) and to understate that of investment (because increasing protection meant that domestic production grew faster than imports, and again because the first-round estimates of investment get rescaled, along with the consumption estimates, to meet the aggregate constraint).

On the other hand, the "big picture" is consistent with any number of interpretations: of that we have proof enough in the very different stories we have told, as recalled above, to account for the self-same stylized facts. The empirical merits of the various interpretations can be gauged only by comparing their specific implications to the more detailed evidence that may or may not be consistent with them; and the detailed evidence that has now been brought to bear contradicts the very "facts" we had read into the available aggregates and were all attempting to explain. The long cycle in GDP, in overall investment, remains; but to a first approximation it is now revealed as a cycle in construction alone, and not at all the cycle in the acquisition of machinery, in the growth of manufacturing industry's stock of capital equipment and capacity to produce, that we had taken it to be. The new disaggregated estimates may be a matter of detail, but as we shall see forthwith that detail is at the heart of the extant literature on Italy's early industrial progress.

Our imagination is shaped by the world we live in. In the mid-twentieth century we naturally presumed that metal consumption meant machine production, that machines were essentially factory equipment rather than farm equipment; we naturally saw in the long cycle in metal consumption a long cycle in investment by industry. Decades on we had understood that metal consumption also meant hardware production; but long-held beliefs possess terrible inertia, and we simply presumed that investment by industry *also* followed the long cycle in metal consumption. We remained sure that industry's stock of equipment had grown with exceptional rapidity in the 1880s and again over the *belle époque*: multiple alternative interpretations succeeded Gerschenkron's own, but the facts to be explained remained in essence those he had himself established.

Gerschenkron thought of industrial development in terms of stages of growth, with a "big push" unleashed by the creation of the necessary supply-side prerequisites. In backward Italy, he thought, the critical missing prerequisite was the ability to accumulate, and manage, industrial capital. The State failed signally to provide it, and exploit the opportunities of the 1880s; it appeared only with the creation of the (German) industrial banks in the mid-1890s, as shown by the attendant rise in the rate of industrial investment and of industrial growth in general (Gerschenkron 1955; for further references and discussion Fenoaltea 2011, pp. 10-14). But the mid-1890s "kink in the curve" of metal consumption turns out to have been a matter of investment in infrastructure rather than in industry; his interpretation is left with no factual foundation at all.

Gerschenkron's near-contemporary and principal interlocutor was Rosario Romeo. Romeo shared Gerschenkron's stages-of-growth approach, but thought that the State had more nearly done everything right than everything wrong. In particular, the State taxed agriculture to create the "necessary" (railroad) infrastructure in the 1860s and '70s; the flow of savings could then be redirected to industry, which duly began to grow, aided by tariff protection, in the 1880s (Romeo 1959; for further references and discussion Fenoaltea 2011, pp. 19-21). But the late-1870s "kink in the curve" of metal consumption turns out to have been a matter of investment in infrastructure rather than in industry; his interpretation is left with no factual foundation at all.[45]

The subsequent, hegemonic interpretation was the one proposed around 1980 by

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Publication lags must be allowed for: Baffigi's reconstruction of the expenditure side was completed (Baffigi 2011) before mine (Fenoaltea 2012) appeared in print.

[45] Romeo's interpretation is not rescued by the increase in the growth rate of machinery *production* ca. 1880 (Figure 2, panel B), as the latter was tied to the change in net protection, and the medium-term growth rate of production plus net imports ("purchases") did not increase at all (ibid., and Figure 5).

Franco Bonelli and Luciano Cafagna. It was in essence Romeo's in slow motion: the "prerequisite" accumulation of (agricultural) capital to 1880 had lasted over a century, and not just the twenty years after Unification; the industrial "take-off" was itself not a concentrated spurt but a sequence of successive "waves," each stronger than the one before, in the 1880s, in the "Giolitti years" (1896-1913), and again in later years, beyond the temporal horizon of this paper (Bonelli 1978, Cafagna 1983; for further references and discussion Fenoaltea 2011, pp. 28-32). The pre-War "waves" of industrial investment were those revealed by the extant indices, by the consumption of metal; but it now appears that these "waves" were in investment in infrastructure, that investment in industry displayed no more than ripples.

My own earlier work reflected those same indices, the same misguided certainty that the cycle in metal consumption meant a cycle in industrial investment. The strong cycle in "machinery" production and industrial investment stood oddly next to the relatively steady growth of other industrial output, the fall in investment after the 1887 tariff hike stood oddly next to its rise after that of 1878. The ("obvious") hypothesis was that the path of investment had been dominated not by the changes in the expected growth of output, but by the changes in the desired capital-output *ratio*, presumably high when risk was low because the political leadership could be trusted, and vice versa.[46] It is now apparent that there was no long cycle in industrial investment: the "political cycle" hypothesis, as it has come to be known, proposed a solution to a non-existent problem.

The "political cycle" hypothesis was in any case killed off some twenty years later by the new estimates for the construction industry, above all by (my belated discovery of) the writings of the Kuznets school (Fenoaltea 1988). The long cycle in Italy was not specific to industrial investment, it seemed to involve capital formation in general; not least, it was part of a world-wide cycle, and clearly called for a world-wide explanation. The Kuznets school had discovered the characteristic long swing of the "Atlantic economy," with transoceanic migration, capital flows, and New-World construction rising while British construction fell, and vice versa; and it had considered migration the prime mover in these related cycles (for references and discussion Fenoaltea 2011, pp. 70-75). Italy didn't fit: it was an Old-World land of out-migration, but its construction cycle was parallel to that of the New World rather than to the British one. The "revised Kuznets cycle" hypothesis maintained the Kuznets school's sense that the various cycles were indeed related, but accepted the critics' view that the long cycle in capital exports was rooted in financial markets, in the long waves of favor and disfavor with which investors viewed non-British bonds. It accordingly inverted the chain of causation: as the spread between core (British) and periphery interest rates varied over the long cycle, it argued, the supply of capital varied inversely in the core and in the periphery, setting in motion the inverse construction cycles and, with these, the cycle in migration.[47]

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[46] Our imagination is shaped by the world we live in: near half a century ago, shortly after Italy's post-war "economic miracle" had come to a crashing end because, it was said, the political "opening to the Left" frightened entrepreneurs and curtailed investment, a political explanation came obviously to mind. Industrial entrepreneurs could trust Depretis (in power from 1876 to 1887), and again Giolitti (from the turn of the century to 1913), but not the "agrarian" Right that preceded Depretis, nor Crispi, his successor, who pursued highly adventurous policies (Fenoaltea 1967, 1969; for further references and discussion Id. 2011, pp. 25-28, 67-70).

[47] Over the decades at hand, save for the very earliest years (until defeat in the Austrian war?) and the very latest (after victory in the Turkish war?), the risk premium on Italian consols varied with that of the financial periphery as a whole, on a par, for example, with that on Central American railway bonds: the long cycle in capital formation in Italy was essentially that of the entire financial periphery, imported through the international capital market, and not genetically Italian at all (for references and discussion Fenoaltea 2011, pp. 75-104). As will be noted below this evidence anticipated, and left unrefuted logically precluded, the neo-Gerschenkronian interpretation proposed in Toniolo (2013a).

The Kuznets school saw construction as "population-sensitive capital formation"; the revised hypothesis saw construction as "finance-sensitive capital formation." Metal consumption, still to our minds (an index of) "industrial investment," moved much as construction did; the evidence seemed to tell us that investment in industry had been as finance-sensitive as investment in infrastructure (and government spending in general).[48] That was admittedly bothersome, as it sat poorly with the familiar relationship between interest-sensitivity and asset longevity; but if those were the facts, there was not much that could be done about it.

We now know better. In the light of the new evidence, warships and trains aside the Kuznets cycle in metal consumption and engineering-industry output appears limited to the construction-related part of engineering, to hardware; the path of investment in ordinary machinery was altogether different. The new evidence thus reduces the scope of the (Italian) Kuznets-cycle story, from an investment cycle involving both infrastructure and equipment to an investment cycle involving infrastructure alone. But it thereby strengthens its appeal: industrial investment did not follow the long cycle at all, the problem created by its apparently excessive sensitivity to capital-market conditions has been eliminated at the root.

The late-twentieth-century interpretations – the Bonelli-Cafagna story, the Kuznets-cycle story – shared the view that the upswings of the 1880s (the Depretis years) and of the *belle époque* (the Giolitti years) were horses of much the same color. The most visible recent contributions share instead Gerschenkron's belief in a structural break in the mid-1890s – and Romeo's belief that that the key to growth was the praiseworthy policy of the State. They have much in common; but for all that they again tell very different stories.

