Emanuele Felice*

Albert Carreras**

WHEN DID MODERNIZATION BEGIN? ITALY'S INDUSTRIAL GROWTH RECONSIDERED IN LIGHT OF NEW VALUE–ADDED SERIES, 1911–1951

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ABSTRACT

The article reconsiders the growth of Italian industry from the First World War to the eve of the economic miracle, with the aid of sector-specific new value-added series, at three different price-bases. The new estimates reduce growth during the First World War, making the Italian case comparable to the other belligerent countries, while improving the performance of the 1920s. The 1929 crisis looks more profound than before, but the recovery after 1933 is now stronger. During the 1920s and the 1930s, a significant shift from traditional to more advanced activities took place, and the cycles of consumption related industries grew in importance: after linking the available estimates with those produced by Fenoaltea for liberal Italy, both descriptive statistics and cointegration analysis suggest that some of these movements began with the turn of the previous century, a finding in line with institutional interpretations of Italy's economic growth. When confronted with the rest of Europe, in Italy the first half of the twentieth century was a relative success, which laid the ground for the following economic boom.

* Autonomous University of Barcelona. *Corresponding author*: ClaudioEmanuele.Felice@uab.cat

** Pompeu Fabra University

Introduction

The economic growth of modern Italy is a success story, often underestimated.[1] From Unification (1861) until our days, Italy became a major economic power, its per capita GDP having multiplied by almost 13 times, at an average annual rate even faster than the one experienced, for instance, by Germany.[2] Such an achievement was due to the extraordinary performance of the industrial sector, which still is vital: the decline of the last decade notwithstanding, in terms of total GDP nowadays Italy ranks as the second manufacturing country of Europe. There is little doubt that most of Italy's convergence took place in the second half of the twentieth century,[3] while growth on the liberal age, from Unification until the Great War, was on the whole disappointing.[4] What did happen in the age in between, from the First to the Second World War? Some scholars have claimed that it was indeed during the interwar years when the pre-conditions of the Italian economic miracle were laid down, and the transformation of the country into a modern economy began;[5] thus far, however, more in-depth inquiry has been hampered by the lack of reliable quantitative data.

This essay aims to lay the foundation for a more thorough understanding of Italy's interwar years, and of the economic growth of contemporary Italy, by presenting and discussing new and detailed series of industrial value-added from 1911 to 1951. A major novelty, to our knowledge with no precedents in historical series for Italy as well as for other countries, consists in the use of three different price-basis (1911, 1938, 1951) series, which are separately discussed and then, in order to examine sectoral growth on an annual basis, combined into a synthetic index. The use of different price-bases allows Italy to be for the first time properly compared with all the other main European countries, each having an industrial series at a different price-basis, and permits us to determine that Italy began to grow faster than its major neighbours as early as in the troublesome interwar years. Furthermore, the business cycle movements displayed by the series show clear signs of a maturing economy: in the interwar age the upward swings of the cycles were increasingly driven by production of industries oriented towards consumption and the internal market; unlike the post-Unification

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[1] Federico, "Italy."

[2] Brunetti, Felice, Vecchi, "Reddito," p. 230. For international comparisons, see Maddison, "Historical Statistics." Italy's performance in terms of well-being was probably even better: Brandolini and Vecchi, "The well-being of Italians."

[3] Crafts and Magnani, "The Golden Age." For an updated overview of European growth rates in the second half of the twentieth century, see Crafts and Toniolo, "Aggregate growth," p. 301.

[4] Fenoaltea, *The Reinterpretation*. Brunetti, Felice and Vecchi, "Reddito," p. 216.

[5] Toniolo ("Alcune tendenze," *L'economia*) for the role of deflationist policies in favouring more advanced manufactures and the growth of the internal market, followed by Gualerni (*Storia dell'Italia industriale*), De Cecco (*L'economia di Lucignolo*, pp. 113–8), and Petri (*Storia economica*), who also insisted on the role of key economic institutions created in the 1930s, *in primis* the state-owned enterprises, in promoting strategic sectors which would have been basis of the following Italian miracle.

cycles which – as revealed by Fenoaltea's estimates[6] – were driven by British capital exports. Indeed, after linking the new series to those produced by Fenoaltea for liberal Italy, cross-correlograms and co-integration analysis suggest that the growth in importance of consumption related cycles had begun already at the end of the nineteenth century, and therefore potentially shed a more favourable light upon the role of key institutional changes, for instance in the credit system with the creation of the universal banks and the central bank.

The article goes on as follows. Section 1 is a précis of the state of the art in the revision of Italy's national accounts, where recently important novelties have come, and a summary of the rationale and characteristics of the new industrial series. As sources and methods of the new estimates are fully described in the Appendix, where the sectoral series have also been relegated, the rest of the article is devoted to interpretative issues. In section 2, the new series of Italy's industry are presented and compared with the previous estimates, as well as with those available for other European and extra-European industrial powers. Section 3 discusses the main novelties and confirmations of the new series, reassessing the available literature in the light of updated quantitative evidence. Section 4 considers in some detail the sectoral figures and, *inter alia*, sketches out a long-run (1861-1951) analytical framework conceptually in line with the one proposed by Fenoaltea for liberal Italy, which, thanks to the longer period of time here considered and the use of some econometrics, may be useful to shed fresh light upon crucial issues and turning points of Italy's industrial growth. As usual, in the conclusions the most significant results are summed up.

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[6] Fenoaltea, "International Resource Flows."

1. *Italian overture: why the new series*

Over the last half a century the time and pace of Italy's industrialization has been a subject of a vast debate among economic historians, but this has concentrated on the liberal age, from Unification to the Great War. The ultimate reason of the dispute lies in the widespread distrust surrounding the official statistics of the Italian production, namely the comprehensive 1861−1956 Gdp series published by Istat (the Italian National Institute of Statistics, *Istituto Centrale di Statistica*) as early as 1957.[7] Further efforts by Italian statisticians made little or nothing to overcome the original bias of the 1957 Istat series, so much so that the new series which was published about a decade after by the group led by Giorgio Fuà[8] was simply re-named the Istat-Fuà or Istat-Vitali's series,[9] while the opacity in Istat's sources made it impossible to improve upon the existing official figures.[10] Thus a few economic historians undertook the task of calculating *ex novo* consistent historical estimates of Italian production, working on original sources. These efforts began with the industrial sector, for liberal Italy (1861-1913), and as a result the interpretation of the history of the Italian economy has significantly changed. The pioneering index by Alexander Gerschenkron published in 1955[11] was soon outdated by the estimates of one of his pupils, Stefano Fenoaltea, who repeatedly refined and extended his 1911-price index of the industrial production for liberal Italy (1861-1913).[12] Fenoaltea's index has now reached a level of detail and accuracy which is probably unparalleled in any other country: as hinted at in the introduction, the economic history of liberal Italy had to be accordingly rewritten, with a significant reduction in importance of the universal banks, and thus of endogenous determinants, in favour of the Kuznets investment cycle, and thus of exogenous factors.[13]

For liberal Italy, industry was followed by agriculture, although in this case the estimates are still preliminary,[14] and more recently by the service sector.[15] Up to the present, however, the overwhelming majority of the economic historians' efforts was directed to the liberal age. Scarce attention was paid to the reconstruction of the following period, the one spanning from the First World

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[7] Istat, *Indagine*.

[8] Vitali, "La stima;" Ercolani, "Documentazione."

[9] This latter appellation is here preferred, in order to acknowledge the decisive contribution by Ornello Vitali.

[10] Cfr. Fenoaltea, "The Reconstruction," p. 79: "the underlying research was held back, and finally lost. The published results could not therefore be subjected to detailed scrutiny, much less to piecemeal revision: they had to be accepted as they stood, or rejected outright."

[11] Gerschenkron, "Notes."

[12] E.g. Fenoaltea, "Public Policy," "Railroads," and "Notes."

[13] Idem, *The Reinterpretation*; see also id., "International Resource Flows."

[14] Federico, "Le nuove stime."

[15] Battilani, Felice and Zamagni, "Il valore aggiunto." For alternative estimates concerning liberal Italy, see Fenoaltea, "The Growth;" Malanima, "Alle origini."

War to the end of the Second World War. Partly as a consequence of this vacuum, also the literature about the Italian economic growth in the interwar period is still poor, when compared to the long-standing debate concerning liberal Italy, and the gap grows bigger when only publications in English are considered.[16] And yet there are good reasons to believe that the interwar period deserves much more consideration, and more reliable estimates.

First, those were years characterized by dramatic changes, in the international arena (with two world wars, the 1929 crisis, the protectionist strengthening towards autarky), the Italian political and economic institutions (the rise and fall of fascism, the rise of state-owned enterprises, the shift from universal to specialized banks), and the Italian industry: in 1911, metalmaking, engineering and chemicals (the most advanced sectors) amounted to 32% of value added in manufacturing, by 1951 their share had risen to 44%.[17] How are these *trend* changes related to the *cycle* of the Italian economy, and what was the pace of transformation towards more capital-intensive activities?

Secondly, for this period the extant Istat-Vitali indices portray a picture which seems, at least in part, unrealistic; as a consequence, the pattern of the Italian economy from the First World War to the Second World War is still uncertain. Most notoriously, according to the extant Istat's estimates during the First World War Italian industry boomed[18], and Italian Gdp experienced an economic growth unparalleled by any other belligerent country: such an improbable finding, that it was rejected by Broadberry when coming to international comparisons.[19] Conversely, during the Second World War Italy's Gdp collapsed much more than in any other western European country.[20] It goes without saying that also the performance of the Italian industry during the 1929 crisis and the fascist years is at the moment unclear, not least because the Istat-Vitali estimates at constant prices do not separate the manufacturing sector, thus making virtually impossible a sector-specific assessment of the crisis as well as of fascist autarky: presumably, both should have favoured some sectors, harmed others, but this conjecture begs for (possibly quantitative) evidence. Moreover, Italy would have been relatively lightly struck by the 1929 crisis, a finding at odds with what we know from unemployment figures and qualitative sources.

Finally, the third good reason for investigating the interwar period is a matter of "opportunity". In the last years there have been significant breakthroughs which have made further quantitative ad-

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[16] To the economic history of liberal Italy some important Italian books have been devoted, later translated in English: namely Toniolo, *An Economic History*, and more recently Fenoaltea, *The Reinterpretation*. Toniolo's volume about the economy of fascist Italy is instead available only in Italian (*L'economia*). The most successful available English volume about the Italian economic history over the long-run (since Unification up to the late twentieth century) is also focused mostly on the liberal period: Zamagni, *The economic history*.

[17] Fenoaltea and Bardini, "Il valore aggiunto," pp. 119−21.

[18] Istat, *Indagine*; Ercolani, "Documentazione;" see also Maddison, "A Revised Estimate," which for the years after 1913 is entirely based upon the Istat-Vitali's series.

[19] Broadberry, "Appendix." For Russia, see the recent estimate by Markevich and Harrison, "Great War."

[20] See Carreras, "Presentazione."

vances possible and, in a certain sense, no further deferrable. Recent research under the auspices of the Bank of Italy has produced new information about the structure of the Italian economy in 1938 and 1951[21]: for those years, we now have a detailed map of industrial value added at current prices, which can be linked to the corresponding 1911 reconstruction.[22] These three benchmarks not only give us a new trend, different from that of the previous Istat series, but, thanks to their high detail and the full description of sources and methods, also lay the basis for the construction of a new cycle. For the industrial sector, this has been proposed for the years spanning from 1911 to 1938, in a recent Italian article by Albert Carreras and Emanuele Felice, where 1911 and 1938 have been linked mostly through the Carreras' index of industrial production,[23] in detailed sectoral breakdown.[24] Soon after, Ferdinando Giugliano has proposed a revision of some of the brand-new Carreras and Felice's series, limitedly to the 1928−38 years.[25] Although the new series by Giugliano have not been used to recalculate Carreras-Felice's indices also for the 1911−27 years, as it should (see the Appendix), both these works have been already incorporated in the recent new series of Italian Gdp, reconstructed under the auspices of the Bank of Italy and Istat.[26]

The present article extends Carreras and Felice's methodology to the 1938−51 years, thus filling the last gap in the historical reconstruction of the Italian industrial production. It also reviews and updates the previous 1911−38 estimates, mainly by incorporating Giugliano's series for the 1928−38 years, and thus by re-scaling Carreras-Felice 1911−27 indices, in order to link them to the new 1928 "benchmark".[27] For the first time, constant 1951-price series, besides the 1938- and 1911-price ones, have also been produced. In short, the article presents and discusses new estimates of Italy's industrial value added, covering all the 1911−51 years: these are based on three different price weights (1911, 1938 and 1951) and thus result into three different indices at constant prices (1911, 1938 and 1951);[28] the three constant-price series are then combined through geometric average into a fourth synthetic ("quasi-current") series, which is useful to analyse on an annual basis the shares attributable to different branches of industry (which would be inaccurate if based on a single, constant-price series).[29] The new 1911-constant series have also been reconnected to the latest

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[21] Fenoaltea and Bardini, "Il valore aggiunto."
[22] Fenoaltea, "Il valore aggiunto."
[23] Carreras, "La producció."
[24] Carreras and Felice, "L'industria italiana."
[25] Giugliano, "Crisis?"
[26] Baffigi, "Italian National Accounts;" Brunetti, Felice and Vecchi, "Reddito."
[27] Some minor refinements in the original Carreras-Felice's series have also been introduced (see the Appendix).
[28] Although the methodology and its foundations are extensively discussed in the Appendix, they can be summarized in a recent sentence by Fenoaltea: "The physical series are combined with value added weights because there is nothing else to work with. This is done […] with a bad conscience but with good precedent: all sorts of scholars, similarly constrained, have done the same." "The Reconstruction," p. 91.
[29] Part of these series have already been published and discussed (the 1911- and 1938-price Carreras-Felice's series, from 1911 to 1938, for those sectors uncovered by Giugliano and unaffected by present refinements: see the Appendix for further details), but only in Italian.

1861−1913 industrial series produced by Stefano Fenoaltea,[30] at the same sectoral breakdown, in an effort to provide a long-term profile of Italy's industry which, for the first time, would not replicate the cycle of the original Istat series, and which may help to shed more light on the determinants of Italy's industrial growth: as anticipated, some preliminary steps in this direction have also been made, and will be presented in section 4.

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[30] "Notes".

2. *The new series: results and comparisons*

Table 1 presents the new series of Italy's industrial value added from 1911 to 1951, and compares them to the previous indices available for that period. As a general rule, in estimating constant-price series we assume that, for each *i* production and *t* year:

$$[1] \; Va^{ti} / Q^{ti} = VA^{(t+1)i} / Q^{(t+1)i},$$

where *Q* is the elementary physical series and *VA* is value added. From [1], we obtain the formula used to produce constant (benchmark year)-price estimates as:

$$[2] \; Va^{ti} = (Q^{ti} / Q^{yi}) \times VA^{yi},$$

where *y* stays for the benchmark year (alternatively 1911, 1938, or 1951; for the detailed list of *i* productions and the proxied used, see table A.1). From the constant-price series, we then calculate "quasi-current series" by interpolating the 1911- and 1938-price series for the years 1911 to 1938, the 1938- and the 1951-price ones for the years 1938 to 1951, in both cases at the same detailed sub-sectoral level as with constant-price series (see again table A.1 for the decomposition), through a geometric average with weights inversely proportional to the distance between the year of the series and the price basis, according to the formula:

$$[3] \; y_{i_{in\,i\,\min\,prices}}^{\frac{i\max - i}{i\max - i\min}} \times y_{i_{in\,i\,\max\,prices}}^{\frac{i - i\min}{i\max - i\min}} ,$$

where *i* is the year of the series *y* (say: 1912, 1913, etc.), *i*min is 1911 for the years 1911 to 1938, 1938 for the years 1938 to 1951, *i*max is 1938 for the years 1911 to 1938 and 1951 for those 1938 to 1951. Concerning the indices, a "Geometric average 11-38-51" index is calculated as the cube root of the product of the three indices, which allows us to have average growth rates at constant prices relatively unbiased by the choice of the price-basis.[31]

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[31] As from the last row in table 2. Alternative formulas, weighting each index with the inverse of distances between its price-basis and the observed year (such as [3], or more elaborate ones), would have assigned a higher share to the 1951-price index in the late years, thus yielding long-run growth rates much closer to the 1951-price index than to the other two indices. A geometric average is preferred to an arithmetic one because the former reduces substitutability among the three indices (the composite index performs better when all the three constant-price indices perform better): on the

