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Italian Industrial Production, 1861-1913: A Statistical Reconstruction
C. The Non-metallic Mineral Products Industries

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CONTENTS

TABLES

SUMMARY TABLES

C. THE NON-METALLIC MINERAL PRODUCTS INDUSTRIES

C01. Introduction

C01.01 The output data and estimates

In the 1911 *Censimento demografico* and *Censimento industriale* the manufacture of non-metallic mineral products is covered by *classe* 5.1 (mineral processing), divided into nine *sotto-classi*. The latter correspond, in order, to stone crushing (5.11), mineral grinding (5.12), stone cutting (5.13), other stone working (5.14), plaster, lime, and cement production (5.15), brick and tile production (5.16), terra cotta and ceramic production (5.17), glass production (5.18), and the manufacture of other kiln products (5.19). In the *ISIC*, the industry is covered by division 36, divided into three major groups and five groups. These correspond to the manufacture of pottery, lime, and earthenware (3610), glass and glass products (3620), structural clay products (3691), cement, lime, and plaster (3692), and other non-metallic mineral products (3699). *Sotto-classi* 5.15 (binders) and 5.18 (glass) thus appear to correspond directly to groups 3692 and 3620, respectively. *Sotto-classi* 5.16 and 5.17 together (clay products) appear to correspond to groups 3610 and 3691 together, but differ internally in the attribution of structural clay products other than bricks and tiles (grouped with bricks and tiles by the *ISIC*, with other clay products by the 1911 censuses). The other *sotto-classi* (5.11-14 and 5.19) together also appear to correspond to the residual group in the *ISIC*; the only difference of any note seems to be that asphalt products are included in *sotto-classe* 5.19 but excluded from group 3699. For present purposes, the non-metallic mineral products industry is defined as in the 1911 censuses, but with the exclusion of asphalt products (here considered chemicals; compare *ISIC*, group 3540); it thus corresponds very closely to the industry as defined in the *ISIC*.

The reports of the Corpo delle miniere are again the primary source of output data. These data fall into three groups. The first group refers to kiln products; it includes the benchmark survey data in the *Statistica mineraria* (pp. 79 ff.) and the *Rivista mineraria 1890* (p. CXIX) and *1901* (p. LV), the annual figures in the subsequent issues of the *Rivista mineraria* to 1912, and a few further figures in the *Notizie minerarie* (p. 38). The time series for 1901-12 are reproduced in Table C.01; like the corresponding quarry output series in Table B.17, these generally reflect only partial and occasional updating (see above, section B03.01). The second group covers the worked-marble data reproduced in Table B.19 above; these are essentially the complements of the corresponding block-marble data from the same quarrying centers, and do not in fact measure aggregate marble processing at all. The third group covers the "mineralworking" data in the *Rivista mineraria*, reproduced here in Table C.02. These appear to be of little value. In the first place, these data cover only a trifling amount of economic activity: in 1911, the number of *operai* totals a mere 541 (*Rivista mineraria 1911*, pp. LIV-LVII), and not all of these were fully employed (for instance, ground pumice was worth only 3 lire per ton more than the quarry output; 19,600 tons of it are said to have been produced by 164 men). In addition, these ostensible national totals are most probably nothing of the sort: the production figures are all from (some of) the areas that produced the raw material, and were apparently collected on local initiative; but since processing was not particularly weight-reducing much of it no doubt took place elsewhere. Comprehensive estimates might be obtained in selected cases (e.g., graphite grinding, on the basis of aggregate output); but the series so obtained would cover so little of the total product to be estimated that the exercise has little to commend it.

The present production series are similarly divided into three groups. The first group covers kiln products, represented by eight time series; these normally incorporate three

benchmarks, extrapolated on the basis of construction movements and (for consumers' goods) population growth and household formation. The second group refers to marble cutting and carving; a single series is estimated from aggregate quarry output and block marble exports. The third group refers to other processed stone, sand, and earth; a simple series is estimated on the basis of quarry output (and thus also, indirectly, from a few benchmark data and construction movements).

C01.02 The employment data and value added estimates

The labor force and employment data from the 1911 censuses and the *Rivista mineraria 1911* are included in Table B.18 above, and are discussed in section B03.01. As noted, the integration of quarrying and processing activity and the seasonal shifts of the labor force from the one to the other make it difficult to estimate value added from these data; the *Rivista mineraria* figures, moreover, tend to be out of date. As a rule, therefore, value added in 1911 is here estimated as the value of the results of activity. The partial estimates below sum to 181.5 million lire for kiln products, and 73.3 for other non-metallic mineral products; the comparable labor force figures equal 169,000 persons (allowing 15,000 for the relevant part of category 5.19) in the kilns, and 60,900 (deducting 1,000 for asphalt processing) in the other workshops. The only significant discrepancy is between the 65.3 million lire here attributed to bricks and tiles, and the 90,400 persons listed by the *Censimento demografico* in category 5.16; but as noted above most of these same individuals also quarried the clay for these kilns, and the present discrepancy is largely offset by the attribution of 33.7 million lire of value added to the quarrying of kiln materials (to which the *Censimento demografico* attributes just 5,700 individuals, category 2.22).