The neo-Gerschenkronian view was pioneered by Pierluigi Ciocca (Ciocca 2006, p. 342, 2007, pp. 137-163, 2008) and Gianni Toniolo (Toniolo 2006, pp. 369-370, 2007, p. 132).[49] Ciocca fitted a quadratic trend to the (second-generation) GDP series, and concluded that while the Depretis and the Giolitti years displayed similar cyclical upswings, the latter years alone were dominated by a strong trend acceleration; but the exercise seems little more than a sop to the *chiffrephiles*, and the heart of his argument lies elsewhere. Ciocca emphasizes the exceptionally vigorous growth of industrial investment in the Giolitti years, and ties it to Giolitti's pro-competition policies, which put pressure on monopoly rents and induced entrepreneurs to increase productivity: in Ciocca's long-term perspective the years prior to World War I are to be seen as analogous to that one other period when the anti-competitive constraints on Italy's economic growth were temporarily loosened, the halcyon years after World War II, the years of the "economic miracle." Ciocca's *reprise* of Gerschenkron's interpretation is thus very limited: the trend acceleration of the Giolitti years was not a *permanent* change, tied to the creation of previously missing capacities ("prerequisites"), but a merely *temporary* one, tied to sound ("anti-trust") policies that lasted all too briefly. Ciocca's interpretation focuses on the enduring institutional constraints on Italy's economic progress, he draws on history to extract valuable lessons for the present; but for all that his interpretation of the period at hand fares no better than those that preceded it.

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[48] The major upswings in naval shipbuilding were tied of course to naval rivalries, specifically to the naval race with France in the 1880s and the pan-European dreadnought race in the run-up to the Great War, as those in railway procurement were tied to the vast public-works program of the 1880s and to reequipment after the railways' nationalization in 1905; but those major projects were successfully carried through, and perhaps conceived at all, thanks to the easy financial conditions that marked the 1880s and the *belle époque*.

[49] Ciocca (2006) and Toniolo (2006, 2007) were reviews of Fenoaltea (2006), the original, Italian edition of Fenoaltea (2011).

The evidence that has now been brought to bear suggests that in the Giolitti years investment in industry grew no faster than before: Ciocca's story too has been deprived of its empirical foundation, and the effect of Giolitti's enlightened policies is simply moot.

Toniolo's reaction to my Kuznets-cycle story similarly emphasized the exceptional growth of the Giolitti years, and my failure to recognize the merits of the political leaders whose innovations made it possible. His own story has since been perfected, and he tells it from a bully pulpit (Toniolo 2013a,b). He shares Ciocca's neo-Gerschenkronian starting-point, the mid-1890s trend break as Ciocca himself quantified it (Toniolo 2013a, p. 16); he shares his approval of public policy, albeit with a different focus (on the banking reform of the mid-1890s, on the "clever" macroeconomic policies that thence "supported growth," pp. 15-17); he shares Ciocca's long-term perspective. But their interpretations are very far apart. Toniolo stresses the break between the decades of "tenuous growth" to 1896 (p. 9), when Italy fell further behind the leaders, and the subsequent century, the "long convergence" (p. 16) that saw Italy finally join their ranks.[50] The "sharp growth acceleration" and more rapid productivity growth of the Giolitti years (p. 16) were not Ciocca's happy aberration but a new beginning: in the language of yesteryear (p. 11) a "big push" (Gerschenkron 1955), indeed a classical "take-off" duly followed by the long "drive to maturity" (Rostow 1960). Toniolo's chapter-length survey precluded an in-depth discussion of the literature, but he brings the Kuznets-cycle story into his own, claiming that the swings in capital inflows were themselves induced by the confidence, or lack of confidence, Italy's policies inspired (Toniolo 2013a, pp. 14-17).[51]

The debate is not just a gerontomachy: the voices of the younger generation have also been heard, and they trace a revealing path. Emanuele Felice and Giovanni Vecchi, in particular, have spoken repeatedly to the issue, often but not always together.[52] The most telling comparison is between Brunetti, Felice and Vecchi (2011) – the chapter on national income in Vecchi (2011) – and Felice and Vecchi (2015), their updated survey of the Italian economy's first century and a half.[53] In the earlier piece the authors presented their new 150-year-long GDP series, reviewed the historians' debate, and concluded that the "new" (cyclical) story suggested by the present author sat well with the evidence; the only limit to that endorsement was a brief footnote recalling the skeptical comments in Toniolo (2007) (Brunetti, Felice and Vecchi 2011, pp. 213-218).[54] The relevant part of the later

[50] Toniolo also describes how, since the early 1990s, Italy is again falling behind (Toniolo 2013a, p. 26, whence his subtitle "A tale of convergence and two tails," p. 5), but these recent developments do not concern us here.

[51] In the Giolitti years, in particular, "[a] sequence of balanced budgets revived the interest of foreign investors in Italy... Interest rates slowly converged on those of Paris and London" (Toniolo 2013a, p. 17).

[52] The alternative views – the Kuznets-cycle story, the Giolittian-take-off story – have also been discussed by Alberto Baffigi, who produced the sesquicentennial national accounts; but on these issues he has remained consistently agnostic. He does suggest that the measured Giolittian acceleration is stronger if one uses early-period weights than late-period weights, but that is a "Gerschenkron effect" (itself the result of bad measurement, Fenoaltea 2015d). See Baffigi (2013b), pp. 168-171, (2015), pp. 24-35, 56-61.

[53] Alessandro Brunetti, their sometime coauthor, is a statistician, presumably not involved in the more narrowly historical debates.

[54] Their summary of the "cyclical model" cites the Kuznets cycle story, but ties the swings in foreign investment to "the political climate" in Italy itself: a conflation with the earlier "political cycle" story that anticipates Toniolo (2013a), as just noted, and may well have been passed on to him, or even taken from him, if only in conversation.

piece is an almost verbatim translation of the earlier one, as far as it went; but the place of the earlier dismissive reference to Toniolo is taken by a sentence chastising me for my "disregard for the role played by national institutions and domestic economic-policy decisions" and, in a further paragraph, a long, critical excerpt from Toniolo (2007), cited chapter and verse (Felice and Vecchi 2015, pp. 522-523). The relevant chapter in Felice (2015) is similarly aligned with Toniolo's views: the author pointedly reproves me for failing to appreciate the shift from slow growth in 1861-96 to faster growth in 1896-1913, and the reforms and policies that began Italy's long convergence on the leaders (pp. 113-158, and esp. pp. 135, 142-146).[55]

To convince those who will soon enough be the senior figures we are now is to shape the new consensus: the "new orthodoxy" that Toniolo suggested might have been mine (Toniolo 2007, p. 131) is clearly his. Thou hast conquered, O pale Venetian...

...or maybe thou hast only a half-time lead, and a fragile one at that, for the weaknesses of Toniolo's story are more real than apparent. We agree that the flows of foreign capital drove the investment cycle in general, and the investment upswing of the Giolitti years in particular. Toniolo traces these flows to the confidence inspired by policy changes in Italy itself: that is the stuff of my "political cycle," the story I too used to tell (Fenoaltea 1969, p. 110, 2011, pp. 27-28). But I abandoned that story for a reason. The spread between Italian and British interest rates, our measure of the markets' confidence in things Italian, varied; to understand whether it varied for British reasons or for Italian reasons – "to test the political-cycle hypothesis" – I looked at the broader evidence.[56] That evidence was unequivocal: from Kuznets-cycle trough to peak to trough to (near) peak the Italian spread matched the spread on the bonds of the world's financial periphery, most closely that on U.S. and Central American railway bonds. Whatever happened in Italy, its position within the periphery was unchanged: domestic policies – restoring and reabandoning convertibility, a stinging defeat in East Africa, financial collapse and reform, deficits and balanced budgets – apparently mattered not a whit, quite as if the failures had been anticipated, and the successes not expected to last (Fenoaltea 2006, pp. 114-119, 2011, pp. 98-102).[57] I changed my story because I looked at the evidence: Toniolo's

[55] "So we return to Gerschenkron and Cafagna, we return to those who recently, like Toniolo, have in essence revived that interpretation. We return to those who tie the success or failure of a country to the action of its ruling classes (economic policies), to the role of institutions" (p. 148, my translation).

[56] The framework is that of the standard "push-pull" analysis. Imagine we find a significant increase in migration from Italy to the United Kingdom. To understand its source we look at the broader flows. At the limit, if the greater flow into Britain is exclusively Italian, and the outflows from Italy to other destinations parallel those to Britain, the underlying pattern is that people are leaving Italy (for the U.K., and everywhere else): clearly, push. If instead the greater outflow from Italy is exclusively to the U.K., and the flows into Britain from other countries parallel those from Italy, the underlying pattern is that people are moving to the U.K. (from Italy, and everywhere else): clearly, pull.