TABLE 1
ESTIMATES OF THE ITALIAN INDUSTRIAL PRODUCTION, 1911–1951

	Million lire of value added				Indices (1911=100)				Other indices (1911=100)		
	1911 prices	1938 prices	1951 prices	"Quasi-current" prices	1911 prices	1938 prices	1951 prices	Geom. av. 11-38-51	Maddis. 1913 (a)	Istat-Vit. 1938	R.S.T. 1938 (b)
1911	4972	26060	1771503	4972	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1912	5428	28119	1945246	5717	109.2	107.9	109.8	109.0	100.8	106.9	106.7
1913	5465	28365	1922223	6069	109.9	108.8	108.5	109.1	106.0	105.4	105.9
1914	5216	27694	1926512	6113	104.9	106.3	108.8	106.7	102.7	101.4	113.7
1915	4730	25508	1704829	5862	95.1	97.9	96.2	96.4	124.7	125.3	124.4
1916	4960	26481	1780610	6473	99.8	101.6	100.5	100.6	126.3	126.3	144.0
1917	4862	26026	1713398	6730	97.8	99.9	96.7	98.1	112.7	111.8	158.3
1918	4717	25432	1680127	6910	94.9	97.6	94.8	95.8	108.1	107.0	169.2
1919	4677	24369	1571738	7200	94.1	93.5	88.7	92.1	108.7	107.2	144.0
1920	5131	26012	1711421	8282	103.2	99.8	96.6	99.8	107.8	105.6	138.5
1921	4908	24774	1511291	8414	98.7	95.1	85.3	92.9	101.3	97.2	121.1
1922	5775	28912	1798480	10456	116.2	110.9	101.5	109.4	112.7	109.8	146.1
1923	6661	32349	2040016	12573	134.0	124.1	115.2	124.2	124.0	120.2	155.7
1924	7182	34718	2229661	14305	144.4	133.2	125.9	134.3	137.3	132.9	173.3
1925	8243	40315	2650270	17459	165.8	154.7	149.6	156.6	155.6	150.5	186.1
1926	8550	40737	2633469	18923	172.0	156.3	148.7	158.7	158.2	152.0	177.6
1927	8183	38362	2391779	19090	164.6	147.2	135.0	148.4	154.4	147.2	164.7
1928	8887	40809	2486375	21752	178.7	156.6	140.4	157.8	168.9	161.2	175.3
1929	9717	44936	2716386	25383	195.4	172.4	153.3	172.8	175.1	166.5	179.6
1930	9475	42728	2567436	25816	190.6	164.0	144.9	165.5	171.0	160.4	169.5
1931	8349	37366	2228261	23950	167.9	143.4	125.8	144.7	156.2	145.8	157.3
1932	7898	35172	2069608	23981	158.8	135.0	116.8	135.8	155.1	144.9	153.9
1933	8701	39036	2272103	28302	175.0	149.8	128.3	149.8	165.9	154.6	166.0
1934	9120	40247	2364515	31108	183.4	154.4	133.5	155.8	159.4	153.8	167.6
1935	9994	43517	2521600	35872	201.0	167.0	142.3	168.4	182.5	167.4	181.8
1936	9927	42311	2450039	37217	199.7	162.4	138.3	164.9	183.5	168.1	191.2
1937	11124	47039	2721452	44085	223.7	180.5	153.6	183.7	204.4	189.7	209.5
1938	11403	48074	2750911	48074	229.3	184.5	155.3	187.3	205.0	189.8	210.6
1939	12149	50249	2847999	67591	244.3	192.8	160.8	196.4	n.a.	208.4	223.2
1940	12140	47938	2751207	87169	244.2	184.0	155.3	191.1	n.a.	211.6	222.5
1941	11077	43493	2480065	106795	222.8	166.9	140.0	173.3	n.a.	200.7	197.0
1942	9686	37671	2117563	125079	194.8	144.6	119.5	149.9	n.a.	177.4	160.9
1943	7060	29028	1499378	127370	142.0	111.4	84.6	110.2	n.a.	138.5	144.5
1944	4699	19571	1020770	117283	94.5	75.1	57.6	74.2	n.a.	85.8	114.8
1945	3759	15926	866421	132509	75.6	61.1	48.9	60.9	n.a.	65.1	101.2
1946	8454	37168	2153430	439047	170.0	142.6	121.6	143.4	n.a.	143.6	192.3
1947	10359	45857	2559759	722935	208.3	176.0	144.5	174.3	n.a.	180.1	243.8
1948	11138	49588	2764885	1067552	224.0	190.3	156.1	188.1	n.a.	190.3	253.1
1949	11921	51414	2873739	1518918	239.8	197.3	162.2	197.2	n.a.	204.4	262.4
1950	13969	59975	3333620	2423272	281.0	230.1	188.2	230.0	n.a.	235.5	283.7
1951	16218	68788	3727945	3727945	326.2	264.0	210.4	262.7	n.a.	269.1	330.7

Sources: see the text.

Notes. (a) From 1938 to 1951, Maddison ("A Revised Estimate") presents estimates for all the economy (total Gdp), but not separately for industry; Maddison's industrial index is at 1870 prices from 1870 to 1913, at 1913 prices from 1913 to 1938: for 1911 and 1912, the index is here calculated by applying to 1911 and 1912 the 1913 ratio 1913-prices/1870-prices. (b) R.S.T. stands for Rossi, Sorgato and Toniolo ("I conti economici"), who present data at 1938 prices for total Gdp and at current prices separately for agriculture, industry, services, and public administration; the 1938-price industrial index is here calculated through R.S.T. implicit total-Gdp deflator.

The first eye-catching result is that the indices change significantly according to their year-price basis: the 1911-price series grows more, the 1938-price series less, the 1951-price series even less. This finding is a confirmation of the «Gerschenkron effect», which occurs when prices and quanti-

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advantages of geometric average, when combining different sectoral series and indices, see as early as 1947 the influential Italian statistical Guglielmo Tagliacarne, "Lo sviluppo."

ties are negatively correlated:[32] in the presence of technological progress, the early-weight price series (1911) assign a higher weight to the sectors growing faster (whose quantities increase and relative prices decrease), and therefore grow more rapidly over the long-run; for the same reason, the late-weight indices (1938 and 1951) grow less. However, since the final indices are the sum of elementary series from [2], they differ from each other not only in the average level of prices (VA^{yi} / Q^{yi}), but also in the quantity of goods being produced: this latter variation tends to counterbalance the former – advanced manufactures which grew more had a higher share in the late benchmarks – but the results – the late-weight indices growing less – suggest that the price-effect was by far prevailing over the quantity-one.

If large differences are observable in the *same* series (i.e., series constructed with the same methodology and proxies) which are based on different benchmark years, when it comes to comparing *different* series a minimum requirement is their year-price bases to be the same, or at least relatively close. For this reason, in Figures 1 and 2 the new series have been contrasted with the previous ones, and with those available for other countries, according to the correspondence of their year-price basis.[33]

The new 1911 index presents remarkable differences with the 1913-price Maddison one.[34] Two appear to be the main novelties: growth during the Great War is reduced down to disappear, while the performance of Italian industry in the twenties and thirties is significantly improved. By comparing the new 1938 index with the previous ones, by Istat-Vitali[35] and by Rossi-Sorgato-Toniolo,[36] we have a strong confirmation of the first two changes, those concerning the First World War and the twenties; with respect to the thirties, we can now say that the consequences of the 1929 crisis are more profound, but the following recovery is a bit stronger, at least relatively to Istat-Vitali. For the 1938–51 years, our index looks in line with the previous ones, the main differences being due to discrepancies in levels and thus referable to the benchmarks; the only partial exception concerns the fall during the Second World War, now slightly milder than with Istat-Vitali. It is worth mentioning that the three previous series are all a derivation of a single series, the first one (Istat-Vitali). Their differences are due to the different benchmark levels, thus are a matter of trend, not of cycle: Rossi, Sorgato, and Toniolo make use of the new 1911 benchmark by Fenoaltea – the same we also use, with small variations[37] – significantly higher (+15%) than Istat-Vitali, and link it to a new bench-

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[32] Gerschenkron, "The Soviet Indices."

[33] PPP-adjusted current-price series are even better, as pointed out among the others by Prados de la Escosura ("International Comparisons"), but of course at the moment we lack the necessary data.

[34] Maddison, "A Revised Estimate."

[35] Ercolani, "Documentazione."

[36] Rossi, Sorgato and Toniolo, "I conti economici."

[37] See the Appendix.

mark for 1951,[38] which was also higher than both Istat and the subsequent new benchmark by Fenoaltea and Bardini.[39] If Istat-Vitali simply follow the old Istat's benchmarks, Maddison – whose series is at the present the most used in international comparisons – employs for liberal Italy 1870-price weights and some series by Fenoaltea (for mining, utilities, construction, plus an amended version of Fenoaltea's earlier 1967 estimates for manufacturing),[40] with the result of raising industrial production in 1913 and thus reducing Italy's industrial growth in the interwar years. Our estimate makes use of three benchmarks, of which the first one, 1911, is higher than the previous Istat datum (+15%), whereas the other two, 1938 and 1951, are very close to the old Istat figure (+3% and –1% respectively).[41] As a result, in terms of trend the growth of the Italian industry from 1911 to 1951 is reduced when compared to Istat-Vitali and Rossi-Sorgato-Toniolo, but it is increased (from 1911 to 1938) when compared to Maddison, and thus when it comes to put Italy in the international context. In terms of cycle, the reduction concentrates on the Great War and on the post-1929 years, whereas the 1920s stand out as a decade characterized by a relatively good performance, and the 1930s recovery is also slightly improved.
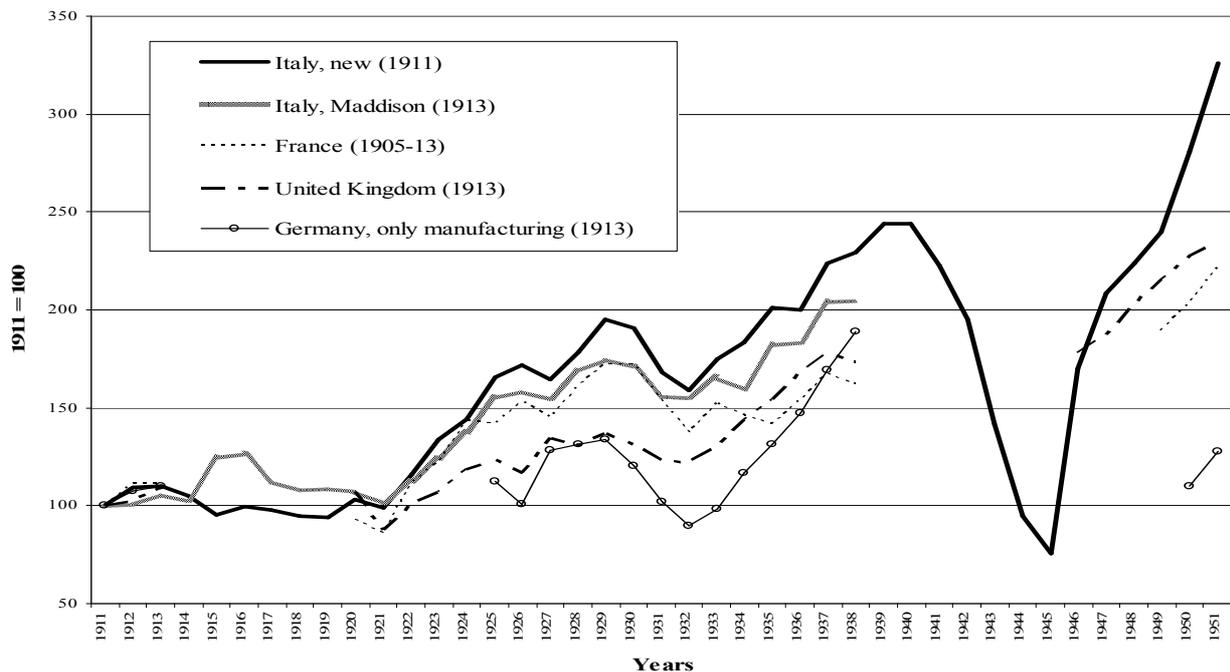
FIGURE 1.

ITALIAN INDUSTRIAL PRODUCTION (1911-1951) AT 1911 PRICES, AND COMPARISONS

Sources: for Italy, Table 1; for France, Toutain, "Le produit intérieur brut;" for United Kingdom, Feinstein, *Statistical Tables*; for Germany Hoffman (with Grumbach and Hesse), *Das Wachstum* (1913 prices).

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[38] Golinelli and Monterastelli, "Un metodo."
[39] Fenoaltea and Bardini, "Il valore aggiunto."
[40] Maddison, "A Revised Estimate," p. 226.
[41] Fenoaltea and Bardini, "Il valore aggiunto," pp. 119–21.

FIGURE 2.

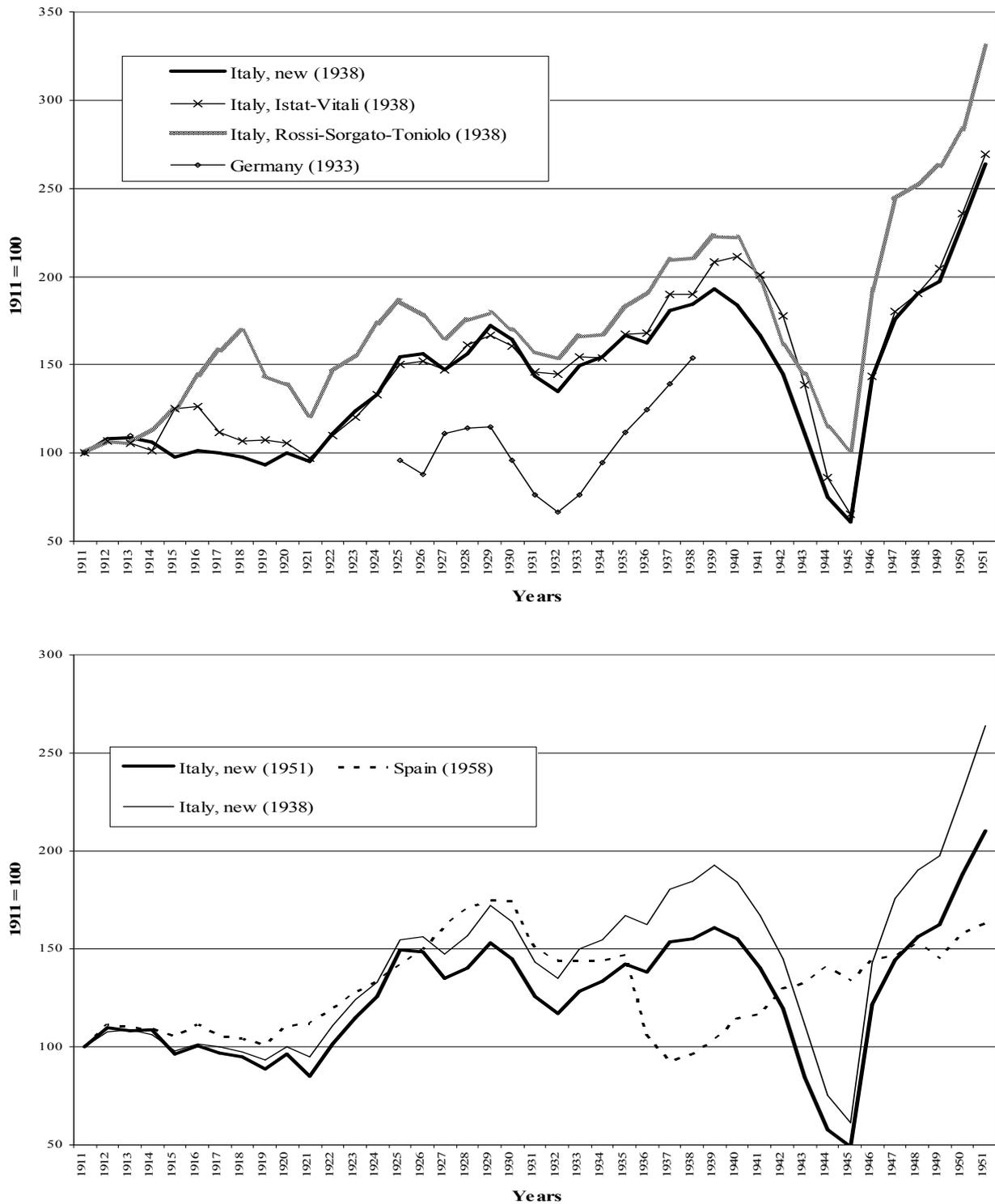ITALIAN INDUSTRIAL PRODUCTION (1911-1951) AT 1938 AND 1951 PRICES, AND COM-

PARISONS

Sources and notes: for Italy, Table 1; for Germany, Scherner, "Nazi Germany's preparation"; Prados de la Escosura, *El Progreso Económico*. The Spanish index is at 1958-prices, which are still partially autarkic, and this is the reason why in figure 2 the index has been compared with both our 1938- and 1951-price indices.

What are the reasons of the observed changes between our estimates and the previous ones, and are they justifiable? We should start by saying that reasons are not easy to be found, since *none* of the previous constant price series presents a decomposition of manufactures, unlike ours. As mentioned, they all incorporate the previous Istat-Vitali's cycle, which is constructed, in turn, from the old Istat 1957 series:[42] there single sectoral estimates are presented, but at current prices, together with a 1938-price deflator for all manufacturing. Vitali simply used this 1938-price deflator in order to deflate the Istat current-price series, thus obtaining a 1938-prices series for all of manufacturing, without any sectoral de-composition and without any substantial change to the Istat data.[43] From this, it follows that our differences in quantities can be due not only to quantity differences with the previous 1957 Istat series, but also to the way Istat estimated prices, which later were used to deflate the current-price series. Furthermore, the explanatory notes of the Istat original series are not at all clear or satisfactory, as generally acknowledged.[44] Nonetheless, some explanations can be inferred. Concerning the Great War, for example, the reason seems to be the Istat's use for metalmaking and textiles of imported prices, which soared; this introduced a serious bias in the current-price series which later passed to the constant-price ones (see next paragraph for further details). In addition to methodological differences, our information is often more complete, and thus more reliable. In the case of engineering, for example, from 1911 to 1928 and from 1938 to 1951 we employ as a proxy apparent consumption of seven metals, whereas Istat only used the two most important metals, iron and steel. For cotton, until 1920 Istat only used yarns, unlike us who employ both yarns and fabrics.[45] In other cases, however, as mentioned differences are difficult to explain, due to the lack of information concerning the Istat sources.