C02. Kiln products

C02.01 Introduction

The production of kiln products is here represented by separate series for plaster, lime, cement, bricks and tiles, terra cotta, ceramic, glass, and other kiln products.

The series for binders and bricks and tiles are obtained, in general, by calculating goods-specific indices of construction-related consumption. These indices are obtained from the construction series developed in section K below, and allow both for the relative movement of the major subaggregates of construction and for the likely incidence of each product group in each of those subaggregates. Actual consumption is estimated for 1865, 1890, and 1901 from the benchmark output data provided by the Corpo delle miniere and international trade, and then extrapolated to other years on the basis of the above consumption indices, assuming that the ratio between the two varied smoothly between, and beyond, the available benchmarks. Output, finally, is obtained as estimated actual consumption minus net imports. Exceptionally, lime output and cement output are first estimated together; cement output is then estimated with the aid of the relatively abundant output data, and lime output is obtained as a residual.

The estimates for terra cotta, ceramic, and glass are obtained through a similar sequence of operations. However, the consumption indices are somewhat more complex: to reflect the large share of consumers' goods in these product groups, the consumption indices are tentatively obtained as weighted sums of series representing population growth and household formation as well as construction movements.

The output of other kiln products is identified primarily with cement and plaster objects; production of the former is assumed to have grown at a constant rate, while production of the latter is assumed to have varied with plaster consumption.

Value added is normally estimated per unit of output from prices and technical coefficients, and then multiplied by output to obtain the corresponding aggregate. In the case of other kiln products, however, there is no direct evidence of aggregate output; aggregate value added is thus estimated from the census data.

C02.02 Binders, bricks, and tiles: preliminary consumption series

The initial estimates of the construction-related consumption of binders, bricks, and tiles are developed in Table C.03.

Cols. 1 - 4 and 7 - 10 are partial estimates of the construction-related consumption of kiln products, measured by its cost at 1911 prices. Like the estimates of low-grade materials consumption in Table B.21, col. 1, these series are obtained by weighting the various construction series, measured in 1911-price value added, obtained in section K below. Each of these series is divided by the typical ratio of value added to value in the corresponding activity (.60 in maintenance, .34 in the new construction of buildings, and .51 in the new construction of railways, including land costs, and in the new construction of other public works), to obtain an estimate of the aggregate value of construction at 1911 prices; and then it is multiplied by an estimate of the share of kiln products in that aggregate. Since the share of value added and low-grade materials costs in each type of activity is already estimated (in section K, or section B03.04 above), so too, explicitly or implicitly, is the share of high-grade materials costs; and it is only the distribution of these last among kiln products and other materials that remains to be determined. Very tentatively, it is here assumed that the cost shares of kiln products and other high-grade materials equal 20% and 8%, respectively, in the maintenance of buildings and other non-railway public works, and 14% each (allowing for the greater share of lumber and metal products) in the maintenance of railways. In the new construction of buildings, kiln products are allowed 34% of total costs, leaving 22% to other high-grade materials; the cost figures in

Corsetti (1941) recalled in section K05.04 below suggest that kiln materials accounted for some 60% of all high-grade materials, assuming that kiln products accounted for all the high-grade materials in the concrete floor and foundations, the stone walls, and the plaster, half of them in the roof and accessories, and 5% of them in the planking, doors, and windows. In the new construction of other non-railway public works, which presumably use rather more metal but much less finished wood than buildings do, the shares of kiln products and other high-grade materials are tentatively set equal to 18% and 6%, respectively. In the new construction of railways, finally, kiln products are here allowed 15% of total costs, leaving 24% to other high-grade materials (and to land, which is included in the total cost of railway construction); this allocation is suggested by the breakdown of railway construction costs reported in section K06.04, allowing kiln products 15% of the cost of bridges, 20% of the cost of tunnels, 34% of the cost of buildings, and 20-25% of unspecified materials and construction.

The consumption of kiln products for the maintenance of private buildings (col. 1) is accordingly estimated as (.20/.60) times Table K.58, col. 8. The consumption of kiln products for the maintenance of public buildings (col. 2) and other non-railway public works (col. 3) is correspondingly estimated together as (.20/.60) times Table K.05, col. 4; its disaggregation tentatively allows public buildings a constant 11% of that total. The consumption of kiln products for the maintenance of railways (col. 4) is estimated as (.14/.60) times Table K.10, col. 24. The consumption of kiln products for the new construction of private and public buildings (cols. 7 and 8) is similarly estimated as (.34/.34) times Table K.58, col. 5, and Table K.05, col. 6, respectively; that for the new construction of other public works (col. 9), as (.18/.51) times Table K.05, col. 10; and that for the new construction of railways (col. 10), as (.15/.51) times Table K.10, col. 21.