[57] As noted above (footnote 47), my story is also one with two tails, as Italy clearly benefited from country-specific capital inflows in the immediate aftermath of Unification, to 1866, and again from country-specific confidence on the very eve of the World War: clearly by 1913, but as clearly not as late as 1906 (the "near" peak referred to above), a decade into the supposedly new "Giolittian" age. The story summarized in the above text applies, to my mind, to the four decades in between: my take is that Italy's rating dropped as a result of its military defeats in 1866, and rose again with its military victory in the Turkish war. In those two episodes what Italians did clearly mattered – as if national credibility depended first and foremost on effective nastiness (whence for example the burning of the Louvain library by the Kaiser's army in 1914). See Fenoaltea (2011), p. 102.

critique simply ignores it, as if the relevant pages of the book he twice reviewed had entirely escaped his notice.[58]

The evidence Toniolo appeals to is the GDP "trend break" in 1896, the associated acceleration in productivity growth, the "convergence" in per-capita GDP over the Giolitti years; but that evidence is equivocal if not tainted. The trend-break calculation compares trough-to-trough growth, to 1896, to trough-to-peak growth from 1896 to 1913: the "acceleration" is foregone, and meaningless.[59] The productivity-growth calculation is heir to the same logical difficulty (to the extent that measured productivity tends to vary pro-cyclically), and to the overwhelming practical problem that the productivity figures on which Toniolo relies are not worthy of his confidence.[60] GDP convergence is not evidence either way: it is part of the Kuznets-cycle story too, as the massive rise of British capital exports over the *belle époque* curbed investment and GDP growth in the core, and boosted it in the periphery.

The deeper point to which we return is that the aggregate national accounts in general, and the GDP series in particular, are consistent with too many alternative stories to help discriminate among them. The proof of the neo-Gerschenkronian pudding has to found in the details, in the fruits of disaggregation; and the burden of the evidence is that

[58] Once more, with feeling: from behind a canal's levee Toniolo and I can see, at intervals, the heads of two men in a boat. From observation to observation they invert their position. I suggest they keep changing their places on the boat; but then I take a closer look, and report back that it is the boat that points first one way and then the other, that the men within it never leave their seats. Toniolo's "handbook" then asserts as fact that the men changed places on the boat (for reasons we can at best surmise, Fenoaltea 2011, pp. xix, 104-108).

[59] A similar criticism applies to the average growth of real wages before and after 1896 (Felice 2015, pp. 146-171), as these surged in the 1880s and the *belle époque*, but stagnated earlier and in between. Felice characteristically interprets the turn-of-the-century acceleration as "a sign of the efficacy of [Giolitti's] redistributive policies" (ibid., my translation; above, footnote 55). Giolitti certainly stopped using the army to resolve industrial disputes in the owners' favor, but then as earlier the main driver of the real-wage growth spurt appears to have been the growing openness of the Italian economy. By the same token, a cardinal redistributive policy measure was the tariff on grain introduced to undo the effects of the 1880s' "grain invasion": Giolitti maintained it to the benefit of the (landed) upper classes and the detriment of the working class, and its real burden was reduced only by the substantial rise in commodity prices. See Fenoaltea (2011), pp. 123-127, 152-162, 252-257; also Toniolo (2013a), p. 14, noteworthy for its spin.

[60] The productivity figures are those presented in Broadberry, Giordano, and Zollino (2013a), part of the same sesquicentennial corpus (Toniolo 2013b). One set of problems stems from the input series on which they are based. The capital-input series is visibly unsound, unless one can seriously believe that Italy's net stock of machinery and transport equipment *dropped by half* over the decade to 1922, and began to recover only half a dozen years later (Broadberry, Giordano, and Zollino 2013b, pp. 706-707; similarly the revised estimates in Giordano and Zollino 2015, p. 212): their investment figures, or their assumed asset lives, are presumably well wide of the mark. Their labor-input series too is manifestly deficient, as their census-based 1911 benchmark grossly underestimates industrial employment (because they failed to recognize the partial nature of the industrial census), and their extrapolation assumes that the heady rise in production over the *belle époque* didn't reduce the unemployment rate at all (Giordano and Zollino 2015, pp. 170, 197-199, 204-206, with estimates unchanged from Broadberry, Giordano, and Zollino 2013b, pp. 682, 694): both employment in 1911 and employment growth over the preceding upswing are clearly much understated. But the overwhelming *logical* weakness is that (the industrial component of) productivity in 1911 is measured by mating their industrial "employment" figures (which correspond to an unemployment rate in excess of 45% at the peak of the pre-war boom) to industrial production estimates (those in Baffigi 2013a, that is, essentially, mine) that are instead by construction consistent with, and if census-based assume, near full employment (at what was, to repeat, the peak of the pre-war boom): what emerges is not a measure of productivity, it is nothing at all (Fenoaltea 2015c, 2016b).

industrial investment grew no faster after the turn of the century than before, that the upswings of the Depretis and Giolitti years were as alike as two peas in a pod. They were years of easy credit as London smiled on foreign bonds, years therefore of exceptionally high investment in infrastructure, of indulgence in arms races and in soon-enough-disastrous colonial adventures.[61] What they were not is what we had taken them to be, years of exceptionally high investment in machinery, in industry's capacity to produce.

Gerschenkron's story, Romeo's story, the Bonelli-Cafagna story, the "political cycle" story, the "revised Kuznets cycle" story, the neo-Gerschenkronian stories are all predicated on the long swing in industrial investment, on its exceptionally rapid growth over the 1880s and/or the *belle époque*. Investment in industry appears actually to have grown relatively steadily from decade to decade, with no long swing at all: for half a century we chewed on, and fought over, a non-existent bone. The long swing in industrial production and in aggregate capital formation was rather a long swing in investment in infrastructure (and other government spending): as it turns out, the exceptional growth of the 1880s and again of the *belle époque* was tied not to exceptional additions to Italy's industrial plant, to the more rapid modernization of its economy, to anything dear to our hearts, but to exceptional surges in the activity of Italy's blacksmiths and bricklayers, in branches of production little changed from classical times. *Sic transit*.

The newly recovered evidence moves the discussion of Italy's industrial development to a new and different venue. The old debate is dead: long live the new one, whithersoever it may take us.[62]

4. Conclusion

The story of the engineering industry in post-Unification Italy has been derived directly from the evidence on aggregate metal consumption; the latter points to a long (Kuznets) cycle in production, and suggests that domestic products ever dominated the domestic market, with no visible gain from the progressive revisions of the tariff structure. New, disaggregated estimates are now available; and they tell a richer, less paradoxical story. The long cycle – with production and total purchases rapidly rising in the 1880s, falling back in the 1890s, and rising again in the early 1900s – is present in the (dominant) hardware sector, and seems tied directly, as contemporary observers suggested, to the construction cycle. The hardware industry ever dominated the domestic market, with a share of purchases that exceeded eight-tenths; but the net tariff protection it received was ever significant, and

[61] Giolitti's conquest of Tripolitania, a short-term success, set the stage for the further colonial adventures of the interwar years. As is well known the latter alienated Italy from its former allies, causing it finally to abandon what had been a fixed point of its foreign policy from Unification on, that Italy should never risk a war against the mistress of the seas. Giolitti favored neutrality in the Great War, and that might have avoided Fascism altogether; but without its dreams of empire even a Fascist Italy could have avoided the Carthaginian alliance with Hitler's Germany in the Second World War, as Franco's Spain did (or rejoined the Western Allies, who would no doubt have accepted Mussolini as readily as they accepted Stalin).

[62] The reader will forgive me if I do not indicate the direction I expect it to take. One reason is that the relatively steady growth path of industrial investment does not manifestly restrict the set of possible correlates: nothing stands out as it did decades ago when that path appeared to follow the long cycle. Another is that what then first stood out, at least to my eyes, turned out to be a red herring. I corrected my error some twenty years later; at this point, with a much shortened horizon, I should in any case be reluctant to hazard what could be another fish story.

varied little. Purchases of ordinary machinery apparently grew far more rapidly and altogether more steadily, with minor setbacks at roughly decadal intervals, and nothing like the two decades it took for hardware purchases to surpass their late-1880s peak. Domestic production, initially minuscule, grew even more rapidly: the tariff reforms of 1878 and 1887 progressively altered net protection from negative to positive, and the census data suggest that the industry's share of the domestic market practically doubled, from about one third in 1871 and 1881 to nearer two thirds in 1900 and 1911. The production of precision equipment shows a long cycle similar to that of fabricated metal, but it seems mostly a (public and private) consumption cycle, the induced reflection of the long cycle in capital supply, construction and overall production; the massive increases in watch imports recorded over the 1880s are a further confirmation that "the crisis of the 1880s" is a figment of the literature.