The new estimates realign Italy with the performance of the other main European countries, at least for the Great War (see Figure 1). And yet it is worth emphasizing that, over the long run, Italy's industrial growth is higher than that of any other main European country. In our view this is an important finding, as long as available European comparisons, based on Maddison's figures, depicted Italy as a lagging-behind country, at least in terms of Gdp.[46] Table 2 is intended to further qualify this result, by comparing the performance of the Italian industry with that of the other main European and extra-European industrial powers, in Europe and abroad, in terms of annual growth

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[42] Istat, *Indagine*.
[43] Vitali, "La stima," pp. 468−9; Ercolani, "Documentazione," p. 383.
[44] E.g. Fenoaltea, "The Reconstruction," p. 79.
[45] For the notes about Istat's methodology and sources, see Istat, *Indagine*, pp. 80–2.
[46] Rosés and Wolf, "Aggregate Growth." The recent review by Williamson of industrial output in peripheral countries, which for Italy incorporates the series by Carreras and Felice, has already begun to revise this "conventional wisdom", by pointing out that Italy grew faster than Germany and the United Kingdom in the years 1920 to 1939: Williamson, "Industrial Catching Up," p. 47.

rates by sub-period. As mentioned in the introduction, an important novelty lies in the fact that comparison is made in terms of the benchmark year of the constant series: not a nuance, given the high variance in the growth rates we have noted.

TABLE 2
ANNUAL GROWTH RATES OF THE INDUSTRIAL PRODUCTION, BY SUB-PERIODS AND COUNTRIES (1911-1951)

	1911-20	1920-29	1929-38	1938-51	1911-29	1929-51	1911-51
Italy (1911 prices)	**0.35**	**7.35**	**1.79**	**2.75**	**3.79**	**2.36**	**3.00**
Italy (Maddison, 1913 prices)	*0.84*	*5.54*	*1.77*	*n.a.*	*3.16*	*n.a.*	*n.a.*
France (1905-13 prices)	-0.81	7.13	-0.71	2.42	3.08	1.13	2.00
United Kingdom (1913 prices)	0.75	2.80	2.64	2.36	1.77	2.47	2.16
Germany, only manufacturing (1913 prices)	n.a.	n.a.	3.89	-2.96	1.64	-0.21	0.62
Belgium (1910 prices)	-5.62	8.51	-1.43	2.04	1.20	0.61	0.87
Sweden (1910-12 prices), without construction	1.22	4.81	4.38	4.24	3.00	4.29	3.71
Italy (1938 prices)	**-0.02**	**6.26**	**0.76**	**2.79**	**3.07**	**1.96**	**2.46**
Italy (Istat-Vitali, 1938 prices)	*0.61*	*5.19*	*1.47*	*2.72*	*2.87*	*2.21*	*2.51*
Italy (R.S.T., 1938 prices)	*3.69*	*2.93*	*1.78*	*3.53*	*3.31*	*2.81*	*3.04*
Germany (1933 prices)	n.a.	n.a.	3.29	n.a.	0.78	n.a.	n.a.
US, only manufacturing (1929 prices)	4.96	4.73	-2.33	7.78	4.84	3.53	4.12
Japan (1934-36 prices)	5.63	7.25	7.50	n.a.	6.44	n.a.	n.a.
Korea (1935 prices)	8.68	6.08	12.55	n.a.	7.37	n.a.	n.a.
Italy (1951 prices)	**-0.38**	**5.27**	**0.14**	**2.36**	**2.40**	**1.45**	**1.88**
Spain (1958 prices)	1.16	5.16	-6.41	4.12	3.14	-0.32	1.22
Italy, geometric average 11-38-51	**-0.02**	**6.29**	**0.90**	**2.64**	**3.09**	**1.92**	**2.44**

Sources: elaborations from the sources cited in Table 1, Figures 1 and 2, plus: Soete, "Het Belgisch BBP," for Belgium; Krantz and Schön, "Swedish Historical National Accounts," for Sweden; Kendrick, "Productivity trends," for United States; Ohkawa, Taka-matsu, and Yamamoto, "National Income," for Japan; Cha and Kim, "Korea's First Industrial Revolution," for Korea.

At 1911 prices, Italy outperforms all the three major European economies, United Kingdom,[47] France,[48] and Germany,[49] as well as Belgium, from 1911 to 1951; it only ranks second to Sweden, which did not experience the two world wars. Such an achievement is due, in prime instance, to the extraordinary performance of the 1920s and then, to a minor extent, to the faster recovery following the Second World War; the performance of the 1930s is instead less encouraging, in absolute but also in relative terms (Italy is overcome by both Germany and the United Kingdom). To be honest, these differences are all at pre-First World War prices, and thus should be viewed, at least in part, as a product of relative backwardness, and due to differences in prices rather than in quantities: as long as they are referable to the fact that, in the interwar years, Italian industry undertook a moderniza-

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[47] We use data from Feinstein, *Statistical Tables*. The same data were employed by Broadberry, *The British Economy*, pp. 29–32.
[48] For France, we use data from Toutain, "Le produit intérieur brut". These have been critically reviewed by Jean-Pierre Dormois "Episoded in catching-up", although at the present a new series of industrial value added (or Gdp) have not been produced; Dormois's estimates, however, are less optimistic than Toutain's ones, thus further corroborating our argument.
[49] For Germany, we use data from Hoffman (with Grumbach and Hesse), *Das Wachstum*; a revision has been proposed by Albrecht Ritschl ("Spurious growth"), limitedly to the years 1925 to 1938, which reduces Hoffman's data and thus, as with France, corroborates our argument; Ritschl's data (at 1933 prices) have also been shown in figure 1. For the Second World War, the widely accepted Wagenführ's figures (Wagenführ, *Die deutsche Industrie*) are probably downward biased (Tooze, "No room"; see also Scherner, "Nazi Germany's preparation"), but, of course, there would be no surprise in finding that the index of German industrial production overtook the Italian one during the Second World War, given the subordinate position of Italy.

tion towards more advanced manufactures that the other economies had already lived through.[50] And yet, a comparison with other countries made at later price-bases confirms the good performance of the Italian industry, particularly in the 1920s, when, according to the new estimates, at 1930s prices the growth rate of Italy's industry was higher than that of United States and Korea, and close to that of Japan. Also a comparison with Spain, which was at that time at a lower level of industrial development, corroborates the idea that the Italian industry performed relatively well (see also Figure 2): at 1950s prices, Italy again grew faster over the long-run.[51]

The next paragraphs are intended to qualify the findings sketched thus far, as well as to reassess the available literature in light of the new quantitative evidence.

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[50] In 1911, engineering and chemicals were relatively underdeveloped, thus their unit prices were higher as compared to those of, say, textiles and foodstuffs: since engineering and chemicals are the sector which grew more in the interwar years, so does the 1911-price index, in comparison with the indices of more-advanced countries, whose unit prices in engineering and chemicals at eve of the First World War were relatively lower.

[51] It goes without saying that Spain did not experience the two world wars while suffered through a devastating civil war, 1936–9, and this is the reason why in this case comparisons for sub-periods turn out to be misleading.

3. *The interpretative framework and the existent literature: novelties and confirmations*

It is now time to see how the main novelties (or confirmations) of our estimates compare with, and hopefully improve, the available literature. We consider separately four periods, in chronological order: the Great War; the 1920s; the 1929 crisis and the 1930s; the years from the Second World War to 1951.

Concerning the Great War, as mentioned the performance of the Italian industry is now significantly reduced and more in line with that of other countries.[52] Most of the difference between our series and the old Istat-Vitali's one took place in 1915: for this year, our index decreases by some percentage points, whereas the previous one increased by about one fourth. According to the new index, some increase took place indeed in the following year, 1916, that is after and not before Italy entered the war (on May 1915); however, this rise was not enough to bridge the gap with Istat-Vitali. Our estimates are now in line with what can be observed in the other belligerent countries. The spurt of the previous series is all the more unrealistic since in 1914 Italy was at the end of an expansive cycle, by now slowing down, and its industry could hardly grow more at such an amazing rate.[53] But why was there the big spurt in the Istat's figures? It was concentrated in engineering and textiles, and the reason were prices: Istat used quantity series of iron and steel, at their imported prices, which grew considerably in the years of the war; this is true for textile too, and in particular for cotton, where the price of imported yarns was proxied.[54] By the book, the current-price series of value *added* (the difference between output and input) must be calculated by subtracting the price of (in this case imported) inputs to that of output: if Istat had followed this rule,[55] the outcome would have been less optimistic current-price series of value added, since during the Great War output prices presumably grew less than import prices.[56] The constant-price index was then constructed by deflating the current-price series, with value-added weights in 1938 (where engineering, chemicals and even some textiles because of autarchy had higher shares), through a single common deflator for all of manufacturing, build with value added weights in 1906-10 (where engineering had a lower

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[52] Cfr. Broadberry, "Appendix."

[53] See Fenoaltea, *L'economia italiana*, particularly pp. 61–3, and idem, "The Growth." This is all the more true in that the mobilization plan drained manpower.from the factories (and the fields) to the trenches.

[54] Istat, *Indagine*, pp. 80–2.

[55] For engineering, however, output prices are usually difficult to compute, given the high diversification of the sector: this can be the reason why Istat – in its 1957 long-run series which stands out as a pioneering effort by international standards – did not use them.

[56] Cfr. Carreras and Felice, "L'industria italiana," p. 331.

share than in the Great War, and thus it was deflated less),[57] and thus ended up incorporating a big spurt which was, indeed, an increase in price rather than in quantity.

The new sectoral estimates help us to understand what happened to the Italian industry during the Great War, and suggest an apparently well-grounded new picture. In 1915, we have some growth, although relatively mild, of those productions more useful for the war, i.e. metalmaking and engineering, chemicals, textiles and clothing, whereas those productions less likely to be associated with the war effort, such as mining, non-metallic minerals and construction, decreased. Most of the increase of the "warlike" industries, in particular of metallurgy and engineering, took place in 1916, which seems quite reasonable: from the outbreak of the war, some months had to pass before the heavy industries could run into high gear, not least because they had reached their full capacity in the previous years. According to our estimates, in 1917 textiles and clothing decreased: if their growth in the two previous years was due to the massive needs of the Army, these by 1917 had stabilized. Quite plausibly, again in 1917 – in what was the most difficult year of the entire conflict – also the food industry shrank. Other manufactures suffered severe downturns: mainly non-metallic minerals, which fell more and more during the war years, to recover only after the confict (in 1919, instead metalmaking and engineering shrank). Thus our results suggest a redistribution in favour of the heavy "warlike" activities, whereas on the whole Italy's industry slightly expanded at the beginning of the war, but began to fall as the conflict grew more intense and grave. The previous available constant-price estimates did not show a sectoral breakdown, as we know, but they, in order to assign an average 25% growth rate in the first year of the war, should have displayed an increase of heavy industries even higher, no doubt unrealistic.

The economic historians who have discussed the performance of the Italian economy during the First World War have appeared to be somehow disoriented by the old estimates. Those who accepted the idea of an industrial great leap forward, corroborated it by pointing to the booming figures of steel production (hardly representative of all the industry) and of some big firms subsidized by the State.[58] Others, most recently Pierluigi Ciocca, were much more skeptical, but in the absence of alternative estimates could only observe that after the first one-two years of the War industrial value added decreased, even according to some of the old estimates (Maddison and Istat-Vitali, see table 1).[59] The new figures now support, with quantitative evidence, this more critical approach.

For what concerns the 1920s, our estimates are instead more optimistic. First, they indicate an increase in 1920, at the peak of the Italian reconversion after the war, which is now in line with the

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[57] Vitali, "La stima," pp. 468−9; Ercolani, "Documentazione," p. 383.
[58] E.g. Crepax, *Storia dell'industria*, pp. 233–40.
[59] Ciocca, *Ricchi per sempre?*, pp. 172–3.

available estimates of industrial employment;[60] the following recession in 1921 looks now a bit milder, but is confirmed. Second, the new series slightly raise the growth in the first half of the decade (1922−5), which is largely due to the engineering sector: on this, they offer quantitative support to a consolidated, although mainly qualitative, literature.[61] Last but not least, the new series increase the expansion following the 1926-27 revaluation of the lira: after a sudden slump in 1927, the growth of engineering, and of manufactures as a whole, resumed in 1928 and 1929. Such a finding for the first time provides quantitative support to an important literature which, since the late 1970s, has emphasized the role of the 1926-27 monetary squeeze, in redirecting the Italian industry towards the internal market and more advanced productions (whose exports too increased, relatively to low-technology goods):[62] among the firsts who drew attention to this point was Gianni Toniolo,[63] later followed by Rolf Petri.[64] Around the mid-1990s, Gualberto Gualerni[65] and with him Marcello De Cecco[66] have made of Mussolini's 1926 revaluation (*Quota 90*) the turning point in the twentieth century modernization of the Italian industry. According to our estimates (see also the next paragraph), *Quota 90* looks indeed as an important stage of a process which gained momentum in the following decade, but whose first signs − the expansion of engineering − had manifested as early as in the first half of the 1920s.[67]

This result is in line with the recent estimate by Federico and Vasta about the terms of trade. After 1926, and even more in the 1930s, in manufactures Italian exports became cheaper than imports; the same did not happen with primary products, where instead export grew costlier, and the terms of trade further improved in the 1930s.[68] Thus, in Italy it had become cheaper to import primary products rather than industrial goods, as well as to export the latter rather than the former. This change should have facilitated industrial growth and also, within industry, a reallocation of value added from traditional to more advanced productions (see the next paragraph). Of course, we must take into account that Italy's degree of openness (the ratio of the sum of total import and export flows to

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[60] Zamagni, "Una ricostruzione;" Broadberry, Giordano and Zollino, "A Sectoral Analysis."

[61] E.g. Zamagni, *Dalla periferia*, pp. 368–9; see also Tattara and Toniolo, "L'industria manifatturiera."

[62] Of course, Italy's degree of openness (the ratio of the sum of total import and export flows to gross domestic product) fell after 1926 and remained low throughout the rest of the period. However, this collapse regarded mostly the low-technology goods; in fact, the share on exports of medium-technology goods, already on the rise since 1920, sharply and further increased after 1926 (cfr. Vasta, "Italian export capacity," pp. 134–5 and 145).

[63] *L'economia*, pp. 123–6; but the first idea can be found already in idem, "Alcune tendenze," pp. 37–9. For an early appreciation of *Quota 90*, see also Cohen, "The 1927 Revaluation."

[64] *Storia economica*, p. 91.

[65] *Storia dell'Italia industriale*.

[66] *L'economia di Lucignolo*, pp. 113–8.

[67] In this decade, however, the growth of labour productivity still played a minor role. See the most updated estimates in Broadberry, Giordano and Zollino, "A Sectoral Analysis," p. 31, which make use of Carreras-Felice value-added series; at constant price, the net capital stock in machinery and equipment only began to rise in 1926 (pp. 66–7).

[68] Federico and Vasta, "Was Industrialization an Escape?", pp. 239–42.

gross domestic product) fell after 1926 and remained low throughout the rest of the period[69] (so much so that the contribution of exports to the growth of the Italian economy is usually dismissed as negligible in the interwar years).[70] However, this collapse regarded mostly the low-technology goods; in fact, the share on exports of medium-technology goods sharply and further increased after 1926. Significantly enough, exports of medium-technology goods were on the rise since the early 1920s, both in absolute and percentage terms.[71]

TABLE 3

THE CONSEQUENCES OF THE 1929 CRISIS: INTERNATIONAL COMPARISONS

(industrial production at 1938 prices, without construction)

	% change from 1929 to the lower bound of the cycle (1932)	% change from 1929 to 1937
United States	-45.2	2.4
United Kingdom	-11.4	35.4
France	-25.6	-10.7
Belgium	-27.1	3.7
Netherlands	-6.1	11.0
Germany	-40.8	22.4
Austria	-34.3	1.0
Italy (old estimate)	-22.7	14.8
Total western Europe	-23.2	18.6
Italy (Istat-Vitali)	-14.6	11.4
Italy (new)	-22.9	12.2

Sources: data for other countries and the Italian "old estimate" are from Paretti and Bloch, "La production industrielle." For the last two rows, see the text.

With respect to the 1930s, as mentioned the new estimates suggest a more severe impact of the 1929 crisis: industrial production decreased during three consecutive years (1930–2), by almost one fourth, and began to recover only in 1933. From that year on, the recovery was faster than what resulted from the previous Istat-Vitali figures. On the whole, the new estimates put the Italian experience in line with the average of Western Europe, as can be seen from Table 3: much closer to France, rather than to the United Kingdom as it was before. On this, the inclusion of Giugliano estimates represents a significant improvement upon Carreras-Felice's series, which instead for the 1929–32 years had not significantly modified the available picture. Curiously enough, the new se-

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[69] Vasta, "Italian export capacity," pp. 134–5.
[70] For a long-term analysis with updated Gdp series, see Rinaldi and Pistoresi, "Exports, imports and growth."
[71] Vasta, "Italian export capacity," p. 145.

ries bring back the Italian industrial cycle to a 1956 estimate by Paretti and Bloch,[72] which pre-ceeded the Istat one, and was in turn based upon OEEC data.[73] The Istat-Vitali's series had placed Italy into the club of the least-affected countries, but authors such as Toniolo and Ciocca had never believed the "official" figures and, when coming to international comparisons, had resorted to the old estimate by Paretti and Bloch.[74] Our new data now offer updated quantitative evidence in favour of their arguments.[75]

For the years 1933 to 1937, a faster recovery than the one suggested by the previous Istat-Vitali figures also has some interpretative relevance. We know that for 1928−38 Istat changed its index for mechanical engineering, shifting from apparent consumption of iron and steel to the hours worked.[76] We also have abandoned apparent consumption from 1928 to 1938, but have replaced it only in part with labour input data, for most of the sector making use instead of production data.[77] If the series based mostly on production data (ours) rose more rapidly than those based only on the labour input (Istat-Vitali), than in those years some substitution of labour with capital, and a rise in labour productivity, was on the march, at least in the mechanical sector. This finding is in line with recent analyses emphasizing as in those years real wages had increased, because of deflation,[78] thus making more profitable the substitution of labour with capital. On the other hand, physical inputs had become cheaper as compared to outputs, and an index still based on apparent consumption, as the previous one by Carreras and Felice, showed faster recovery in the first years following the crisis lower bound, but then slower growth from the mid 1930s:[79] the contrast with production data entails a rise in stocks in the first part of the cycle, a decrease in the second one (also due to import restrictions), which is confirmed by contemporary sources.[80] The most updated reconstruction of labour productivity, elaborating on the Giugliano's value-added estimates here incorporated, also sug-

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[72] Paretti and Bloch, "La production industrielle."

[73] OEEC, *Statistiques Industrielles*. For Italy (p. 154) the quantity series were taken from *Annuario Statistico Italiano*, whereas the weight system used to calculate the 1938-price index was not specified.

[74] Toniolo, *L'economia*, pp. 139–46; Ciocca, *Ricchi per sempre?*, p. 194.

[75] It should be added that international comparisons are particularly problematic for the 1929 crisis, since each national index is based upon different weights between inputs and outputs, whose prices followed different paths: the input prices decreased much faster and thus the indices based upon inputs fell more. For pioneering remarks about this issue, cfr. Tattara and Toniolo, "L'industria manifatturiera," p. 107. Gianni Toniolo (*L'economia*, p. 145) emphasized once more the relevance of this matter for the Italian case, where in those years industrial policy would widen the gap between output and input prices, but he also acknowledged that a precise quantification could hardly be produced, given the high complexity of standardizing and comparing different levels of disaggregation, and the difficulty of finding any unbiased deflator.

[76] Istat, *Indagine*, p. 89.

[77] Giugliano, "Crisis?"

[78] Mattesini and Quintieri, "Italy and the Great Depression".

[79] Carreras and Felice, "L'industria italiana." This cycle is in line with the reconstruction of the demand of still and iron proposed by Federico, "La domanda siderurgica" (see in particular pp. 390 and 396–7).

[80] Banca d'Italia, *L'economia italiana*, p. 769.

gests that on the whole the ratio capital/workers was on the rise in the first half of the 1930s, while decreased in the second one.[81]

Finally, for what concerns the last period (1938–51), there appear to be only slight differences between our estimate and Istat-Vitali. This doesn't mean that Italian official statistics for the years following the Second World War should be trustworthy. On the contrary, as shown convincingly by Vera Zamagni, in that period "confusion" was still a dominant trait of the Italian industrial figures: in just four years, from 1949 to 1952, four competing estimates of Italy's industrial production were published covering the years 1947 to 1951, one from Istat, all different from each other and in turn different from the later Istat's 1957 estimate.[82] However, for those years there is substantial agreement among scholars for what concerns the interpretative framework: all agreed that the performance of the Italian industry in the Second World War was far worse than the one in the First World War, all agreed that the recovery after the war was impressive.[83] Thus our new data, while not raising new interpretative concerns, confirm the established knowledge for that period, although reducing the (too high) production gap between the First and the Second World War. In addition, for the years 1938 to 1951 this article offers a decomposition of the Italian industry which so far was lacking (the previous 1938-price series referred only to total manufacturing), at three different price-bases: no doubt a net addition, at the same time not altering the overall profile of Italy's industry from 1938 to 1951, as incorporated in the most recent series of national Gdp.[84]

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[81] Broadberry, Giordano and Zollino, "A Sectoral Analysis;" our calculations from tables A3, A4, A5. Although the available periodization does not allow for a more in-depth discussion concerning the manufacturing sector, it results that the growth rate of productivity in manufacturing more than doubled in the last part of the period (1938 to 1951: 1.45 annual rate) as compared to the first longer part (1911-1938: 0.64 annual rate) (table 6, p. 31).
[82] Zamagni, "Betting on the future," p. 298.
[83] For a synthesis from a quantitative perspective, see Zamagni, "Un'analisi."
[84] See Brunetti, Felice, Vecchi, "Reddito;" Baffigi, "Italian National Accounts."

4. *Sectoral estimates and the long-run view: when did the modernization of Italy's industry begin?*

The new series allow us to discuss the sectoral patterns of Italy's industry from 1911 to 1951, for the first time since Istat's 1957 estimate at current prices. In order to do this, we now turn to the series at quasi-current prices. Any of the three constant price sectoral indices, in fact, would be biased by the sectoral weights assigned to each price-basis; the quasi-current price index offers instead a more balanced picture, by combining the three weight systems through geometric average, as from equation [3].

TABLE 4

PERCENTAGE SHARES OF TOTAL INDUSTRIAL PRODUCTION

(quasi-current prices)

		1911	1917	1921	1929	1932	1938	1945	1947	1951
1	Mining	4.4	2.6	2.9	2.7	2.5	2.6	2.0	2.0	2.6
2.01	Foodstuffs	16.7	17.1	23.1	15.6	18.8	16.2	20.7	10.5	10.5
2.02	Tobacco	0.6	0.8	1.1	0.7	0.8	0.8	2.2	1.0	0.9
2.03	Textiles	8.6	9.9	9.9	9.7	10.0	10.9	11.4	20.6	12.3
2.04	Clothing	4.9	5.6	5.9	5.4	4.3	3.0	3.0	4.1	3.9
2.05	Leather	6.0	6.4	6.4	5.2	4.0	2.6	2.4	3.2	2.9
2.06	Wood	7.8	2.0	3.2	3.2	2.9	2.6	6.2	4.1	4.6
2.07	Metalmaking	2.4	4.2	1.7	4.1	4.2	5.3	2.0	3.4	4.5
2.08	Engineering	17.0	27.6	13.8	17.0	12.7	19.5	9.4	15.2	20.6
2.09	Nonmet. minerals	5.1	1.9	3.6	3.8	3.5	2.8	2.1	2.5	3.7
2.10	Chemicals, rubber	3.4	4.4	4.6	7.1	7.5	12.9	3.3	8.2	8.9
2.11	Paper, printing	4.9	4.7	3.4	2.1	2.4	2.2	2.8	2.5	3.3
2.12	Sundry manuf.	0.5	0.8	0.8	1.1	1.4	1.9	1.4	1.6	1.4
2	Manufacturing	77.8	85.4	77.5	75.1	72.6	80.8	66.8	77.0	77.4
3.	Construction	14.0	5.1	13.8	16.4	17.7	10.3	18.9	14.6	14.6
4.	Utilities	3.8	6.9	5.9	5.7	7.2	6.2	12.4	6.5	5.4
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources and notes: see the text.

Table 4 shows the percentage shares of total industrial production at quasi-current prices, for selected years. We can observe that in the first decade, from 1911 to 1921, there was a relative growth of the most traditional manufactures, from foodstuffs to textiles, whereas the share of engineering and metalmaking decreased; the Great War was of course an exception, exemplified at its best by the 1917 benchmark, but a short-lived one. It is only in the 1920s that the first signs appeared of a

reorientation of Italy's industry towards more advanced productions, and these signs consolidated in the 1930s, in the recovery following the 1929 crisis.[85] Still in 1921, foodstuffs were the biggest sector in terms of value added; on the eve of the 1929 crisis, they had been overcome by engineering, but then the crisis pushed back again the share of the latter. Engineering rose again in the 1930s, together with other advanced manufactures: by 1938, it ranked first, followed by foodstuffs, whereas chemicals stood out as the third sector, having overtaken textiles. Once again, the Second World War brought back the composition of Italy's industry towards more traditional activities,[86] so much so that in 1945 foodstuffs had temporarily taken back the lead, followed by construction and textiles. These latter were the first sector to recover after the war, ranking first by 1947, soon before the implementation of the Marshall Plan. By this time, however, engineering and chemicals had already resumed their growth. This further consolidated with the Marshall Plan: by 1951, engineering had imposed itself as the most important sector, followed at a distance by textiles, and having now doubled foodstuffs.

We can divide manufactures into two main sectors, plus a residual: on the one hand, the mainly traditional sectors, those linked to agriculture or to the first industrial revolution, which produced nondurable goods, i.e. foodstuffs, tobacco, textiles, clothing, leather, paper and printing; on the other, the more advanced sectors, those partly or mostly linked to the second industrial revolution, i.e. metalmaking, engineering, chemicals;[87] the residual is made by traditional sectors which produced durable goods (wood, non-metallic minerals) and by sundry manufactures, including both traditional and advanced industries and producing mainly nondurable goods. Figure 3 compares the growth of "traditional" versus "advanced" manufactures, as a share of total production, at quasi-current prices; the series for the two main advanced manufactures, engineering and chemicals, are also shown.

The share of advanced manufactures increased dramatically during the Great War, but sharply decreased when the war ended. By 1921, the share was about as ten years before (chemicals had grown, but engineering had shrunk), so much so that we can conclude that the First World War was a parenthesis, rather than the beginning of a new cycle. This new cycle was to begin soon after, in the early 1920s, and to last until the collapse of the Fascist regime in the Second World War. It was clearly accelerated by the consequences of the 1929 crisis: at the beginning, the crisis brought about

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[85] The new available series on Italian exports confirm this finding, and long as they display a growth in the share of manufactured goods and, in particular, of machinery and transport equipment in the 1920s and 1930s, of chemicals in the 1930s (Federico and Vasta, "Was Industrialization an Escape?", p. 237). Conversely, the percentage of silk on total exports sharply decreased from the early 1920s, and by 1938 had collapsed (Vasta, "Italian export capacity," p. 137).

[86] Not least, because the most advanced ones used coal, which *de facto* in the Second World War – unlike in the First World War – could no longer be imported (see the end of this section).

[87] Needless to say, these sectors also include some traditional manufactures, but at the present these are impossible to separate from the rest (a part from the value-added series of matches, whose share of chemicals was by all means negligible: see table A.1).

a reduction in the share of the most advanced manufactures, and yet quite soon, by 1933, this share began to rise again, up to the point that in 1936 it had overcome that of traditional manufactures. During the last years of the Second World War, traditional manufactures did not collapse as severely as the advanced ones, being more linked to basic needs which tended to remain above a minimum threshold. After the Second World War, traditional manufactures recovered first – they suffered less from energy supply shortages – but quite soon had to give way to the most advanced sectors.
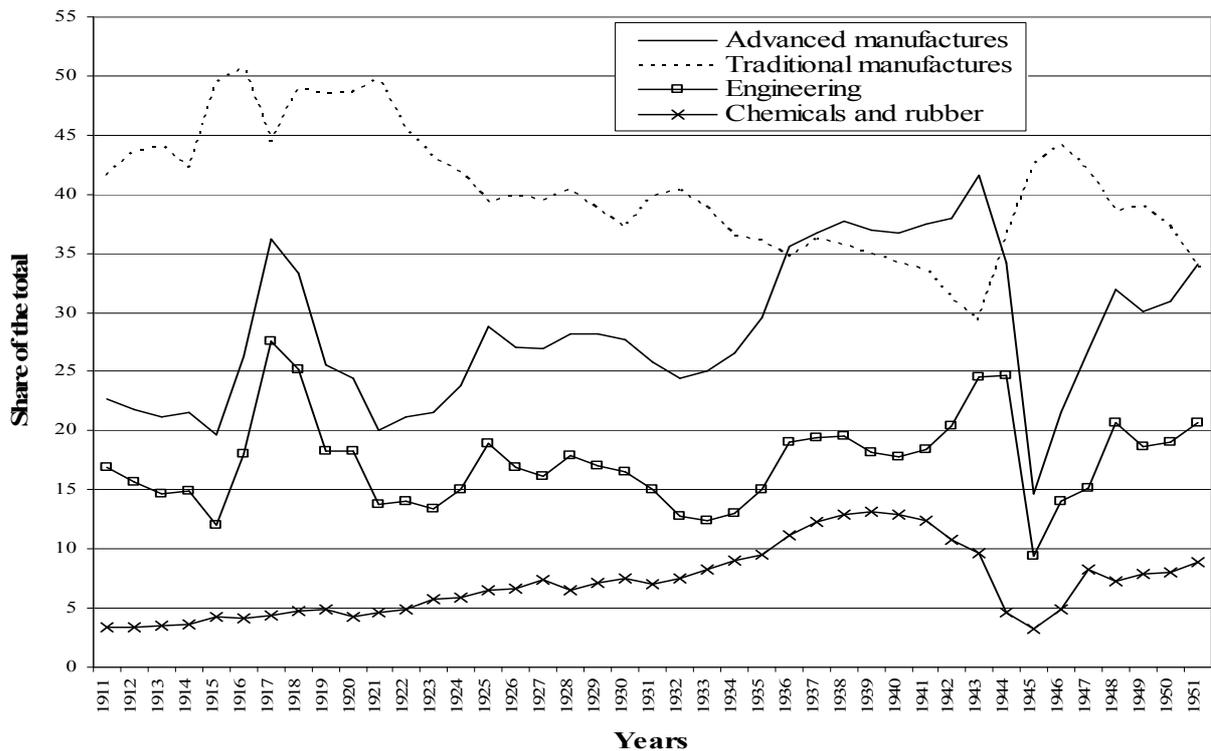
FIGURE 3.

"ADVANCED" VERSUS "TRADITIONAL" MANUFACTURES, 1911–1951

(shares of total industrial value added, quasi-current prices)

Note: See the text.

Yet, if we examine separately the two main components of advanced manufactures, engineering and chemicals, we can see that two rather different cycles were at work. From 1911 to 1951, chemicals were on the rise, their cycle growing more pronounced in the late 1930s, when the sector boomed due to the autarkic policy of the Regime (which inflated its prices); after the Second World War, chemicals recovered their growth, although from a lower level. Conversely, engineering followed a cycle characterized by several ups and downs: it is here that the Great War marked an authentic boom, but it is here also that the following Reconversion was more severe; it is here that the

1924–5 growth was truly noticeable, but the 1926 deflationist squeeze had a severe impact, with a short-lived recovery in 1928−9; but then came the international crisis, which – according to the new figures by Giugliano – was felt until 1932; from 1933 to 1938 recovery and later growth were on the march (as a share of manufacturing, the increase lasted until the apex of Italy's military effort in 1943). After the war, a new upward cycle was set in motion, although with some delay: engineering recovered after textiles, whose share was definitely overtaken in 1948; by then, the sector had already reached one fifth of total industrial value added, approximately the same share as in 1942. On the whole, these ups and downs moved along a slightly rising trend, which began in the first half of the 1920s.