The new, disaggregated estimates have broad implications for the macroeconomic history of post-Unification Italy. The previous, aggregate estimates for the engineering industry pointed to a cycle broadly parallel to the Kuznets cycle in construction. The new estimates both strengthen and weaken that parallel. They strengthen it, by showing that that long cycle was in the (large) hardware component of the engineering industry, that for which construction was a direct customer. But they otherwise weaken it, for they show that that long cycle in metal consumption was not, as we had taken it to be, a long cycle in the production of, and investment in, industrial machinery. Investment in machinery grew relatively steadily, with altogether shorter cycles (and a downturn in the wake of "the crisis of 1907" even as infrastructure investment continued to grow). The long cycle tied to capital-market conditions now appears essentially as a pure construction cycle; and that too can be seen as a return to normalcy.

The literature of the last half century and more has focused on the causes, and significance, of the exceptionally vigorous growth of industrial investment in the 1880s and again, to some primarily, from the turn of the century. The new, disaggregated estimates establish that the growth of industrial investment in those years was not exceptionally vigorous at all, in fact it much resembled that of the preceding and intervening decades: our long debate turns out to have been about nothing at all.

Proper measurement is all too often its own niggardly reward. In this case the fruits of disaggregation have proved wonderfully rich: long-held views have been swept away, and the path ahead appears in a new light. Bliss is it in this dawn to be alive: to be young would be very heaven.

References

Baffigi, A. (2011). Italian National Accounts, 1861-2011. *Banca d'Italia – Economic History Working Papers* No. 18.

Baffigi, A. (2013a). Data appendix – Italy's national accounts (1861-2010): Tables A1–A4. In G. Toniolo, ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 632-79.

Baffigi, A. (2013b). National accounts, 1861-2011. In G. Toniolo, ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 157-86.

Baffigi, A. (2015). *Il PIL per la storia d'Italia. Istruzioni per l'uso*, Collana storica della Banca d'Italia. Serie statistiche, vol. V, Venice, Marsilio.

Bardini, C. (1998). *Senza carbone nell'età del vapore. Gli inizi dell'industrializzazione italiana*, Milan, Bruno Mondadori.

Bonelli, F. (1971). *La crisi del 1907. Una tappa dello sviluppo industriale in Italia*, Turin, Fondazione Luigi Einaudi.

Bonelli, F. (1978). Il capitalismo italiano. Linee generali di interpretazione. In R. Romano and C. Vivanti, eds., *Storia d'Italia. Annali, 1. Dal feudalesimo al capitalismo*, Turin, Einaudi, pp. 1193-255.

Broadberry, S., Giordano, C., and Zollino, F. (2013a). Productivity. In G. Toniolo, ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 187-226.

Broadberry, S., Giordano, C., and Zollino, F. (2013b). Data appendix – Italy's national accounts (1861-2010): Tables A5–A7. In G. Toniolo, ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 680-712.

Brunetti, A., Felice, E., and Vecchi, G. (2011). Reddito. In G. Vecchi, *In ricchezza e povertà. Il benessere degli italiani dall'Unità ad oggi*, Bologna, il Mulino, pp. 209-34.

Cafagna, L. (1983). La formazione del sistema industriale: ricerche empiriche e modelli di crescita. *Quaderni della Fondazione G. G. Feltrinelli* 25, 27-38.

Carter, N., ed. (2013). The economy of liberal Italy: a roundtable discussion with Brian A'Hearn, Nick Carter, Giovanni Federico and Vera Zamagni on Stefano Fenoaltea's *The Reinterpretation of Italian Economic History: From Unification to the Great War*. Cambridge: Cambridge University Press, 2011. *Modern Italy* 18, 81-94.

Cerrito, E. (2012). Quale storiografia economica? Chiose su "Depressioni." *Studi storici* 23, 141-91.

Ciccarelli, C. (2012). The consumption of tobacco in Italy: national and regional estimates, 1871-1913. *Rivista di storia economica* 28, 409-52.

Ciccarelli, C., and Fenoaltea, S. (2009). Shipbuilding in Italy, 1861-1913: the burden of the evidence. *Historical Social Research* 34, no. 2, 333-73.

Ciccarelli, C., and Fenoaltea, S. (2011). The rail-guided vehicles industry in Italy, 1861-1913: the burden of the evidence. *Research in Economic History* 28, 43-115.

Ciccarelli, C., and Fenoaltea, S. (2014). *La produzione industriale delle regioni d'Italia, 1861-1913: una ricostruzione quantitativa. 2. Le industrie estrattivo-manifatturiere*, Rome, Banca d'Italia.

Ciccarelli, C., and Nuvolari, A. (2015). Technical Change, Non-Tariff Barriers, and the Development of the Italian Locomotive Industry, 1850–1913. *Journal of Economic History* 75, 860-88.

Ciocca, P. (2006). A proposito di Stefano Fenoaltea, *L'economia italiana dall'Unità alla Grande Guerra*, Bari-Roma, 2006. *Rivista di storia economica* 22, 339-43.

Ciocca, P. (2007). *Ricchi per sempre? Una storia economica d'Italia (1796-2005)*, Turin, Bollati Boringhieri.

Ciocca, P. (2008). Interpreting the Italian economy in the long run. *Rivista di storia economica* 24, 241-46.

Comitato nazionale per le tariffe doganali e per i trattati di commercio (1917a). *Notizie sulla industria meccanica in Italia. Caldaie per macchine: tariffa doganale n. 308*, Milan, La Stampa Commerciale.

Comitato nazionale per le tariffe doganali e per i trattati di commercio (1917b). *Notizie sulla industria meccanica in Italia. Locomobili – macchine agrarie: tariffa doganale n. 310 d ed f*, Milan, La Stampa Commerciale.

Corpo delle miniere (1881). *Notizie statistiche sull'industria mineraria in Italia dal 1860 al 1880*, Rome, Regia Tipografia.

Corpo delle miniere (1896). *Rivista del servizio minerario 1895*, Rome.

Corpo delle miniere (1902). *Rivista del servizio minerario 1901*, Rome.

Corpo delle miniere (1915). *Rivista del servizio minerario 1913*, Rome.

Direzione generale della statistica (1874-76). *Popolazione. Censimento 31 dicembre 1871*, 3 vols., Rome, Stamperia Reale/Tip. Cenniniana/Regia Tipografia.

Direzione generale della statistica (1883-85). *Censimento della popolazione del Regno d'Italia al 31 dicembre 1881*, 3 vols. in 4 tomes plus *Relazione generale e confronti internazionali*, Rome, Tip. Bodoniana/Botta.

Direzione generale della statistica (1896). *Annuario statistico italiano 1895*, Rome, Bertero.

Direzione generale della statistica (1902-04). *Censimento della popolazione del Regno d'Italia al 10 febbraio 1901*, 5 vols., Rome, Bertero.

Direzione generale della statistica (1906). *Statistica industriale. Riassunto delle notizie sulle condizioni industriali del Regno. Parte I*, Rome, Bertero.

Direzione generale della statistica (1912). *Annuario statistico italiano 1911*, Rome, Bertero.

Direzione generale della statistica (1913-16). *Censimento degli opifici e delle imprese industriali al 10 giugno 1911*, 5 vols., Rome, Bertero.

Direzione generale della statistica (1914-16). *Censimento della popolazione del Regno d'Italia al 10 giugno 1911*, 7 vols., Rome, Bertero.

Direzione generale della statistica (1915). *Annuario statistico italiano 1914*, Rome, Bertero.

Direzione generale delle gabelle (1861ff.). *Movimento commerciale del Regno d'Italia nel [year]*.

Federico, G., Natoli, S., Tattara, G., and Vasta, M. (2011). *Il commercio estero italiano, 1862-1950*, Collana storica della Banca d'Italia. Serie statistiche, vol. IV, Rome-Bari, Laterza.

Federico, G., and Wolf, N. (2013). A long-run perspective on comparative advantage. In G. Toniolo, ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 327-50.

Felice, E. (2015). *Ascesa e declino: storia economica d'Italia*, Bologna, il Mulino.

Felice, E., and Vecchi, G. (2015). Italy's growth and decline, 1861-2011. *Journal of Interdisciplinary History* 45, 507-48.

Fenoaltea, S. (1967). Public policy and Italian industrial development, 1861-1913. Unpublished Ph.D. dissertation, Harvard University.

Fenoaltea, S. (1969). Decollo, ciclo, e intervento dello Stato. In A. Caracciolo, ed., *La formazione dell'Italia industriale*, Bari, Laterza, pp. 95-114.

Fenoaltea, S. (1984). Railway construction in Italy, 1861-1913. *Rivista di storia economica* 1, *International Issue*, 27-54.

Fenoaltea, S. (1988). International resource flows and construction movements in the Atlantic economy: the Kuznets cycle in Italy, 1861-1913. *Journal of Economic History* 48, 605-37.