The difference between the cycles of chemicals and engineering should not come as a surprise: the two sectors belong to different industrial categories, the former producing mainly nondurable goods, the latter durable goods and their inputs. Among the nondurable goods industries there are also foodstuffs, tobacco, textiles, clothing, leather, paper, sundry manufacturing industries, and the utilities. The durable goods (and related materials) industries are instead constituted also by extractive, woodworking, metalmaking, engineering, nonmetallic mineral processing, and construction industries. The former are tied to consumption, the latter to investment. During liberal Italy, according to Fenoaltea there was a dominant effect of the production of durable goods (and related materials), which followed the Kuznets cycle of British foreign direct investments;[88] non-durables moved along a much more even path, whose small changes were nonetheless in line with those of durable goods: "As the adage had it, *quand le bâtiment va, tout va* (When construction prospers, everything prospers)".[89]

Figures 4 links the present estimates (at 1911 prices) with those produced by Fenoaltea for liberal Italy, [90] in order to offer a long-term view of Italy's industrial production from 1861 to 1951, allowing for the distinction between durable and nondurable goods. As with liberal Italy, also in the interwar years durables and nondurables follow similar cycles. The only remarkable exception is the Great War, which began with a rise in non-durable goods, presumably in order to supply the army's needs, continued with a rise in durable goods, in order to produce military equipment, and was followed by a recovery of consumption and thus of non-durable goods, paralleled by a collapse of durable goods. After the First World War and its recovery, we can observe the same ups and downs in both durable and non-durables industries. And yet the main difference with the period of liberal Italy is that now consumption cycles are also manifest, especially in the 1930s, and of some momen-

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[88] Fenoaltea, "International Resource Flows."
[89] Fenoaltea, "Notes," p. 712.
[90] Ibidem.

tum in determining the profile of the Italian industrial production: for example, the 1937 and 1939 peaks are mainly due to the rise of non-durable industries.
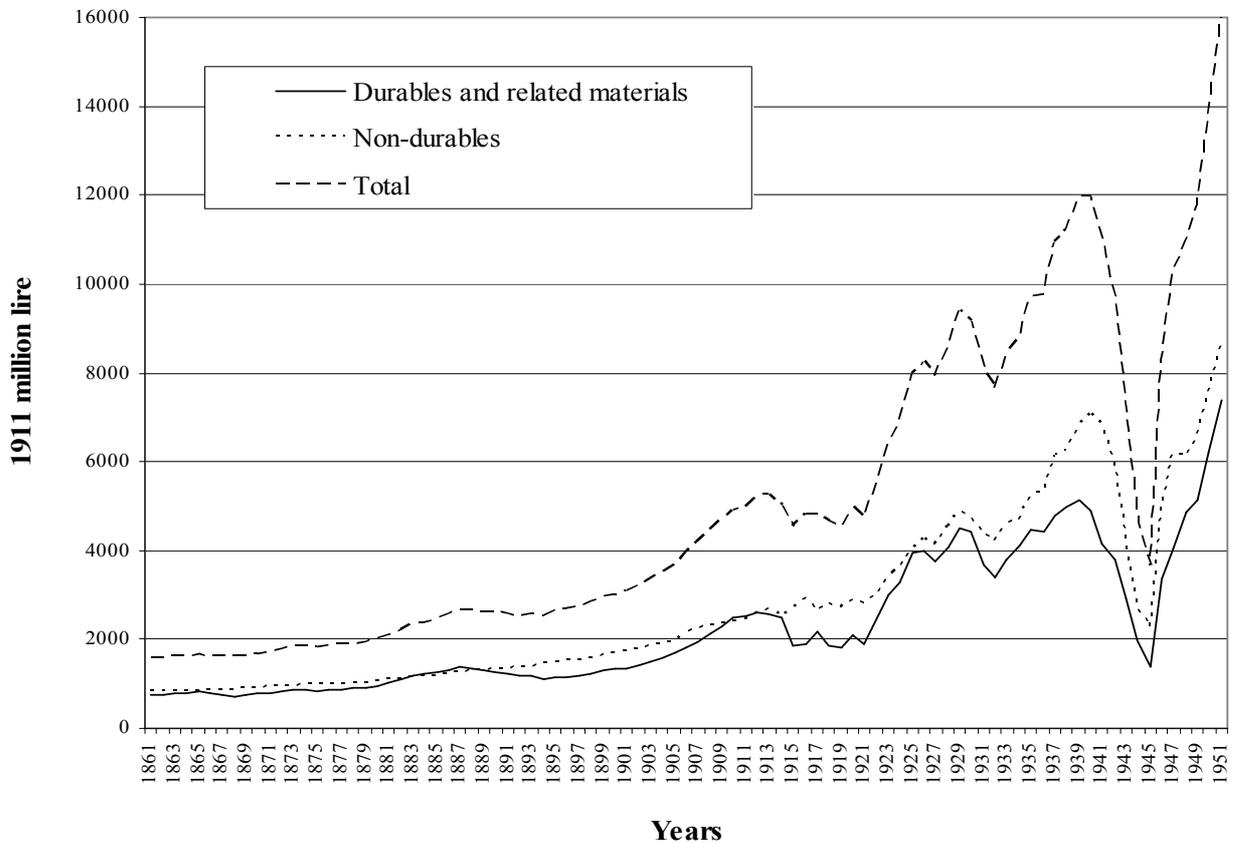
FIGURE 4.

ESTIMATED INDUSTRIAL PRODUCTION, 1861–1951

Note: See the text and Fenoaltea, "Notes."

We can make a further analytical step, by comparing the movements of durable and nondurable industries over the long with the avail of some econometrics, namely cross-correlograms and cointegration analysis. The results from cross-correlograms[91] are displayed in figure 5. The first finding

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[91] In descriptive statistics, cross correlation is the method most commonly used to estimate the degree to which two stationary time series are correlated. Given two series $x_{(i)}$ and $y_{(i)}$, with i = 1, 2, … N-1, the cross-correlation r at delay d is defined as:

$$[4] \quad r = \frac{\sum_{i=1}^{N-1} [(x_i - \overline{x}) \times (y_{i-d} - \overline{y})]}{\sqrt{(x_i - \overline{x})^2} \times \sqrt{(y_{i-d} - \overline{y})^2}}$$

where $\overline{x}$ and $\overline{y}$ are the means of the corresponding series which, in our case, are logarithm of value added of durable industries (x_i) and logarithm of value added of nondurable and related industries (y_i), in both cases at 1911 prices (log transformation is employed to ensure stationarity). Correlation series, as those displayed in figure 5, result from computing [4] for a certain number of delays d. For an introduction to this method, see Chatfield, *The Analysis of Time Series*, pp. 169–74.

which comes to the eye is that the two movements are always highly correlated at a delay of 0, i.e., on average they follow the same cycle on a yearly basis. However, and here comes the second result, the shape of the curve of the liberal age is remarkable different from that of the interwar years: in the first period (1861-1913), the trend is prevailing, in the second one (1913-1951) is instead the cycle to prevail.[92]
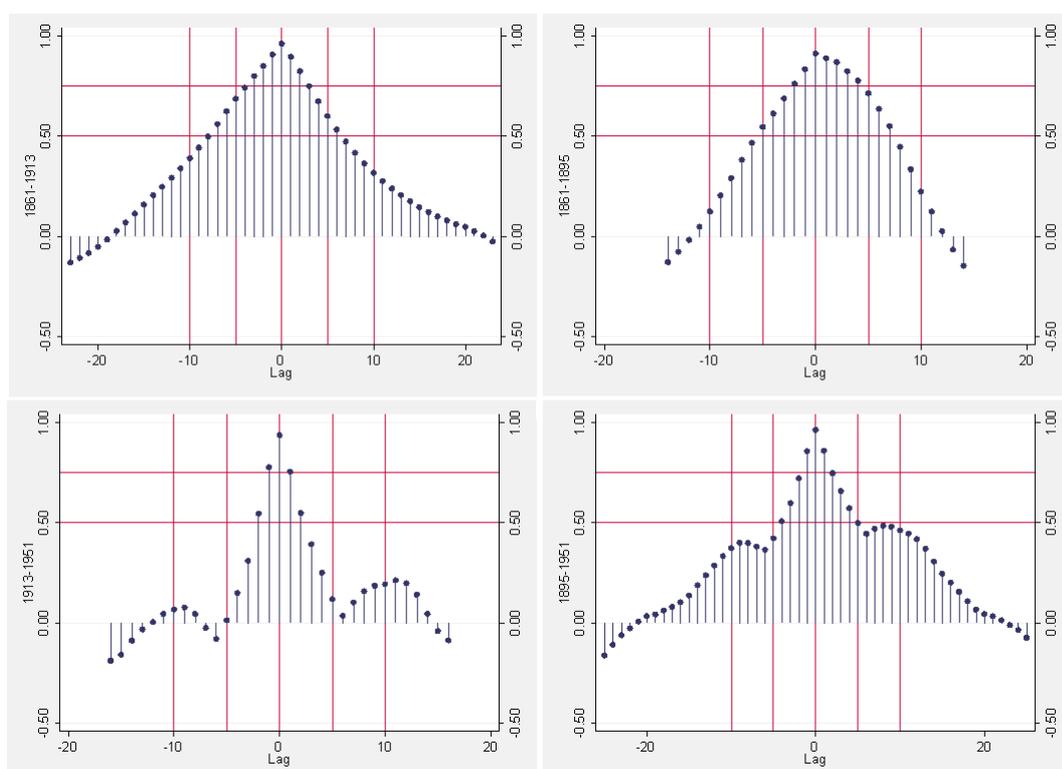
FIGURE 5

CROSS-CORRELOGRAMS DURABLE AND NONDURABLE INDUSTRIES, 1861-1951, BY SUB-PERIODS (VALUE ADDED AT 1911 PRICES)

Source: elaborations from Figure 4.

Note: x_i is logarithm of value added of durable industries, y_i is logarithm of value added of nondurable and related industries. For more details, see the text.

The partition of the 1861-1951 period into the two unequal halves mentioned above is simply made on the basis of the available sources (Fenoaltea for liberal Italy, then the estimates here presented). Thanks to the fact that we now have relatively consistent long-run series, we can divide the 1861-1951 years also in a different way, in search of breaks not imposed by changes in sources. This simple exercise, whose main results are displayed in the second part of figure 5,[93] yields an in-

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[92] This finding is confirmed by autocorrelation plots run separately for the two series.
[93] Other partitions have been omitted for reasons of space.

triguing finding, which is the third one worthy of attention: in the long-run, the main division seems to run around 1895. In the decades before (1861-1895), along a prevailing common trend there indeed appears to be the dominant effect of durable industries, mild nonetheless, as stressed by Fenoaltea: the movements of investment related industries seem to slightly anticipate, by two or three years of delay, those of the consumption related ones. In the second period (1895-1951), to prevail is instead the cycle and, what is more important, the dominant effect of durable industries is no longer clearly detectable: in the short-run, on average the two series appear to proceed, more or less, on an equal footing, i.e., the growth of consumption related industries is now no longer anticipated by that of investment related ones. Furthermore, it is worth noticing that the dominant effect of durable industries disappears as early as in the Giolitti's age: in fact, it could not be noted in the cross-correlograms going from 1861 to 1913.

Results from descriptive statistics are confirmed by cointegration analysis. To tests for cointegration, we run an Engle-Granger Augmented Dickey-Fuller test, which checks for the presence of unit roots on the residuals (z_t) of the following OLS regression model:

[5] $Y_t = \alpha + \theta X_t + z_t$;[94]

where θ is the cointegration coefficient between the value-added series of nondurable (Y_t) and durable industries (X_t) at 1911 prices:[95] if the two variables result cointegrated, that means that they share a common stochastic trend. Here the null hypothesis is the presence of unit root, which cannot be rejected (i.e., we have cointegration) if the test statistic lies inside the acceptance region at different levels of confidence. As we can see from the results displayed in table 5, we have cointegration with much more confidence for the early period of the series, than for the late one. Namely, the break lies once again in the mid of the 1890s: before we have strong cointegration, i.e., nondurables and durables follow the same stochastic trend (the one of durables, as displayed in figure 5); after, no longer. Once again, the main finding is that from the mid of the 1890s the growth of consumption related industries becomes more independent from that of investment related ones. It is only tempting to link this break to the important institutional innovations of the first half of the 1890s, mainly in the credit system: the birth of the Bank of Italy and, above all, the creation of universal

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[94] Engle and Granger, "Cointegration." We are aware that the OLS estimator, being not-normally distributed, can yield distorted results and thus should be handled with caution. However, alternative estimators, namely the dynamic OLS (see Stock and Watson, "A Simple Estimator"), or the nonstationary vector autoregressive process developed by Johansen ("Statistical Analysis"), are strongly dependant on the number of observations, and thus cannot be profitably used for our exercise (we compare series with different number of years/observations: see table 5). We rather prefer to comment the present results with due prudence (for example, considering only the less disputable evidence) and, above all, to couple them with those from descriptive statistics previously discussed.

[95] The variables have been pre-tested for the presence of unit roots, with the inclusion of both trend and intercept, in order to check if they are integrated of the same order (they are).

banks. The consequence would be to infuse new life into a now out-of-fashion tradition, dating back to Gerschenkron's substitutive factors.[96]

TABLE 5

COINTEGRATION ANALYSIS BETWEEN DURABLE AND NONDURABLE INDUSTRIES:
ENGLE-GRANGER AUGMENTED DICKEY-FULLER TEST

Years of the series	Test statis-tic, Z(t)	Interpolated Dickey-Fuller, Z(t)			MacKinnon approximate p-value for Z(t)	θ value	R^2	Number of obs.
		1% critical value	5% critical value	10% critical value				
1861-1913	-2.037	-3.579	-2.929	-2.600	0.2704	0.938	0.928	51
1861-1895	-0.683	-3.696	-2.978	-2.620	0.8511	0.788	0.833	33
1895-1913	-4.279	-3.750	-3.000	-2.630	0.0005	0.733	0.977	17
1895-1951	-2.280	-3.573	-2.926	-2.598	0.1785	0.951	0.928	55
1913-1951	-2.976	-3.668	-2.966	-2.616	0.0372	0.862	0.877	37
1861-1951	-2.820	-3.525	-2.899	-2.584	0.0554	1.048	0.965	89

Sources and notes: see the text. All the models are 1-lagged.

It goes without saying that entering into institutional history is far beyond the scope of this article. For now, the new estimates corroborate the argument that during the period under review the Italian industry had begun to redirect itself towards the internal market, and suggest that this redirection could well have begun as early as by the end of the nineteenth century. Italy was beginning to walk on its own feet, and as a consequence one single "external" explanation, as the cycle of British investments for the first decades following Unification, was no longer valid. As far as the interwar years are concerned, the ups and downs are rather referable to a succession of internal and external shocks. Thus the 1926–7 fall is due to the deflationist policy of the Regime (internal), whereas the following slump (1930–2) is of course a consequence of the 1929 crisis (external). The following recovery (1933–6), stronger in engineering and construction and in related industries, is mostly due to the production of durables goods: it is once again referable to the Fascist policies (internal), in favour of public construction on the one hand, directed to the preparations for the Ethiopian war (October 1935 – May 1936) on the other. After the Ethiopian war and until the Second World War, most of the growth of the Italian industry is due to non-durables, and thus again to a recovery of consumption (internal).

Finally, it shall be noticed that the advent of the Second World War did not mark an increase in the industrial value added, as instead it had been the case with the First World War – although the discrepancy between the First and the Second World War is less pronounced now than with the previous Istat-Vitali's series. The change in alliance played a role in this discrepancy, the allies of the

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[96] Gerschenkron, "Notes."

First World War (England, France) facilitating the provision of capital and energy inputs (coal) to the Italian industry, that of the Second World War (Nazi Germany) making it more difficult and even preying upon Italy's industry.[97] In fact, during the Second World War durables suffered from the same downturn as non-durables, and then both rapidly recuperated after the war, once the Italian more "traditional" alliances were re-established; as expected, the new upward cycle began a bit earlier in non-durable productions, while sharply accelerated in durables around 1950, once the Marshall plan was fully operative.[98]

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[97] Cfr. Petri, "Stima;" Rieder, "I rapporti."
[98] For a recent analysis of the Marshall Plan from the business history perspective, confirming these results, cfr. Fauri, "Big business."

5. Conclusions

The new series of Italy's industrial value added propose a new picture which, compared to the previous quantitative evidence, shows significant novelties and a few confirmations. At the aggregate level, the estimates reduce Italian growth during the First World War, while improving performance in the 1920s. The 1929 crisis looks now more profound than before, and in line with the average of Western Europe, while the recovery after 1933 is stronger. For what concerns the last period, from the advent of the Second World War until 1951, there are instead no significant differences between the new estimates and the extant one by Istat-Vitali.

From the end of the First World War, four upwards swings have been detected: the first one began in the early 1920s and lasted until the 1926-27 revaluation of the lira; the second one, shorter, going from 1927 to 1929; the third one began with the end of the 1929 crisis, around 1933, and continued up to the outbreak of the Second World War; the last one started at the end of the Second World War and developed into the economic miracle. These ups and downs moved along a positive trend – Italy outperformed the other main European countries − characterized by a growth in percentage of advanced manufactures (engineering, chemicals) at the expense of more traditional ones (foodstuffs, textiles, clothing): such a redistribution had begun already during the First World War, but at that time resulted ephemeral; the changes which took place from the early 1920s, and consolidated in the 1930s, were instead more enduring.

During a time when the internal factors and the national market were growing in importance, some of these cycles were determined not only by investment related industries, particularly engineering and construction, but also, for the first time, by non-durable industries, especially in the late 1930s. As expected, however, in the interwar years consumption related industries moved along a relatively stable path, wherein two different trends can be noticed: chemicals and utilities on the one side, which grew faster; foodstuffs, textiles and clothing – i.e. traditional manufactures − on the other, which grew slower. After linking the new series with those produced by Fenoaltea for liberal Italy, cross-correlograms and cointegration analysis suggest that non-durable industries had begun to proceed on their own footing as early as by the second half of the 1890s, thus shedding a potentially more favourable light upon the role of institutional change at the national level.

All in all, in the interwar years the growth in value added of the Italian industry was a success story. Not so much in absolute terms, the annual rate being still low (especially when confronted with the following decades), but surely in relative terms, when compared to other countries: in the

most troublesome decades of industrial capitalism, Italy converged towards the most advanced European economies. A long-run analysis, covering the entire period from Unification (1861) until 1951, reveals that the modernization of Italy's industry may have begun in the last years of the nineteenth century (in coincidence with the creation of some key institutions), to intensify between the two global conflicts and the few years immediately following the Second World War. Among the pessimists, who looked with disappointment at the period from Unification to the *First* World War,[99] and the optimists, who regarded as a "success" the Italian performance from Unification to the *Second* World War,[100] this article helps to bridge the gap with quantitative evidence.

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[99] Fenoaltea, "Lo sviluppo economico."
[100] Federico, "Italy."

APPENDIX

The new estimates of Italy's industrial value added (1911-1951): sources, methods, and results

On sources and methods: Carreras and Felice

As far as sources and methods are concerned, we aim to provide an index with four main characteristics: a) to be independent from the previous Istat-Vitali's series, as much as possible; b) to be fully documented and thus replicable; c) to be in line with the detailed value-added reconstruction produced for benchmark years (1891, 1911, 1938, and 1951) under the auspices of the Bank of Italy; d) to be conceptually consistent with Fenoaltea's index covering the period 1861 to 1913 – and which complies with points a), b), and c) – so much so as to be able to sketch the long-term evolution of the Italian industry. As with Fenoaltea's index,[101] no claim to perfection or near-perfection is advanced here. On the contrary, we too are aware that our estimates are still largely improvable. Indeed, this argument is even more true in our case than in Fenoaltea's one, mainly because the level of detail is here inferior – although usually higher than what can be observed for other countries. In our view, however, possible improvements should remain within the four characteristics sketched above, with a particular attention to point d), that of long-term historical consistency.

For what concerns points a) and b), with only two exceptions[102] the same sources and methods of the 1911–38 estimates have been used to extend the series up to 1951. Besides having been fully described in the Italian article covering the 1911–38 years,[103] these sources and methods are documented in Appendix Table 1. Here only their general characteristics are discussed. As it can be reconstructed from Appendix Table 1, the original Carreras' indices consist of 71 elementary series: for the most part (51), these are based on direct physical production, i.e. on output data; another consistent group of elementary series (17), with a high impact on the final indices, consists of apparent consumption series, i.e. of the sum of production plus imports minus export of the relevant inputs, whereas a few other series, with a very modest impact on the final indices, are based on import/export figures. Almost the totality of these elementary series are in turn taken, or estimated, from official statistical data, in some cases (textiles) with a remarkable level of elaboration upon the original sources, for example by allowing for reprocessed waste in the silk series.[104] In the article by Carreras and Felice, these Carreras' series have the lion's share. They cover 58% of the industrial value added in 1911, and between two-thirds and 70% of the industrial value added in 1938 and 1951. In more detail, they include all of the durable-goods advanced industries (engineering, metalmaking, chemicals and rubber), a considerable part of the old consumer-goods industries (almost entirely textiles, the greater part of foodstuffs and tobacco), and not-negligible shares of the other manufactures. Concerning the non-manufacturing industries, they cover all of mining, most of the utilities, but none of construction.

The remaining shares and sectors have been covered by making recourse to the available second-hand sources, such as the old Istat series[105], the Barberi's reconstruction of national consumption accounts (which shares merits and faults with the Istat series),[106] and the Rey's series of gross investments in houses and public works (in turn derived

[101] Fenoaltea, "Notes," p. 730.
[102] Explosives and water utilities, which have new proxies for all the years 1911 to 1951.
[103] Carreras and Felice, "L'industria italiana," pp. 313–24.
[104] Carreras, "La producció," pp. 955–78.
[105] Istat, *Indagine*.
[106] Barberi, *I consumi*.

from Istat series), used for the construction sector.[107] In this case, the method consists of computing indices which are supposed to be somehow correlated with production, such as investments, or consumption expenditures (CE). A few of these single elementary series have some impact on the final indices: most notably, gross investments in houses and public works (10 to 15% of the final indices), and total consumption of clothing and footwear (11 to 6%). Of course, the final indices would be altered if the supposed correlation between a proxy series and its corresponding production would turn out to be problematic, as well as if the proxy series itself would be unreliable. Although for the entire manufacturing these possible faults are limited to a part of consumer-goods industries, it is mostly here that further research can significantly improve the estimates. But it is also here that significant progress has been made, at least for the 1928–38 years, thanks to Giugliano's work which is here incorporated (see the next section). Finally, a negligible part of the elementary series (covering about 3% of the total index) have been constructed through combining value-added indices of related sectors. "The practice is mindless, and palpably suboptimal" – Fenoaltea points out[108] – but we have tried to keep it at a minimum.

The 91 elementary (proxy) series are attached – and here we come to point c) – to three different price-weights: 1911, 1938, 1951, all taken from the Bank of Italy recent reconstruction of Italy's industrial value added, which was produced by Fenoaltea (for 1911)[109] and by Bardini and Fenoaltea (for 1938 and 1951).[110] The estimates for these three benchmarks are both reliable and highly detailed, so much so that they make possible to estimate 88 sub-sectoral value-added series for all the three benchmarks (for further details, see Appendix Table 1). The number of sub-sectoral value-added series slightly differs from that of elementary (proxy) series, for two reasons. First, because some elementary series are used to produce a single value-added series, namely in the case of engineering. Secondly, because in some cases a single elementary series has been used to produce more than one value-added series: for example, wheat apparent consumption has been used to estimate the value added of pasta factories, of fresh pasta, of mills and bakers, of biscuits and panettoni; of course these four series exhibit the same cycle, but their relative weights – and thus their trends – change when passing from the 1911 to the 1938 and then to the 1951 price-weight system, and thus this trend-specific component has not been lost. Of course, the number of 88 sectors is the least common denominator to the three benchmarks, which thus have been reduced to a common structure. This allows us to present not only series of the Italian industrial value added at three different constant prices (1911, 1938, 1951), but also a combined index at "quasi-current prices" (again at the same sectoral breakdown), whose single components can be used to compare sectoral shares.[111]

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[107] Rey (edited by), *I conti economici*, pp. 211–2.

[108] Fenoaltea, "The Reconstruction," p. 87. It is Rule 3: "indexation must be thought out".

[109] Fenoaltea, "Il valore aggiunto." There are some minor variations concerning the 1911 benchmark, due to the fact that in this case the (older) national estimates have been revised thanks to the ongoing work by Ciccarelli and Fenoaltea: "Metalmaking", "Le industrie", "The Chemicals" (whose new national figures were already incorporated in Carreras and Felice, "L'industria italiana"), *La produzione industriale* (whose national figures, for mining and quarrying and for the utilities, have been incorporated here; for construction, the regional revision by Ciccarelli and Fenoaltea has not changed the 1911 national figure).

[110] Fenoaltea and Bardini, "Il valore aggiunto."

[111] By deflating this index through a common deflator – we opt for the Istat's cost of life index – we have a fourth index at constant prices, which is not displayed in the tables. This cannot be considered our "best estimate" of the industrial "real" production (see on this Fenoaltea, "The Reconstruction," p. 93), mainly due to the few benchmarks used to interpolate, and was only used to discuss the "relative" value of the industrial production as compared to the general level of prices.

On sources and methods: Giugliano

Appendix Table 1 is the basic "grid" used in Carreras and Felice's Italian article covering the years 1911 to 1938, and here extended to the 1938–51 years. As mentioned, in the present article a significant integration has come from the work of Ferdinando Giugliano, whose results have here been incorporated. It is worth stressing that, in order to have homogeneous estimates over the long run, these new series cannot be included, limitedly to the years 1928 to 1938, without changing consequently also the series for the years 1911 to 1927, for each one of the sectors where Carreras-Felice's series have been substituted by Giugliano's. In fact, once we accept Giugliano's estimate for 1928, is then this "benchmark" which must be reconnected to the 1911−27 Carreras-Felice's remaining series, rather than the previous 1928 estimate (which came from reconnecting the 1938 benchmark through Carreras-Felice's proxies). Thus Giugliano's estimates cannot be simply superimposed on Carreras-Felice's figures, as instead it has been done in the latest reconstruction of the Italian Gdp,[112] but must be used to re-scale the 1938-price series also for the years 1911 to 1927, at the same high level of detail of both Giugliano's and Carreras and Felice's elementary series.[113] The resulting 1938-price sub-sectoral series for the entire period 1911 to 1938, which in short combine proxies by Carreras and Felice (1911−28) and by Giugliano (1928−38), can then be used also to re-estimate the 1911-price value-added series for the years 1911 to 1938, and, *ça va sans dire*, the 1951-price value-added series for the same period. As a consequence, the 1911- and 1938-price value-added series here presented are different from those of Carreras-Felice's Italian article (in trend, not in cycle), also for the years 1911 to 1927, for all of the sectors where Giugliano's 1928−38 series have been used.

There are very few doubts that Giugliano's indices overcome some shortcomings of Carreras-Felice's. For the years 1928 to 1938, Giugliano has estimated six sectors, covering about 50% of industrial value added in 1938: engineering, textiles, wood, clothing, leather, and construction. The latter four provide new series independent from the old Istat-Vitali's figures, thus complying to point a) and representing a significant improvement upon Carreras and Felice – not out of line with the authors' desiderata.[114] More in particular, for wood, clothing, leather and footwear, where Carreras and Felice used two proxies based on Barberi's consumption, Giugliano has estimated three separate indices, based on the total number of hours worked.[115] For construction, where Carreras and Felice used only one index, in turn based on the old Istat-Vitali's series, Giugliano has estimated three indices, weighted from the value of production in 1938 (as reported in the 1937–9 industrial census): for public works (0.52 weight), the number of days worked,[116] corrected for changes in the number of daily hours worked;[117] for non-residential buildings (0.14 weight), Giugliano's revised index of industrial production in manufacturing; for residential buildings (0.34 weight), data on construction permits released in all the Italian provincial capitals.[118]

Giugliano's indices for engineering and textiles are not necessarily superior to Carreras-Felice's, on theoretical grounds, but there are good reason to believe that, at least in the Italian context of the 1929 crisis and its aftermaths, they are more reliable. For silk, where Carreras and Felice had only one index, based on apparent consumption, Giugli-

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[112] Brunetti, Felice, Vecchi, "Reddito."
[113] Given the formulas [1] and [2] used to calculate constant-price series (see section 2), the re-scaling is needed to make them equivalent when, for each production *i*, the proxy used (Q) is not the same for all the *t* years.
[114] Carreras and Felice, "L'industria italiana," p. 289.
[115] From Banca d'Italia, *L'economia italiana*, for the years 1931 to 1936; Assonime, *Bollettino*, for the years 1928–30 and 1937–8.
[116] From Ministero delle Corporazioni, *Sindacato e corporazione*.
[117] From Zamagni, "Una ricostruzione."
[118] Taken from Istat, *Annuario*; data for 1937 and 1938 are extrapolated using the data of permits released in the main 17 provincial capitals.

ano has employed three indices: the Carreras's series relative to the production of cocoons,[119] the production of reeled silk,[120] and a third index, relative to the value added of twisting and weaving natural and artificial silk, based on the number of framehours,[121] which incorporates also artificial fibers. For cotton, wool, jump, hemp and linen, the proxies by Giugliano are of the same number as those by Carreras and Felice, but mostly based on production rather than on apparent consumption, and thus more reliable.[122] For mechanical engineering, where Carreras and Felice had only one index, although in turn made up of seven series (i.e., the apparent consumption of seven metals), there are now eleven indices, weighted from the value of production in 1938 (as reported in the 1937–9 industrial census): of these, seven (civil and military shipbuilding, cars and commercial vehicles, and rolling stock) have been reconstructed through direct production data,[123] whereas the remaining four (foundries, electrical equipment, specialised workshops and various workshops) have been estimated making use of employment data[124] corrected for changes in the number of hours worked.[125]

At least for the 1928–38 years, physical output and labour-input data, such are those by Giugliano, are better suited than physical-input data, such are those by Carreras and Felice, mostly due to the possible time lags – particularly serious during a downturn − between the purchase of physical-inputs and the production of final goods; not by chance, stocks seem to have increased in 1932 and 1933, whereas in the next years, "following import restrictions, the industry seems to have largely drawn from existing stocks".[126] To be honest, the use of apparent consumption to estimate engineering is in line with a long tradition,[127] in order to cope with a sector whose production is so highly diversified, but successive (and the latest) Fenoaltea's refinements for liberal Italy have introduced employment as well.[128] Therefore, Giugliano's engineering series are also (or even more) in line with the most updated estimates for post-Unification Italy.

It should be noticed that Giugliano's indices of engineering are usually lower than Carreras and Felice's ones, resulting significantly higher only in the last years (1936 and 1937). For all the 1928–38 years, on average Giugliano's figures are lower than Carreras and Felice's, by about 12%; since for the following years the return to apparent consumption doesn't increase the numbers – quite the contrary – Giugliano's figures for the years from 1939 onwards would probably be higher, if they ever were produced. It is possible, therefore, that over the whole cycle, from 1929 to the Second World War, the two methodologies yield very similar results. This would be of some comfort. It is possible as well that either the 1929–35 years, or (more probably, for the reasons above) the 1939–42 ones were indeed better than what depicted by our new estimates. This last finding would reinforce rather than invalidate the main results of this article.

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[119] Carreras, "La producció."

[120] From Ministero delle Corporazioni, *Sindacato e corporazione*.

[121] From Istat, *Annuario*.

[122] For cotton, there are two indices, the physical production of woven cotton (based on length, the number of meters of yarn, rather than on weight as in Carreras), and the quantity of spun cotton (the number of tonnes of yarn), both collected by the *Istituto cotoniero* (From Istat, *Annuario*), "a voluntary cartel encompassing all producers of woven cotton" (Giugliano, "Crisis?," p. 35). For wool, Giugliano uses the number of active frames for the wool weaving industry, and the total number of active spindles for the spinning industry (From Istat, *Annuario*; 1928 figures are extrapolated using the growth rate of the cotton weaving and spinning industry). For Jute, hemp and linen there are three production indices, for hemp and linen spinning, hemp and linen weaving, jute (simple average of jute spinning and weaving indices) respectively (From Ministero delle Corporazioni, *Sindacato e corporazione*).

[123] From Istat, *Sommario*; Anfia, *L'automobile*.

[124] From Ministero delle Corporazioni, *Sindacato e corporazione*.

[125] From Zamagni, "Una ricostruzione."

[126] Banca d'Italia, *L'economia italiana*, p. 769.

[127] At least for Italy: Gerschenkron, "Notes;" Fenoaltea, "Public Policy" and "Railroads"; Toniolo, "Effective Protection;" and of course Carreras, "La producció."

[128] Fenoaltea, "Notes," p. 729.

On long-term historical consistency: Fenoaltea

The above remarks lead us to point d), that of long-term historical consistency, i.e. to a comparison with Fenoaltea's 1861−1913 industrial index. Fenoaltea has recently published an article which contains a witty and clear exposition of its approach.[129] The author identifies four main "rules". The first one, "the data must be vetted", is of particular relevance for liberal Italy, when production statistics were faulty in many regards, and above all for what concerns agriculture.[130] Things improved by the turn of the twentieth century,[131] so much so that what was the source of the main discrepancy between Fenoaltea's and Gerschenkron' indices, the errors in the official crop estimates which were used by the Gerschenkron but refuted by Fenoaltea, is no longer a serious drawback for the period of our concern.[132] Nonetheless, and although statistical accuracy continued to improve under the fascist dictatorship, problems of "bad data" can still be present, particularly in the "official" estimates by Istat, Barberi, and Rey, used to proxy the sectors uncovered by Carreras. Of course, the incorporation of Giugliano's estimates, which for those very sectors resort to different and more reliable sources, partly overcomes this problem for the 1928−38 years.

We have already implicitly referred to our compliance with Fenoaltea's rule 3 ("indexation must be thought out"), when discussing the negligible part of our elementary series which have been constructed by combining value-added indices of related sectors; as well as with rule 4 ("deflation must be general and not activity-specific"), when introducing our "best estimate" of the industrial "real" product. Therefore, we can now concentrate on rule 2, which states that "the elementary series must be homogeneous. […] Ideally, each production process would be broken down as far as the trade statistics allow; in practice, at least the major trade flows are certainly to be allowed for".[133] The solution is thus disaggregating. In our case, this was done, we believe, to a reasonable level (about ninety sectors), which, although lower than Fenoaltea's current index ("almost 200 product-specific series"),[134] is higher than the early Gerschenkron's and Fenoaltea's efforts ("a few dozens series"),[135] and on the whole comparable to what is available for other countries.

Of course, "homogeneous" refers not only to disaggregation, but also to the appropriateness of the elementary series. These are, for Fenoaltea's estimate referring to liberal Italy, production (output) figures, in some cases proxied by apparent consumption, and so it is for Carreras' elementary series we make use of. In the case of engineering we use apparent consumption of iron, steel, aluminium, lead, copper, tin, and zinc, weighted with their relative prices, for the years 1911 to 1928 and 1938 to 1951. As mentioned, this method is similar to the one employed in Fenoaltea's early works and in Gerschenkron's pioneering index, where the consumption of semi-finished iron and steel net of rails was used, but is partially different from Fenoaltea's last index, which instead has used the above proxy only for a part of engineering, estimating the rest through employment census data or energy consumption.[136] In this case too, the incorporation of Giugliano's estimates – where labour input data have been used roughly for the same sectors as in Fenoaltea − is not at odds with the consistency of elementary series over the long run, quite the contrary. It should be emphasized that, for

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[129] "The Reconstruction."
[130] Indeed, officially crop figures were so unreliable that their publication had to be suspended in 1896 (Istat, *Le rilevazioni statistiche*, p. 73). See also Federico, "Le nuove stime," pp. 361–2.
[131] Mainly after the reorganizazion of the national agricultural statistics service in 1909–10. See Federico, "Le nuove stime," p. 364.
[132] Cfr. Federico "Una stima," pp. 54 and 77.
[133] Fenoaltea, "The Reconstruction," p. 85.
[134] Fenoaltea, "Notes," p. 708.
[135] Fenoaltea, "The Reconstruction," p. 90.
[136] More in detail: "The engineering series is obtained as the sum of four components. The 1911 value added estimates for the maintenance of tools and the working of precious metals are extrapolated […] using the census data on blacksmiths and goldsmiths […]. The estimates for other new production are extrapolated together on the basis of the consumption of semi-finished iron and steel, net of rails; and the estimates for other maintenance, essentially of machines, are extrapolated together on the basis of the energy consumed to drive those machines. The third of these four components is essentially what was considered representative of engineering as whole in the author's early work (and in Gerschenkron's)." (Fenoaltea, "Notes," p. 729).

what concerns consistency, "there may be exceptions, where qualitative differences can be captured by altering the dimension of measurement":[137] this is true for aircraft production, as well as for automobiles and other motor vehicles and intermediate goods, which developed in the interwar period while being negligible or absent in the liberal age; here too, the sector-specific Giugliano's estimates look as a net improvement.