Fenoaltea, S. (1992). Il valore aggiunto dell'industria italiana nel 1911. In G. M. Rey, ed., *I conti economici dell'Italia. 2. Una stima del valore aggiunto per il 1911*, Collana storica della Banca d'Italia. Serie statistiche, vol. I.2, Rome-Bari, Laterza, pp. 105-90.

Fenoaltea, S. (2003). Notes on the rate of industrial growth in Italy, 1861-1913. *Journal of Economic History* 63, 695-735.

Fenoaltea, S. (2005). The growth of the Italian economy, 1861-1913: preliminary second-generation estimates. *European review of economic history* 9, 273-312.

Fenoaltea, S. (2006). *L'economia italiana dall'Unità alla Grande Guerra*, Bari-Rome, Laterza.

Fenoaltea, S. (2010). The reconstruction of historical national accounts: the case of Italy. *PSL Quarterly Review* 63, 77-96.

Fenoaltea, S. (2011). *The reinterpretation of Italian economic history: from Unification to the Great War*, New York, Cambridge University Press.

Fenoaltea, S. (2012). The growth of the Italian economy, 1861-1913: the expenditure side re- (and de-) constructed. *Rivista di storia economica* 28, 285-318.

Fenoaltea, S. (2015a). Italian industrial production, 1861-1913: a statistical reconstruction. F. The engineering industries. *Carlo Alberto Notebooks* No. 419.

Fenoaltea, S. (2015b). The measurement of production movements: lessons from the general engineering industry in Italy, 1861-1913. *Explorations in Economic History* 57, 19-37.

Fenoaltea, S. (2015c). Industrial employment in Italy, 1911: the burden of the census data. *Rivista di storia economica* 31, 225-46.

Fenoaltea, S. (2015d). Of economics and statistics: the "Gerschenkron effect." *Carlo Alberto Notebooks* No. 406.

Fenoaltea, S. (2016a). The measurement of production: lessons from the engineering industry in Italy, 1911. *Research in Economic History* 32, 73-145.

Fenoaltea, S. (2016b). Fenoaltea on industrial employment in 1911: a rejoinder. *Rivista di storia economica* 32, 113-17.

Field, A. J. (1985). On the unimportance of machinery. *Explorations in Economic History* 22, 378-401.

Gerschenkron, A. (1955). Notes on the rate of industrial growth in Italy, 1881-1913. *Journal of Economic History* 15, 360-75.

Gerschenkron, A. (1962 [1955]). Description of an index of Italian industrial development, 1881-1913. In Id., *Economic backwardness in historical perspective*, Cambridge MA, Harvard University Press, pp. 367-421.

Giordano, C., and Zollino, F. (2015). A historical reconstruction of capital and labour in Italy, 1861-2013. *Rivista di storia economica* 31, 155-223.

Giordano, F. (1864). *L'industria del ferro in Italia. Per cura del Ministero della Marina*, Turin, Cotta e Capellino.

Grioni, U. (1914). *Annuario della industria mineraria (per i minerali metalliferi), metallurgica, e meccanica in Italia. Anno 1, 1913/14*, 2 vols., Milan, La Stampa Commerciale/Tipografia Sociale.

Istituto centrale di statistica (1957). *Indagine statistica sullo sviluppo del reddito nazionale dell'Italia dal 1861 al 1956. Annali di statistica*, serie VIII, vol. 9, Rome, Istituto centrale di statistica.

Pezzuto, R. (2017). The age distribution of the labor force as evidence of prior events: the Italian data for 1911 and the long swing in investment from Unification to the Great War. *Banca d'Italia – Economic History Working Papers*, in press.

Romeo, R. (1959). *Risorgimento e capitalismo*, Bari, Laterza.

Rostow, W. W. (1960). *The stages of economic growth. A non-communist manifesto*, Cambridge, Cambridge University Press.

Sella, L., and Marchionatti, R. (2012). On the cyclical variability of economic growth in Italy, 1881-1913: a critical note. *Cliometrica* 6, 307-28.

Toniolo, G. (1977). Effective protection and industrial growth: the case of Italian engineering. *Journal of European Economic History* 6, 659-73.

Toniolo, G. (2006). A proposito di Stefano Fenoaltea, *L'economia italiana dall'Unità alla Grande Guerra*, Bari-Roma, 2006. *Rivista di storia economica* 22, pp. 367-71.

Toniolo, G. (2007). Review of Stefano Fenoaltea (2006), *L'economia italiana dall'Unità alla Grande Guerra* (Rome and Bari: Laterza). *Journal of Modern Italian Studies* 12, pp. 130-32.

Toniolo, G. (2013a). An overview of Italy's economic growth. In Id., ed., *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press, pp. 3-36.

Toniolo, G., ed. (2013b). *The Oxford handbook of the Italian economy since Unification*, New York, Oxford University Press.

United Nations (1971). *Indexes to the International Standard Industrial Classification of All Economic Activities*, Statistical Papers, Series M, No. 4, Rev. 2, Add. 1, New York, United Nations.

Vecchi, G. (2011). *In ricchezza e povertà. Il benessere degli italiani dall'Unità ad oggi,* Bologna, il Mulino.

Zamagni, V. (1993). *The economic history of Italy, 1860-1990: recovery after decline*, Oxford, Oxford University Press.

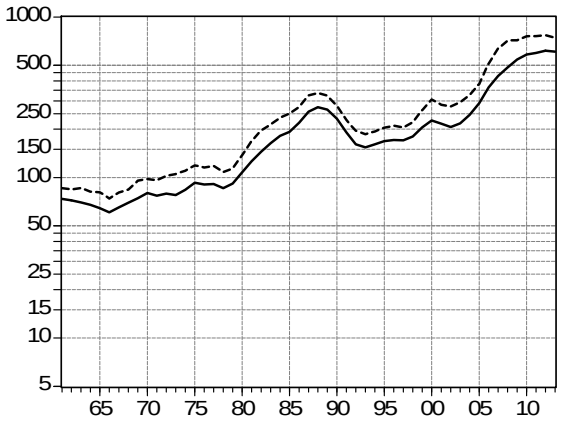
Zamagni, V. (2016). Fenoaltea on industrial employment in 1911: a reply. *Rivista di storia economica* 32, 109-12.

Figures and Tables

Figure 1

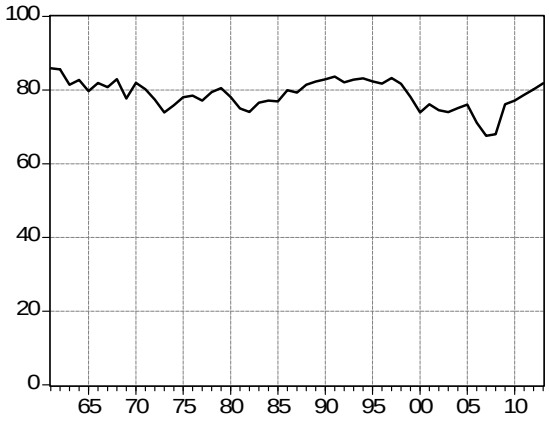
General-Engineering New Production and Purchases, 1861-1913: Aggregate Tonnages

A. New production and purchases (thousand tons)



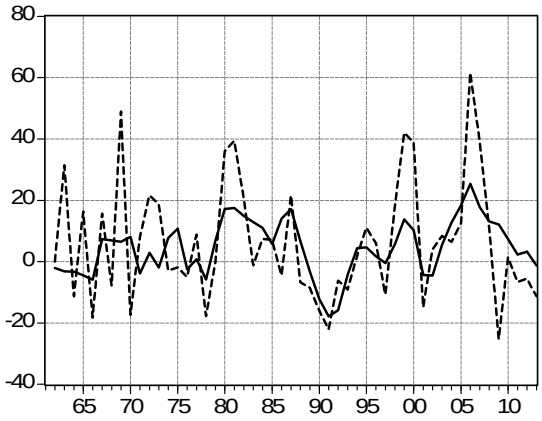
——— production -------- purchases

B. Tonnage market share (percent)



——— production/purchases

C. Annual growth rates (percent)



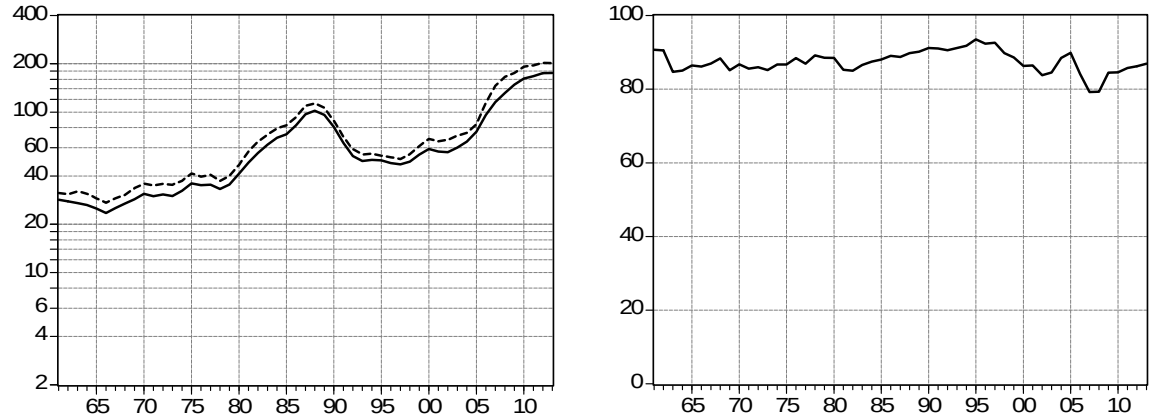
——— production -------- imports

Figure 2

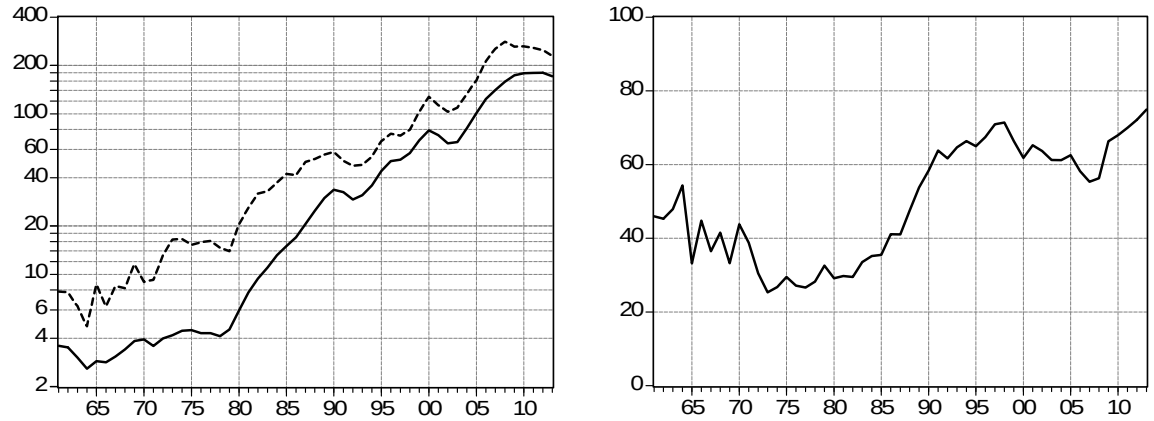
General-Engineering New Production and Purchases, 1861-1913, by Sector
(million lire of engineering-industry value added at 1911 prices)

New production and purchases *Market share (percent)*

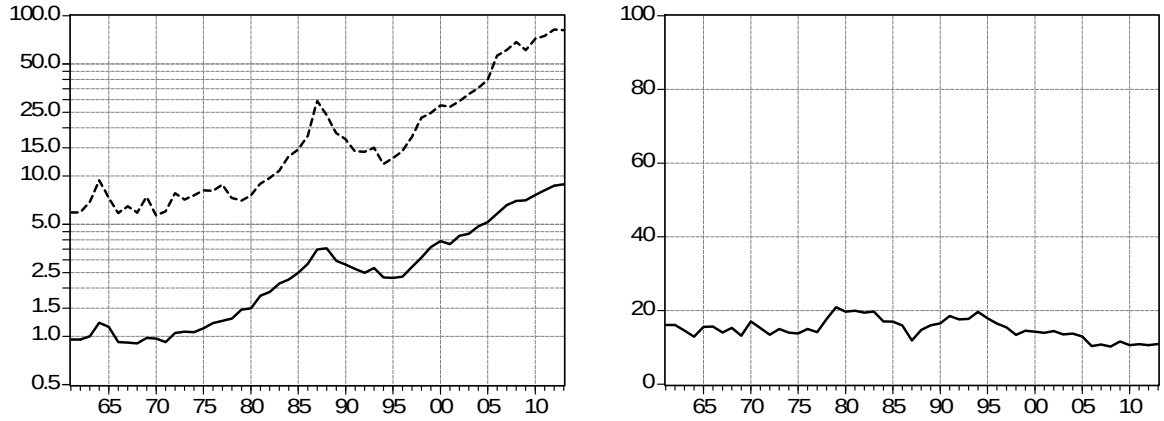
A. Fabricated metal and truss-structure components



B. Residual general equipment



C. Precision equipment



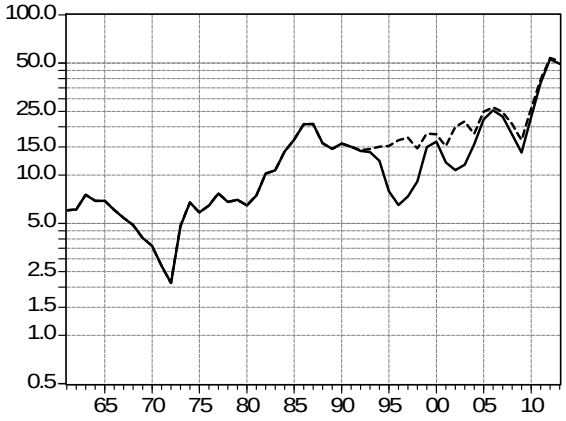
——— production
-------- purchases

——— production/purchases

Figure 3

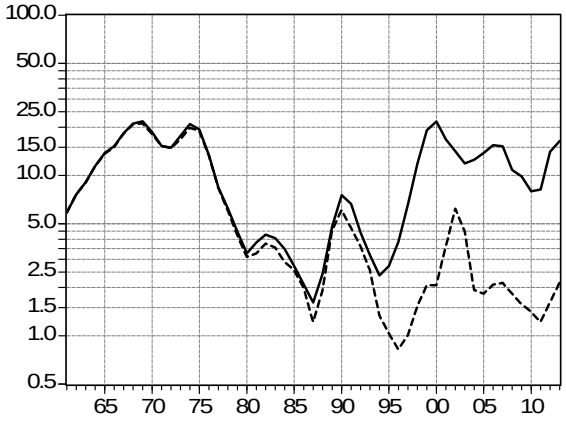
Ship and Railway Rolling-stock New Production, 1861-1913
(million lire of engineering-industry value added at 1911 prices)

A. Naval ships



——— total for the *Regia marina* -------- total including exports

B. Merchant ships



——— total -------- sailing ships

C. Railway rolling stock

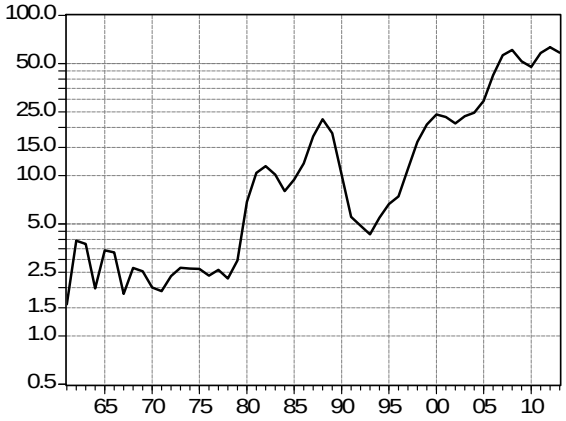
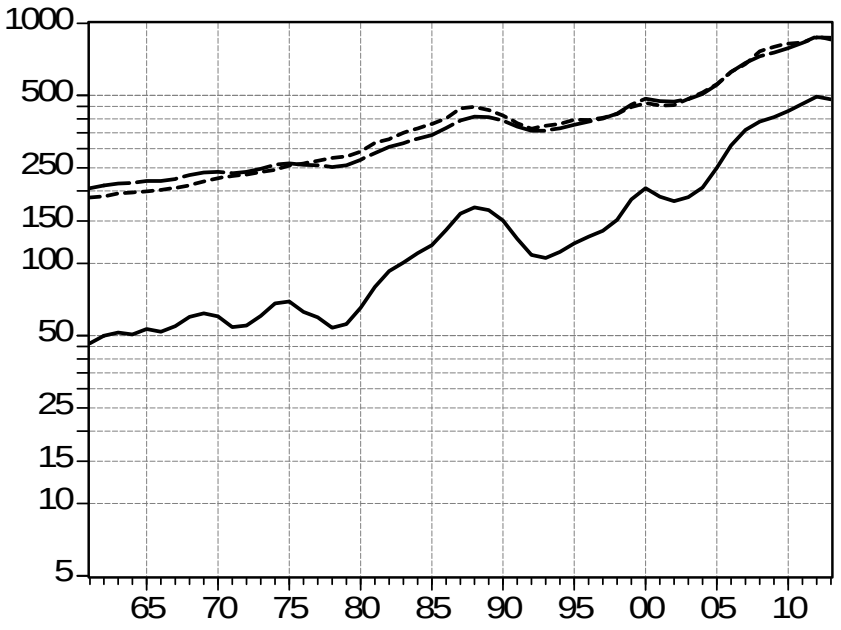