On the matter of consistency, a last remark is warranted. Fenoaltea's industrial index was the final fruit of decades of work and has reached an impressive sectoral breakdown, probably unparalleled for any other country of the world; this work has also resulted in a number of publications over five (or six!) decades, spanning from 1967[138] to 2011.[139] As the author himself recognizes,[140] for liberal Italy over the long run the new index is very close to the Carreras' one; and thus in between Fenoaltea's first index and Maddison's index on the one side (which overstated growth), and the Istat-Vitali's index and Fenoaltea's second index on the other (which instead understated growth). Furthermore, most of the differences between Carreras and Fenoaltea are concentrated in the first decades and are due to the higher volatility of Carreras' index, which in turn is referable to its lower coverage, which exaggerates the impact of industry-specific shocks (in particular in the silk sector). This problem has here been overcome, by estimating the uncovered sectors through sources different from those used by Carreras, i.e. without indexing the unknown series through the known ones – as mentioned, this practice has been kept at a minimum. Not by chance, for 1912 and 1913, when our 1911-price series overlap with those by Fenoaltea, the differences are minimal – in this article, for 1912 and 1913 the original Fenoaltea's figures have been maintained, where necessary rescaled on the new Ciccarelli-Fenoaltea's 1911 benchmarks. As a consequence, we can reasonably argue that our 1913–51 index is probably not far from the one which would result from extending Fenoaltea's last index to the following period. Testing this assumption could be the subject of further research, hopefully facilitated by the full transparency of our sources and methods.

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[137] Fenoaltea, "The Reconstruction," p. 86.
[138] Fenoaltea, "Public Policy."
[139] Fenoaltea, *The Reinterpretation*.
[140] Fenoaltea, "Notes," pp. 708–9.

APPENDIX TABLE 1.

SUB-SECTORAL ESTIMATES OF INDUSTRIAL VALUE ADDED: SOURCES AND METHODS

(Carreras-Felice)

Sector	Sub-sector	Proxy	Method	Source	VA % (11)	VA % (38)	VA % (51)
Mining and quarrying [20]					4.414	2.621	2.583
Fossil fuels	Coke and peat	Coke	P	Carreras/ISTAT	*0.103*	*0.275*	*0.367*
	Natural gas	Methane gas	P	Carreras/ISTAT	*0.051*	*0.031*	*0.253*
	Mineral oil	Mineral fuels	P	Carreras/ISTAT	*0.029*	*0.057*	*0.017*
Metallic minerals	Iron ore	Iron ore	P	Carreras/ISTAT	*0.136*	*0.136*	*0.059*
	Copper ore	Copper ore	P	Carreras/ISTAT	*0.024*	*0.007*	*0.000*
	Lead ore	Lead ore	P	Carreras/ISTAT	*0.140*	*0.171*	*0.165*
	Zinc ore	Zinc	P	Carreras/RSM-ASIND(1)	*0.295*	*0.161*	*0.316*
	Silver and gold ore	Silver ore	P	Carreras/RSM-ASIND(1)	*0.002*	*0.001*	*0.001*
	Manganese ore	Manganese ore	P	Carreras/ISTAT	*0.002*	*0.011*	*0.006*
	Antimony ore	Antimony ore	P	Carreras/ISTAT	*0.002*	*0.005*	*0.005*
	Mercury ore	Mercury ore	P	Carreras/ISTAT(2)	*0.091*	*0.133*	*0.133*
	Tin ore	Tin	P	Carreras/ISTAT	*0.002*	*0.003*	*0.002*
	Iron pyrites	Iron pyrites	P	Carreras/ISTAT	*0.061*	*0.194*	*0.097*
	Aluminium ore	VA of other metallic minerals	Other VA	Other	*0.001*	*0.002*	*0.002*
Other	Rock salt and spring salt	Rock salt	P	Carreras/ISTAT	*0.013*	*0.029*	*0.031*
	Other products of mines	VA of other mining activities	Other VA	Other	*0.149*	*0.311*	*0.219*
Sulphur	Sulphur	Sulphur	P	Carreras/ISTAT	*0.682*	*0.268*	*0.270*
Sea salt	Sea salt	Sea salt	P	Carreras/ISTAT	*0.065*	*0.048*	*0.028*
Quarrying	Construction materials	Marble	P	Carreras/ISTAT	*1.786*	*0.191*	*0.208*
	Furnace materials	Cement	P	Carreras/RSM(3)	*0.780*	*0.588*	*0.402*
Foodstuffs [19]					16.651	16.235	10.496
Milling industries	Pasta factories	Wheat	AC	Carreras/ISTAT	*2.052*	*0.894*	*0.291*
	Rice industry	Rice	P	ISTAT	*0.207*	*0.667*	*0.167*
	Fresh pasta	Wheat	AC	Carreras/ISTAT	*(0.507)*	*(0.785)*	*(0.256)*
	Mills and bakers	Wheat	AC	Carreras/ISTAT	*6.622*	*5.800*	*1.888*
Confectionery industry	Biscuits and panettoni	Wheat	AC	Carreras/ISTAT	*(0.507)*	*(0.785)*	*(0.256)*
	Cocoa, chocolate and ice-creams	Cocoa	M	Carreras/MC	*0.266*	*0.894*	*0.661*
Food processing industry	Meat industry	Meat consumption	CE	Barberi	*1.598*	*0.609*	*0.226*
	Fishing industry	Fish consumption	CE	Barberi	*0.191*	*0.396*	*0.180*
	Vegetable preserves	Vegetable preserves	E	Carreras/MC (4)	*0.489*	*0.590*	*0.586*
	Coffee industry	Coffee	M	Carreras/Cap.-Mess.(4)	*0.066*	*0.346*	*0.142*
Dairy industry	Dairy industry	Milk and dairy consumption	CE	Barberi	*2.517*	*3.133*	*1.572*
Vegetable oil industry	Vegetable oil industry	Olives	P	Carreras/ISTAT	*0.119*	*0.458*	*0.100*
Sundry	Fodder and forage seed industry	Forage seeds	P	Carreras/ISTAT	*0.048*	*0.043*	*0.281*
	Sugar	Sugar	P	Carreras/ISTAT	*1.123*	*0.680*	*3.005*
	Honey	Sugar	P	Carreras/ISTAT	*0.010*	*0.003*	*0.014*
Alcoholic beverages	Wine, alcohol and vinegar manufact.	Wine	AC	ISTAT	*0.322*	*0.518*	*0.510*
	Beer and malt manufacturing	Beer	AC	ISTAT	*0.306*	*0.208*	*0.388*
Non-alcoholic beverages	Non-alcoholic beverages industry	VA of alcoholic beverages	Other VA	Other	*0.171*	*0.071*	*0.145*
Ice industry	Ice industry	VA of meat and fishing industries	Other VA	Other	*0.036*	*0.141*	*0.084*
Tobacco industry [1]					0.565	0.822	0.917
	Tobacco industry	Tobacco	P	Carreras/ISTAT(5)	*0.565*	*0.822*	*0.917*
Textiles [9]					8.628	10.908	12.267
Silk	Silk	Raw silk	AC	Carreras/ISTAT-AS-MC	*2.520*	*1.650*	*1.530*
Cotton	Cotton spinning	Cotton yarns	P	Carreras/ISTAT-MC	*1.488*	*1.748*	*2.014*
	Cotton weaving and dyeing	Cotton fabrics (yarns)	P(AC)	Carreras/ISTAT-MC	*2.273*	*1.971*	*3.054*
Wool	Clean wool, combed wool and woolen yarn	Woolen yarns	P	Carreras/ISTAT-MC	*0.678*	*1.568*	*1.416*
	Woolen cloth and worsted cloth	Woolen fabrics (yarns)	P(AC)	Carreras/ISTAT-MC	*1.070*	*0.780*	*1.269*
Hemp, linen, jute	Hemp and linen combed fiber, tow and yarn	Hemp and linen yarns	P	Carreras/ISTAT-MC	*0.187*	*0.404*	*0.354*
	Hemp and linen cloth	Hemp and linen fabrics (yarns)	P(AC)	Carreras/ISTAT-MC	*0.193*	*0.332*	*0.298*
	Jute industry	Jute yarns and fabrics	AC	Carreras/MC	*0.171*	*0.323*	*0.205*
Various textiles	Various textiles	Clothing consumption	CE	Barberi	*0.042*	*2.132*	*2.128*
Clothing [1]					4.889	3.020	3.877
	Clothing	Clothing and footwear consumption	CE	Barberi	*4.889*	*3.020*	*3.877*
Leather and footwear [1]					6.024	2.575	2.948
	Leather and footwear	Clothing and footwear consumption	CE	Barberi	*6.024*	*2.575*	*2.948*
Timber and wood industry [1]					7.763	2.588	4.554
	Timber and wood industry	Timber and lumber	AC	Barberi	*7.763*	*2.588*	*4.554*
Metalmaking [8]					2.381	5.344	4.535
Ferrous metals	Pig iron, steel, iron alloys	Iron bars	P	Carreras/ISTAT	*0.747*	*1.438*	*0.923*
	Iron and steel semi-finished products	Steel	P	Carreras/ISTAT	*1.227*	*2.391*	*2.375*
Non-ferrous metals	Aluminium	Aluminium	P	Carreras/ISTAT	*0.016*	*0.509*	*0.321*
	Lead	Lead	P	Carreras/ISTAT	*0.070*	*0.147*	*0.073*
	Copper	Copper	P	Carreras/ISTAT	*0.276*	*0.022*	*0.001*
	Tin	Tin	P	Carreras/MC	*0.008*	*0.009*	*0.004*
	Zinc	Zinc	P	Carreras/RSM-ASIND(1)	*0.014*	*0.817*	*0.830*
	Others	VA of other non-ferrous metals	Other VA	Other	*0.023*	*0.010*	*0.008*
Engineering [2]					16.967	19.507	20.621
Mechanical engineering	Engineering	Price-weighted average of iron, steel, aluminium, lead, copper, tin, zinc	AC	Carreras/ISTAT-MC	*16.074*	*19.326*	*19.374*
Precious metals	Working of precious metals	Silver	P	Carreras/RSM-ASIND(1)	*0.893*	*0.182*	*1.247*
Nonmet. mineral prod. [6]					5.121	2.798	3.707
	Marble	Marble	P	Carreras/ISTAT	*0.209*	*0.131*	*0.222*
	Cement, lime, plaster	Cement	P	Carreras/RSM(3)	*0.744*	*0.743*	*0.786*
	Bricks and tiles	Cement	P	Carreras/RSM(3)	*1.203*	*0.341*	*0.360*
	Ceramics, terracotta, grès	VA of Marble and Bricks and tiles	Other VA	Other	*0.589*	*0.518*	*0.678*
	Glass	Marble	P	Carreras/ISTAT	*0.585*	*0.678*	*1.147*
	Other construction stone	VA of other nonmet. mineral prod.	Other VA	Other	*1.790*	*0.387*	*0.512*
Chemicals and rubber [11]					3.354	12.922	8.893
Chemicals	Sulphuric acid	Sulphuric acid	P	Carreras/ISTAT	*0.227*	*0.744*	*0.016*
	Soda, potash, chlorine	Caustic soda	P	Carreras/ISTAT	*0.070*	*0.468*	*0.011*
	Explosives	VA-per-unit-weighted average of sulphuric and nitric acid	P	Carreras	*0.272*	*0.325*	*0.004*
	Fertilizers	VA-per-unit-weighted average of ammonia, nitric acid, ammonium sulphate, calcium cyanamide, perphosphates	P	Carreras	*0.296*	*1.035*	*1.008*
	Dyes	Inorganic basic chemicals (6)	P	Carreras	*0.274*	*0.505*	*0.404*

	Matches	Sulphur	P	Carreras/ISTAT	0.178	0.092	0.001
	Other chemicals	Inorganic basic chemicals (6)	P	Carreras	1.633	4.533	3.625
Mineral oil and coal	Mineral oils	Refined oil (raw oil)	P(AC)	Carreras	0.059	0.883	1.179
	Coke and agglomerates	Coke	P	Carreras/ISTAT	0.121	1.146	0.018
Rubber	Rubber	Natural rubber	AC	Carreras/MC	0.182	1.252	1.517
Synthetic fibers	Synthetic fibers	Synthetic fibers	AC	Carreras	0.042	1.939	1.111
Paper, Printing [3]					4.867	2.192	3.270
	Pulp production	Pulp	P	Carreras/ISTAT (7)	0.467	0.866	0.779
	Paper production	Paper	P	Carreras/ISTAT (8)	1.887	0.308	0.752
	Printing and publishing industries	Paper	P	Carreras/ISTAT (8)	2.514	1.019	1.739
Sundry manufacturing [2]					0.533	1.889	1.358
	Photos and film manufacturing	Spectacle leisure consumption	CE	Barberi	0.247	0.401	0.487
	Various manufacturing	Copper (40%) and others VAs (60%) (9)	Other VA	Other	0.286	1.487	0.871
Construction [1]					14.016	10.342	14.585
	Construction	Gross investments in houses and public works	Investments	Rey	14.016	10.342	14.585
Utilities [3]					3.793	6.236	5.388
	Electricity	Electricity	P	Carreras/ISTAT	2.150	4.857	4.398
	Gas	Gas	P	Carreras/ISTAT	0.766	0.649	0.586
	Water	Water VA	VA	ISTAT 1957	0.877	0.730	0.404

Legend: P = production; Other/VA = recombination of other value-added series; M = imports; CE = consumption expenditure; E = exports; AC = apparent consumption; P(AC) = apparent consumption as a proxy of production; Investments = gross investments; VA = previous Istat value-added series.

Sources: "Carreras" is Carreras, "La producció;" "ISTAT" is Istat, *Sommario*; "RSM" is Maic, *Rivista del Servizio Minerario*; "AS-IND" is Istat, *Annuario di statistiche industriali*; "MC" is Ministero delle Finanze, Direzione generale delle gabelle (from 1935, Istat), *Statistica del commercio*; "Barberi" is Barberi, *I consumi*; "Cap.-Mess." is Capanna and Messori, *Gli scambi commerciali*; "AS" is MAIC (from 1926, Istat), *Annali di Statistica*; "Rey" is Rey (edited by), *I conti economici*; "ISTAT 1957" is Istat, *Indagine*; "Carreras/" followed by one or more other sources, means that data are from Carreras who in turn had taken them from the cited sources.

Notes: In square brackets, the number of sub-sectors for each sector.

(1) RSM for the years 1911–3, then ASIND.

(2) From 1921 to 1924 the series is interpolated through the production of mercury metal (ISTAT).

(3) RSM for 1911–2 and from 1928 onwards; from 1913 to 1919, it follows the series of limestone for cement-making (same source); from 1920 to 1927, the source is Svennilson, *Growth and Stagnation* (whose data come in turn from the League of Nations).

(4) From 1940 to 1945 interpolated through the average of the sector.

(5) Linearly interpolated from 1928 to 1930.

(6) VA-per-unit-weighted average of hydrochloric acid, nitric acid, sulphuric acid, ammonia, caustic soda, sodium carbonate, chlorine, calcium carbide.

(7) Exponentially interpolated from 1913 to 1925.

(8) Linearly interpolated from 1916 to 1919, in 1922, and in 1924–5.

(9) Copper is production; others is the summed VAs of timber and wood industry, chemicals, rubber, paper and printing, photos and film manufacturing.

For Giugliano's integration concerning the years 1928 to 1938 (for engineering, textiles, wood, clothing, leather, and construction), see the text.