Figure 4

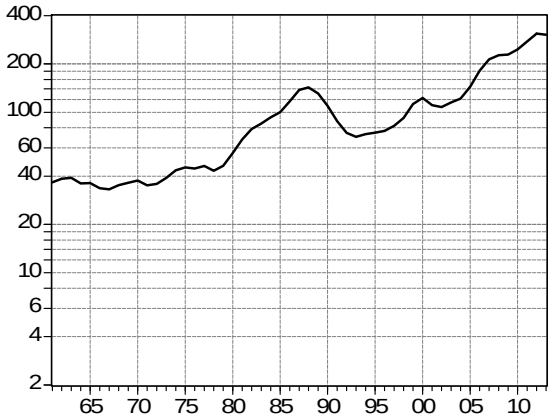
Total Engineering New Production, 1861-1913: by Destination
(million lire of engineering-industry value added at 1911 prices)

A. Total new production

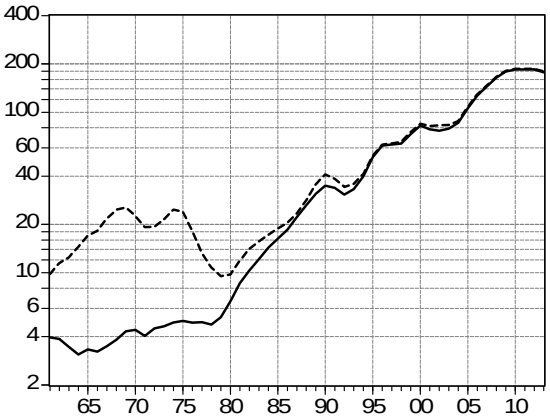


——— total new production —— total production -------- total production, Fenoaltea (2003)

B. New production for infrastructure/ government work



C. New production for other domestic markets and for foreign markets



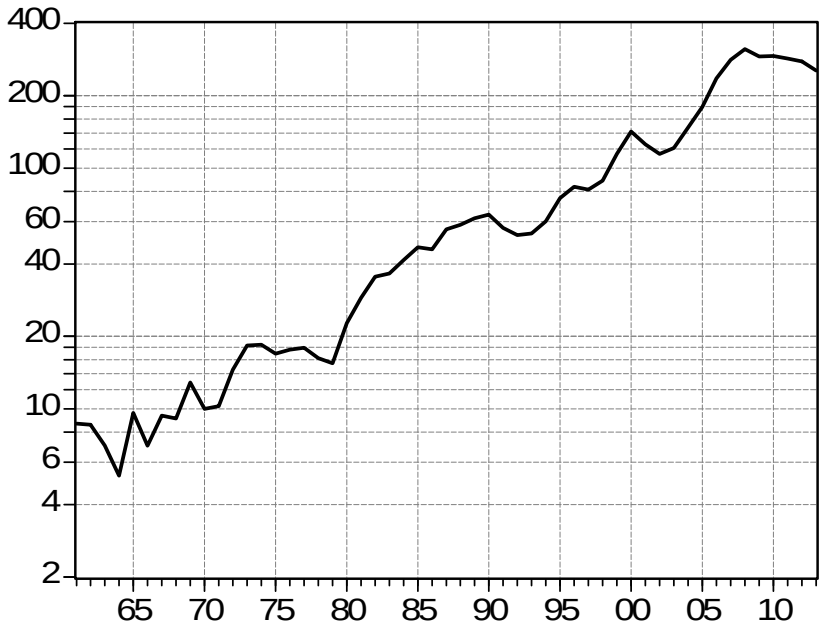
-------- total
——— total excluding ships

NB: maintenance and the working of precious metals are included (only) in panel A, total production; the new production of hand tools is included in panel B and excluded from panel C.

Figure 5

Investment in General Machinery, 1861-1913

A. Levels (machinery purchased: thousand tons)



B. Annual growth rates (percent)

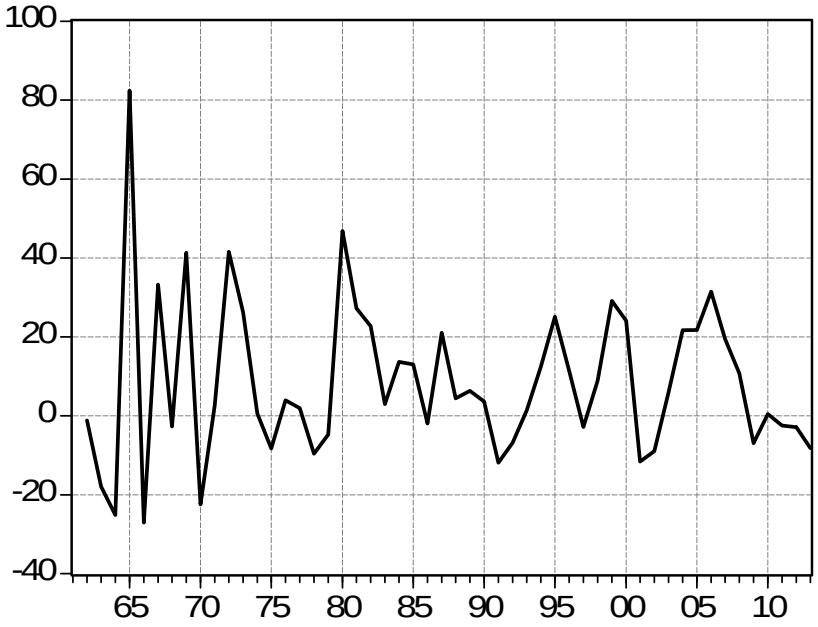


Table 1

Estimated general-engineering new production, 1861-1913 (thousand tons)

	(1) Fabri-cated metal	(2) Truss-structure components	(3) Machines merely assembled	(4) Other general equipment	(5) Precision instru-ments	(6) Clocks and watches merely assembled	(7) Clocks and watches from metal	(8) Metal consumed
1861	67.07	1.72	.40	3.86	.036	.004	.022	97.6
1862	65.46	1.95	.40	3.76	.036	.004	.022	95.6
1863	63.56	2.04	.32	3.27	.036	.006	.024	92.5
1864	61.85	1.92	.27	2.78	.043	.011	.028	89.5
1865	58.66	1.93	.62	2.99	.042	.006	.027	85.4
1866	55.24	1.58	.39	3.02	.032	.006	.023	80.4
1867	59.75	1.23	.57	3.23	.030	.011	.022	86.3
1868	63.80	1.24	.54	3.61	.030	.010	.022	92.3
1869	68.02	1.13	1.12	3.91	.031	.015	.023	98.2
1870	73.60	1.26	.80	4.11	.030	.016	.023	106.2
1871	69.64	2.77	.84	3.70	.028	.016	.022	102.1
1872	70.03	4.58	1.64	3.89	.033	.020	.023	105.0
1873	66.17	7.22	2.23	3.90	.037	.018	.021	103.0
1874	71.45	7.55	2.17	4.22	.037	.017	.021	110.9
1875	80.90	6.59	1.53	4.49	.037	.021	.023	122.9
1876	78.97	6.45	1.63	4.24	.038	.030	.023	119.8
1877	79.85	6.25	1.69	4.22	.038	.031	.025	120.7
1878	74.63	6.35	1.50	4.09	.041	.030	.025	113.6
1879	79.59	6.82	1.30	4.61	.044	.046	.025	121.6
1880	93.04	7.87	2.54	5.78	.049	.037	.026	142.5
1881	108.74	9.37	3.90	7.29	.054	.062	.027	167.4
1882	123.98	11.65	5.68	8.57	.058	.062	.029	192.3
1883	139.71	13.03	6.31	10.15	.061	.083	.031	217.2
1884	156.14	12.53	7.86	11.99	.066	.081	.035	241.1
1885	165.16	12.23	9.12	13.61	.072	.092	.038	254.9
1886	189.45	12.05	8.02	16.22	.080	.113	.041	290.8
1887	223.16	12.09	9.71	19.62	.112	.124	.043	340.7
1888	234.44	13.19	8.90	24.66	.129	.098	.042	363.6
1889	220.70	12.17	7.23	30.83	.110	.072	.038	351.5
1890	185.45	10.99	5.34	35.62	.095	.087	.036	308.4
1891	146.44	9.83	3.64	34.84	.082	.091	.037	253.4
1892	119.98	9.68	2.84	31.52	.073	.092	.037	213.3
1893	112.69	8.07	2.58	33.70	.073	.110	.039	204.2
1894	113.50	9.27	2.95	38.86	.068	.082	.037	213.2
1895	113.74	7.91	2.87	47.86	.065	.088	.036	223.1
1896	109.59	7.77	2.46	55.59	.074	.077	.035	227.0
1897	102.79	13.12	2.19	56.94	.088	.086	.038	226.0
1898	108.31	11.67	1.75	62.66	.108	.084	.043	238.9
1899	121.76	11.13	2.96	74.95	.122	.106	.050	271.9
1900	132.87	10.43	5.41	85.95	.128	.120	.057	299.8
1901	126.94	11.83	4.17	80.50	.134	.085	.058	286.7
1902	122.20	15.73	4.24	71.40	.137	.131	.062	273.6
1903	127.99	20.04	4.05	72.85	.143	.122	.069	288.4
1904	144.25	16.24	5.81	88.27	.152	.143	.080	325.2
1905	167.38	16.98	5.84	110.39	.167	.143	.084	385.0
1906	208.76	26.63	8.59	134.53	.205	.128	.095	482.7
1907	252.49	30.19	11.27	152.33	.239	.139	.102	568.4
1908	290.53	30.77	16.67	170.42	.255	.146	.108	643.1
1909	328.48	33.31	11.06	189.18	.255	.131	.121	720.8
1910	355.74	40.91	12.33	194.58	.259	.160	.137	773.6
1911	367.76	41.77	14.18	194.78	.277	.160	.154	791.2
1912	385.07	42.32	11.65	196.02	.290	.175	.167	816.8
1913	385.93	42.23	11.07	186.83	.299	.160	.178	806.4