APPENDIX TABLE 2

ITALIAN INDUSTRIAL PRODUCTION, 1911–1951

(million lire of value added)

	1. Mining and quarrying				2.01. Foodstuffs				2.02. Tobacco				2.03. Textiles			
	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices
1911	219	665	51780	219	828	5450	200602	828	28	257	17723	28	429	5041	563407	429
1912	228	712	54352	242	873	5432	212552	899	29	264	18183	31	476	5665	631817	502
1913	230	741	56402	257	910	6218	247697	1121	26	239	16519	31	476	5408	598842	523
1914	209	701	53542	243	758	5510	208511	1001	35	317	21879	44	478	5626	665713	570
1915	159	587	44161	195	795	5727	211885	1119	33	299	20598	45	523	5881	620878	677
1916	150	582	43166	194	812	5834	201330	1219	34	314	21688	52	547	6364	689348	769
1917	125	524	37949	172	709	5500	188915	1152	33	301	20733	54	434	5259	595090	667
1918	106	478	35214	157	864	6375	213348	1488	33	302	20823	58	407	5225	624916	684
1919	143	493	34851	204	866	6082	224247	1583	34	314	21690	66	340	4354	484724	625
1920	182	610	44088	267	813	5872	214222	1602	38	348	23988	79	404	4934	528928	798
1921	158	521	36753	240	930	6590	246813	1946	42	385	26536	95	398	4152	435867	830
1922	181	569	38810	281	921	6556	251275	2052	40	368	25421	99	442	4675	435867	1003
1923	249	742	50834	393	983	6747	274191	2317	38	348	24003	102	489	5158	493985	1206
1924	260	779	54249	428	981	6881	296860	2491	39	357	24647	113	516	5556	545699	1396
1925	299	893	61786	510	992	7089	266831	2752	39	360	24870	124	538	6639	739473	1670
1926	325	954	65213	571	1059	7401	296223	3101	42	384	26497	143	532	6363	665090	1790
1927	326	979	68803	604	1007	7033	284522	3159	42	382	26367	155	512	5582	522439	1820
1928	329	985	69084	634	1089	7429	311579	3596	40	367	25333	162	556	5699	465957	2097
1929	341	1038	72715	693	1105	7691	323708	3965	39	353	24339	168	594	6102	495569	2456
1930	346	1046	71868	729	1045	7090	304037	3974	37	339	23383	176	529	5418	438754	2392
1931	291	890	59817	646	996	6934	286995	4127	36	326	22466	183	479	4882	396278	2371
1932	268	795	52476	607	1030	7013	297826	4514	34	315	21764	193	437	4443	356694	2395
1933	278	815	51819	652	1044	7262	297664	5018	34	311	21473	206	490	4919	394203	2940
1934	308	885	56106	742	925	6530	276108	4828	33	306	21106	220	487	4908	392928	3228
1935	331	966	61877	844	1039	7337	286561	5851	37	343	23673	268	488	4939	403267	3593
1936	326	1015	66381	922	994	6837	292202	5892	37	342	23617	290	446	4494	367981	3625
1937	378	1194	78380	1137	1064	7492	309549	6944	40	365	25186	336	554	5493	452918	4935
1938	395	1260	83593	1260	1130	7805	315723	7805	43	395	27257	395	524	5244	431434	5244
1939	417	1326	87365	1817	1171	8013	323440	10458	50	454	31302	628	536	5235	448751	7332
1940	401	1173	73932	2185	1082	7154	316242	12367	52	478	32946	916	440	4539	402824	8951
1941	320	1185	78711	3058	979	6602	272035	14873	57	519	35784	1378	349	3650	355884	10337
1942	284	1056	68691	3713	876	5912	246183	17561	58	534	36846	1965	215	2351	233884	9488
1943	213	802	50552	3829	736	5155	183404	19511	28	259	17884	1321	129	1452	137389	8173
1944	124	408	24110	2578	670	4842	158193	23456	12	112	7747	792	104	1117	100791	8740
1945	99	310	17270	2585	580	4254	145108	27413	33	302	20853	2954	134	1355	124085	15086
1946	210	644	36817	7496	877	5994	230691	53278	42	385	26534	5207	715	6460	497995	92293
1947	279	879	51234	14201	877	6525	245854	76027	44	399	27511	7477	876	7905	559899	149218
1948	309	992	58278	22151	1085	7425	305693	122370	51	464	32033	12057	643	6129	448514	165149
1949	394	1250	67313	35560	1123	7778	324288	175086	53	484	33388	17405	676	6449	461183	237520
1950	525	1639	78701	57423	1293	8896	385160	281543	54	491	33855	24444	675	6485	475078	340255
1951	725	2277	96280	96280	1291	9050	391286	391286	54	496	34200	34200	627	6170	457315	457315

APPENDIX TABLE 2 – continued

	2.04. Clothing				2.05. Leather				2.06. Wood				2.07. Metalmaking			
	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices
1911	243	774	62287	243	300	660	53107	300	386	917	100638	386	118	678	36441	118
1912	255	1088	87576	357	301	927	74669	434	367	866	95134	377	134	846	45542	157
1913	253	952	76618	326	302	811	65326	391	362	856	93960	384	129	894	47866	177
1914	227	852	68573	304	271	726	58466	360	318	750	82309	348	123	848	45553	179
1915	244	915	73687	341	291	780	62826	398	205	485	53286	232	127	888	47801	198
1916	295	1111	89433	432	353	947	76252	498	140	331	36344	164	157	1101	59359	261
1917	248	932	75060	379	296	795	63998	430	110	260	28510	133	161	1138	61356	285
1918	249	935	75304	397	297	797	64206	444	89	212	23320	112	123	845	45874	230
1919	255	958	77142	424	304	817	65772	469	122	286	31419	156	85	622	32995	175
1920	335	1262	101581	583	400	1076	86610	635	166	392	42989	220	71	507	28089	155
1921	275	1033	83152	498	328	880	70897	536	195	460	50509	267	63	474	26638	147
1922	325	1223	98438	616	388	1042	83930	653	300	708	77747	424	94	689	38005	235
1923	349	1315	105920	691	418	1122	90308	723	327	771	84655	477	114	876	47613	312
1924	376	1412	113661	775	449	1204	96909	799	388	916	100605	585	141	1058	57236	409
1925	433	1629	131158	933	518	1389	111827	950	459	1083	118950	714	191	1430	77061	591
1926	452	1700	136896	1016	540	1450	116720	1021	507	1198	131511	816	196	1450	77909	645
1927	420	1579	127124	985	501	1346	108388	976	485	1143	125545	804	181	1386	74131	649
1928	498	1875	150952	1221	596	1598	128704	1193	464	1094	120157	794	211	1647	88646	822
1929	539	2028	163259	1378	644	1729	139198	1329	465	1096	120370	822	252	1943	102850	1043
1930	480	1805	145356	1281	574	1539	123933	1218	430	1015	111478	786	220	1630	85944	948
1931	433	1630	131241	1207	518	1390	111898	1132	404	954	104766	763	192	1484	76653	914
1932	355	1336	107598	1033	424	1139	91739	956	354	835	91699	689	191	1536	79117	1003
1933	377	1420	114343	1146	451	1211	97491	1046	342	807	88622	688	226	1758	91852	1242
1934	389	1465	117958	1234	465	1249	100573	1111	389	920	100963	809	239	1875	97858	1418
1935	378	1423	114558	1251	452	1213	97674	1111	436	1032	113262	937	278	2154	112740	1750
1936	355	1332	107253	1223	423	1136	91446	1071	439	1038	113978	974	283	2296	118757	1991
1937	404	1521	122433	1457	483	1296	104389	1259	481	1134	124521	1098	312	2378	121057	2220
1938	386	1452	116914	1452	461	1238	99683	1238	527	1244	136585	1244	335	2569	130787	2569
1939	379	1426	114855	1999	450	1206	97092	1690	552	1303	143085	1871	357	2788	139362	3759
1940	401	1508	121393	2961	471	1264	101743	2482	597	1411	154903	2907	370	2907	144134	5279
1941	339	1276	102740	3513	395	1060	85370	2919	523	1234	135508	3650	360	2870	139290	6986
1942	252	947	76261	3655	291	780	62821	3010	524	1238	135909	5255	325	2571	125372	8438
1943	176	662	53282	3579	201	540	43512	2922	244	577	63312	3514	273	2176	104600	9556
1944	138	519	41811	3936	157	420	33847	3186	277	654	71753	5716	122	944	47261	5692
1945	99	373	30053	3965	112	299	24116	3182	277	654	71753	8204	41	313	16227	2603
1946	350	1316	105971	19595	390	1047	84287	15585	394	931	102164	16767	134	1036	54280	11776
1947	373	1404	113083	29307	413	1107	89148	23104	486	1146	125800	29635	210	1648	83700	24833
1948	431	1618	130295	47327	471	1264	101805	36978	464	1095	120208	40647	265	2084	105130	42301
1949	422	1588	127867	65094	458	1230	99016	50407	607	1434	157435	76413	250	1955	100269	54523
1950	465	1745	140545	100278	499	1340	107857	76956	645	1523	167227	116504	312	2457	124203	91658
1951	477	1795	144515	144515	509	1365	109904	109904	655	1546	169781	169781	429	3378	169101	169101

APPENDIX TABLE 2 – continued *2*

	2.08. Engineering				2.09. Nonmet. Minerals				2.10. Chemicals, rubber				2.11. Paper, Printing			
	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices
1911	844	4154	243086	844	255	973	86781	255	167	1232	41218	167	242	459	52080	242
1912	897	4151	242882	892	268	1032	91765	287	183	1349	45083	196	270	503	57295	273
1913	873	3908	228648	890	271	1025	90733	307	191	1371	44727	215	273	517	58738	284
1914	844	3778	221035	911	235	873	77182	274	186	1325	43546	224	286	540	61427	302
1915	616	2759	161419	705	177	543	46979	207	194	1369	45769	250	288	549	62278	310
1916	964	4316	252530	1169	157	454	39018	185	196	1344	43232	269	284	547	61838	312
1917	1445	6469	378501	1858	105	304	26101	127	203	1315	42242	295	279	546	61442	314
1918	1275	5711	334150	1739	69	198	17016	85	217	1313	42336	331	275	545	61090	316
1919	911	4078	238611	1317	155	548	48227	208	213	1343	46793	351	271	544	60804	320
1920	989	4431	259243	1517	230	752	65554	311	205	1203	42226	352	267	544	60560	324
1921	712	3189	186616	1158	230	642	54928	304	210	1259	44810	386	225	487	53273	284
1922	854	3824	223735	1473	275	810	69808	382	258	1554	55552	508	256	543	59785	330
1923	920	4119	240981	1683	462	1107	92734	609	346	2040	72068	717	293	605	67136	384
1924	1109	4967	290618	2153	475	1167	98144	649	402	2180	76172	845	309	638	70809	415
1925	1608	7200	421284	3311	515	1369	116439	753	502	2780	96301	1139	326	674	74741	450
1926	1468	6571	384491	3207	581	1519	128846	871	523	2870	97794	1257	344	709	78693	487
1927	1330	5956	348497	3085	568	1450	122603	871	567	2969	100702	1411	301	623	69140	439
1928	1579	7069	413604	3885	610	1436	119977	924	543	2805	95341	1426	328	681	75510	494
1929	1652	7394	432641	4314	633	1435	119151	969	658	3307	112087	1803	350	729	80679	543
1930	1539	6892	403291	4268	709	1405	113840	1029	631	3375	116131	1940	351	752	82730	572
1931	1224	5477	320457	3600	600	1150	92541	878	557	2663	86654	1667	327	673	74863	535
1932	977	4376	256033	3054	618	1029	80289	845	570	2666	88686	1790	337	720	79320	585
1933	1056	4728	276622	3503	665	1032	79079	887	712	3250	111464	2335	368	758	84180	641
1934	1151	5151	301411	4052	758	1182	90711	1042	776	3649	126131	2790	417	823	92616	724
1935	1446	6473	378754	5406	790	1277	98946	1152	1004	4170	141954	3436	484	958	107835	869
1936	1780	7973	466526	7071	714	1142	88240	1065	1268	4722	155853	4163	421	881	97973	820
1937	2028	9079	531205	8549	816	1324	102655	1276	1577	5790	186918	5434	507	1093	120802	1052
1938	2094	9378	548723	9378	858	1345	103374	1345	1684	6212	200716	6212	478	1054	115922	1054
1939	2009	9045	524231	12313	944	1391	105161	1939	1866	7066	225658	8871	530	1062	118701	1524
1940	1865	8337	489228	15465	877	1191	87884	2306	2022	7057	227067	11279	529	1045	117340	2156
1941	1754	7783	462539	19696	519	806	61825	2191	2084	6483	207853	13278	490	961	108162	2850
1942	1658	7424	434364	25579	424	737	58090	2818	1647	5137	161730	13469	402	785	88447	3348
1943	1457	6695	374151	31225	321	526	40857	2796	1168	3717	110862	12263	147	290	32595	1775
1944	986	4573	251304	28938	249	367	27714	2692	378	1264	38066	5423	147	290	32595	2551
1945	310	1451	78497	12441	209	278	20436	2807	144	679	24562	4342	147	290	32595	3669
1946	1140	5169	295530	61430	455	714	54873	10301	774	2637	89265	21504	226	451	50461	8185
1947	1488	6782	384462	109687	560	904	69972	18309	1479	5470	185392	59413	353	693	77873	18143
1948	2192	9946	568377	220732	620	929	70566	25928	1200	5594	182207	77585	372	738	82733	27753
1949	2044	9154	535626	282602	771	1114	83731	43017	1577	6594	211464	120002	440	845	95673	46114
1950	2433	10942	635222	461539	948	1424	108228	77502	1894	7988	259163	195411	523	1003	113606	78861
1951	2964	13452	768738	768738	1097	1782	138189	138189	2580	10456	331532	331532	559	1078	121896	121896

APPENDIX TABLE 2 – continued *3*

	2.12. Sundry manuf.				2. Manufacturing				3. Construction				4. Utilities			
	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices	1911 prices	1938 prices	1951 prices	Quasi-current prices
1911	27	384	20059	27	3867	20979	1477429	3867	697	4019	226574	697	189	397	15720	189
1912	28	408	21109	31	4081	22531	1623607	4436	713	4420	249210	818	210	456	18077	221
1913	29	412	21448	35	4095	22611	1591122	4684	707	4545	256237	897	232	468	18462	231
1914	28	379	19821	37	3789	21524	1574015	4554	764	4915	277096	1035	275	554	21859	281
1915	31	461	23350	46	3523	20656	1430756	4528	567	3646	205566	820	303	619	24346	319
1916	29	454	22558	48	3966	23117	1592930	5378	318	2042	115099	490	385	740	29415	411
1917	31	496	24381	56	4053	23315	1566329	5750	210	1350	76117	346	418	837	33003	462
1918	27	442	21487	55	3925	22900	1543870	5939	185	1190	67092	325	430	864	33951	489
1919	31	488	24158	69	3588	20434	1356582	5763	411	2640	148830	769	396	802	31475	464
1920	24	309	15851	54	3944	21630	1469841	6630	456	2930	165178	911	379	842	32314	474
1921	26	353	18040	67	3635	19904	1244414	6518	546	3506	197651	1163	383	843	32473	493
1922	30	434	22084	88	4183	22426	1441647	7863	785	5045	284419	1786	398	872	33604	526
1923	33	504	24940	109	4771	24712	1618534	9330	916	5887	331909	2224	457	1008	38739	626
1924	36	557	27571	132	5220	26893	1798931	10762	917	5891	332131	2375	523	1155	44350	740
1925	41	656	31906	169	6161	32298	2210841	13556	896	5763	324882	2479	641	1361	52761	914
1926	43	686	33539	196	6285	32301	2174209	14550	919	5903	332797	2709	745	1579	61250	1093
1927	43	670	32594	214	5958	30119	1942052	14568	878	5644	318224	2764	761	1620	62700	1154
1928	45	710	34969	252	6559	32410	2030729	16866	877	5634	317632	2944	839	1780	68930	1308
1929	44	686	33459	270	6974	34493	2147310	19060	1165	7484	421958	4174	906	1921	74403	1456
1930	44	674	32787	294	6588	31934	1981664	18878	1193	7670	432427	4564	1037	2078	81477	1645
1931	43	636	31813	312	5809	28199	1736625	17689	973	6259	352876	3974	996	2018	78943	1641
1932	43	638	32006	346	5369	26046	1582771	17403	977	6282	354188	4256	1011	2049	80173	1715
1933	47	712	35133	425	5813	28168	1692126	20077	1218	7829	441362	5659	1086	2224	86796	1914
1934	50	763	37388	505	6080	28821	1755751	21961	1268	8149	459447	6286	1160	2392	93211	2119
1935	57	897	43765	655	6890	32216	1922989	26279	1195	7679	432935	6321	1305	2656	103799	2428
1936	53	845	40116	684	7213	33038	1963942	28869	868	5581	314654	4902	1340	2677	105062	2524
1937	56	889	42006	800	8322	37854	2243639	35360	782	5030	283589	4714	1469	2961	115844	2874
1938	57	908	42521	908	8577	38844	2269639	38844	773	4972	280312	4972	1488	2998	117367	2998
1939	58	936	42897	1255	8901	39925	2314535	53639	842	5417	305425	7387	1813	3581	140674	4748
1940	54	885	40210	1589	8761	37776	2235914	68658	796	5113	288237	9507	2010	3876	153124	6819
1941	41	634	28229	1516	7891	33878	1995219	83187	678	4358	245722	11052	2089	4072	160413	9498
1942	40	578	27065	1880	6711	28994	1686972	96466	562	3609	203474	12480	2081	4012	158426	12420
1943	22	320	13892	1354	4903	22369	1175740	97989	414	2659	149928	12539	1501	3198	123158	13013
1944	16	209	10753	1286	3255	15311	821835	92408	237	1520	85673	9771	1051	2332	89152	12526
1945	17	223	11952	1902	2102	10471	600237	88568	443	2849	160637	24983	1040	2296	88277	16373
1946	30	431	20948	4688	5527	26571	1612999	320609	1043	6708	378194	80207	1507	3245	125420	30735
1947	54	803	37691	11494	7212	34786	2000385	556647	1005	6457	364058	105285	1734	3735	144082	46802
1948	59	866	40803	16720	7852	38152	2188364	835547	1014	6517	367431	144902	1821	3927	150812	64952
1949	61	883	41721	22998	8483	39508	2271661	1191181	1075	6910	389599	209516	1804	3746	145166	82661
1950	68	1010	47700	35418	9809	45304	2597844	1880369	1347	8653	487856	357759	2087	4379	169219	127721
1951	72	1107	50628	50628	11314	51675	2887085	2887085	1500	9644	543704	543704	2492	5192	200876	200876

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