NB: "General engineering" excludes the shipbuilding, railway-vehicles, and precious-metal products industries.
Sources: Fenoaltea (2015a), chapter F.04.

Table 2

Net imports of general-engineering goods, 1861-1913 (thousand tons)

	(1) Fabri-cated metal	(2) Machine parts	(3) Other general equipment	(4) Precision instru-ments	(5) Clocks and watches: parts	(6) Clocks and watches: assembled	(7) Total
1861	7.03	.40	4.43	.184	.004	.048	12.1
1862	7.03	.40	4.43	.184	.004	.048	12.1
1863	11.83	.32	3.46	.197	.006	.064	15.9
1864	11.17	.27	2.23	.295	.011	.079	14.1
1865	9.47	.62	6.02	.229	.006	.059	16.4
1866	9.10	.39	3.62	.193	.006	.042	13.4
1867	9.13	.57	5.57	.221	.011	.042	15.5
1868	8.57	.54	4.97	.202	.010	.036	14.3
1869	12.03	1.12	7.86	.249	.015	.049	21.3
1870	11.45	.80	5.08	.176	.016	.035	17.6
1871	12.15	.84	5.72	.197	.016	.036	19.0
1872	12.08	1.64	9.00	.283	.020	.039	23.1
1873	12.58	2.23	12.21	.295	.018	.017	27.4
1874	11.99	2.17	12.06	.277	.017	.038	26.6
1875	13.28	1.53	10.91	.311	.021	.033	26.1
1876	11.05	1.63	11.73	.292	.030	.030	24.8
1877	12.86	1.69	12.04	.323	.031	.035	27.0
1878	9.73	1.50	10.64	.240	.030	.030	22.2
1879	11.08	1.30	9.55	.193	.046	.026	22.2
1880	12.98	2.54	14.38	.237	.037	.028	30.2
1881	20.14	3.90	17.69	.258	.062	.028	42.1
1882	23.59	5.68	21.18	.300	.062	.027	50.8
1883	23.41	6.31	20.04	.301	.083	.032	50.2
1884	23.85	7.86	21.64	.387	.081	.058	53.9
1885	23.86	9.12	24.16	.410	.092	.070	57.7
1886	24.60	8.02	21.75	.525	.113	.076	55.1
1887	29.58	9.71	26.34	1.143	.124	.085	67.0
1888	27.94	8.90	24.59	.900	.098	.072	62.5
1889	25.25	7.23	23.78	.682	.072	.056	57.1
1890	18.81	5.34	23.12	.579	.087	.052	48.0
1891	15.19	3.64	18.01	.416	.091	.053	37.4
1892	13.37	2.84	18.30	.408	.092	.057	35.1
1893	11.59	2.58	17.14	.418	.110	.057	31.9
1894	10.88	2.95	18.24	.321	.082	.047	32.5
1895	8.31	2.87	24.38	.365	.088	.051	36.1
1896	9.62	2.46	25.62	.480	.077	.046	38.3
1897	9.11	2.19	22.18	.635	.086	.047	34.2
1898	13.44	1.75	24.17	.923	.084	.059	40.4
1899	16.83	2.96	36.50	.959	.106	.057	57.4
1900	22.47	5.41	50.62	1.063	.120	.065	79.7
1901	21.47	4.17	40.86	1.113	.085	.060	67.8
1902	26.25	4.24	38.69	1.134	.131	.065	70.5
1903	26.62	4.05	44.24	1.264	.122	.091	76.4
1904	20.59	5.81	53.33	1.392	.143	.084	81.3
1905	20.47	5.84	63.27	1.699	.143	.061	91.5
1906	43.56	8.59	92.93	2.621	.128	.089	147.9
1907	72.95	11.27	118.48	2.832	.139	.094	205.8
1908	82.55	16.67	125.44	3.223	.146	.102	228.1
1909	65.56	11.06	90.69	2.849	.131	.075	170.4
1910	71.45	12.33	85.41	3.374	.160	.094	172.8
1911	67.21	14.18	76.24	3.539	.160	.090	161.4
1912	67.22	11.65	69.37	3.900	.175	.094	152.4
1913	63.54	11.07	56.38	3.897	.160	.084	135.1

NB: "General engineering" excludes the shipbuilding, railway-vehicles, and precious-metal products industries.
Sources: Direzione generale delle gabelle (1861ff.) and Fenoaltea (2015a), chapter F.04.

Table 3

Tariff protection (lire/quintal)

	(1) 1861-64	(2) 1866-70	(3) 1871-77	(4) 1879-87	(5) 1888 ff.	(6) V.A.[a]
Sample tariffs						
1. Heavy plate	5.00	5.00	4.62	4.62	7.00	
2. Thin sheet	8.00	8.00	9.25	8.00	10.00	
3. Simple fabricated metal	10.00	11.55	11.55	11.80	13.00	
4. Tools n.e.c.	8.00	8.00	9.25	10.00	13.00	
5. Machinery n.e.c.	2.00	2.00	2.00	6.00	10.00	
6. Steam engines	2.00	3.00	6.00	6.00	12.00	
7. Precision instruments	20.00	10.00	10.00	30.00	30.00	
Sample net tariffs						
8. Simple fabricated metal	3.25	4.80	5.31	5.56	3.55	
9. Tools n.e.c.	1.25	1.25	3.01	3.76	3.55	
10. Machinery n.e.c.	-4.25	-4.25	-3.78	.23	1.25	
11. Steam engines	-4.25	-3.25	.23	.23	3.25	
12. Precision instruments	.00	-10.00	-13.13	10.00	5.00	1,650.0
Estimated average net tariffs						
13. Fabricated metal	2.25	3.03	4.16	4.66	3.55	41.5
14. Machinery	-4.25	-4.00	-2.78	.23	1.75	90.0

[a]unit value added at 1911 prices (lire/quintal).

Sources: Lines 1 through 7 are taken from Direzione generale delle gabelle (1861ff.); see Fenoaltea (2015a), chapter F.04. Lines 1 and 2 report the tariffs on heavy plate and thin sheet, respectively, taken as a representative raw materials for the engineering industry; lines 3 and 4 refer to fabricated metal products, lines 5 and 6 to machines, and line 7 to precision instruments. Lines 8 through 12 refer to the corresponding net tariffs. Lines 8 through 11 are calculated as the tariffs in lines 3 through 6 less the product of the tariff in line 1 and the input-output ratio (1.35 for lines 2 and 3, 1.25 for lines 4 and 5); line 12 is similarly obtained as the tariff in line 7 less the input-output ratio (2.50) times the tariff in line 2. The estimated average in line 13 is obtained directly from lines 8 and 9, with equal weights, that in line 14 from lines 10 and 11, with a treble weight on the former. The estimates of unit value added in 1911 (col. 6) are those reported in the text, footnote 8. In 1911 the average net tariff works out to some 9 percent of (engineering-industry) value added in the case of fabricated metal, 2 percent in that of machinery, and zero in that of precision instruments. The constant net import balances in both metal and metal goods establish that the standard calculation of net protection is in fact the correct one (which it patently is not if an export balance in the input or the output implies that the corresponding tariff did not inflate the relevant price in the domestic market).

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