Cols. 5 - 6 and 11 - 12 are estimates of the aggregate consumption of kiln products in the maintenance and new construction of buildings on the one hand and other structures on the other; they are obtained by summing over the appropriate components of cols. 1 - 4 and 7 - 10. Recalling that buildings represented some 4 to 5% of railway costs (section K06.04), and that kiln products represented some 34% of building costs and 15% of total railway costs (as estimated above), the share of buildings in total railway kiln products consumption is here set at 10% (in new construction, and, by analogy, in maintenance). Col. 5 is accordingly obtained as cols. 1 plus 2 plus 10% of col. 4; col. 6, as col. 3 plus 90% of col. 4; col. 11, as col. 7 plus col. 8 plus 10% of col. 10; and col. 12, as col. 9 plus 90% of col. 10.

Cols. 13 - 15, finally, are the indices of construction-related consumption of plaster, lime, and cement, and bricks and tiles calculated from cols. 5 - 6 and 11 - 12. In 1901, these indices are calculated directly from the 1901 benchmark output data (transcribed, with the exception of the cement output figure, from the *Rivista mineraria 1901,* p. LV), the average values reported in the *Rivista mineraria 1911* (p. LXXXIX), and the international trade statistics, as follows. In 1901, cols. 5 - 6 and 11 - 12 equal 21.8, 28.7, 80.1, and 33.1 million lire, respectively. In 1901, again, plaster consumption equaled 348 thousand tons, including 342 of domestic output and 6 of net imports; at 8.36 lire per ton, these were worth 2.9 million lire. Lime and cement consumption (for construction) is estimated at 1,478 thousand tons, worth 28.4 million lire; these include 821 thousand tons of fat lime (819.9 of domestic output plus 17.3 of net imports, minus 16.0 used in sugar extraction, as estimated below) at 16.09 lire per ton, 431 thousand tons of hydraulic lime (equal to domestic output, on the assumption that the net imports of hydraulic lime and cement together consisted of cement) at 18.66 lire per ton, and 226 thousand tons of cement (219.5 of domestic output, as estimated below, and 6.4 of net imports) at 31.72 lire per ton. Brick and tile consumption equaled 4,593 thousand tons (4,666 of domestic output, including refractories, less 73 of net exports); at 8.70 lire per ton (the average value of domestic output, including refractories), these were worth 40.0 million lire.

Together, therefore, the binders, bricks, and tiles used in construction were worth 71.3 million lire (at the source). The total value of the kiln products used in construction includes perhaps 10 to 11 million lire of other clay and glass products; this level is suggested by the value of the other clay products (25 million lire, at their 1911 average values, and given minor international trade), assuming that perhaps 25% of these were used for construction, and of glass panes and jars (6 million lire), assuming that the consumption of panes equaled 70% of this output figure. In all, therefore, the 1911-price value at the source of the kiln products consumed in construction equals approximately half of their estimated value at the point of use (about 81.8 million lire, against 163.7 million for the sum of Table C.03, cols. 5 - 6 and 11 - 12). The value of the binders, bricks, and tiles at the point of use is accordingly estimated as twice the above figures for the value at the source; the resulting estimates equal 5.8 million lire for plaster, 56.8 for lime and cement, and 80.0 for bricks and tiles. These are the figures for 1901 entered in Table C.03, cols. 13 - 15.

In 1861-1900 and 1902-13 cols. 13 - 15 are obtained by combining cols. 5 - 6 and 11 - 12 with weights equal, respectively, to .1583, .0000, .0293, and .0000; .4615, .8099, .0668, and .5481; and .2213, .1107, .7450, and .3725. These three sets of four weights are the rows of the (3 by 4) matrix *A* which year by year premultiplies the (4 by 1) vector *b* of the values of cols. 5, 6, 11, and 12 to yield the (3 by 1) vector *c* of the values of cols. 13, 14, and 15. The elements a_{ij} of the matrix *A* are also estimated from the relatively abundant evidence available for 1901, as follows.

Since in 1901 the elements of the vector *c* sum to 142.6 million lire, against 163.7 for the sum of the elements of vector *b*, other clay products and glass are implicitly attributed a value of 21.1 million lire. Overall, therefore, other clay products and glass are attributed 12.89% of the total consumption of kiln products. The specific shares of other clay products and glass are calculated on the assumption that they were twice as high in the maintenance and new construction of buildings (which absorbed window panes, ceramic tiles, and the like) as in other construction (which absorbed terra cotta pipes and the like), but otherwise the same in maintenance and new construction; they are accordingly set equal to (21.1)/(21.8 + (28.7/2) + 80.1 + (33.1/2)) = .1589 in the maintenance and new construction of buildings, and half that in other construction. The share s_j of binders, bricks, and tiles in the aggregate consumption of kiln products in each of the four activities corresponding to the elements of vector *b* is the column sum of the a_{ij}; s_1 and s_3 are here set equal to .8411 (= 1 − .1589), and s_2 and s_4 are set equal to .9206 (= 1 − (.1589/2)).

These four column sums, and the two independent equations in the relation $Ab = c$, are the six initial constraints on the twelve unknown weights a_{ij}. To solve this system for these unknowns, six further constraints are imposed. Of these, three refer to bricks and tiles. The first assumes that 90% of the bricks and tiles consumed were absorbed by new construction, and 10% by maintenance; therefore, $(a_{31}21.8 + a_{32}28.7) = (1/9)(a_{33}80.1 + a_{34}33.1)$. The second and third assume that the share of kiln products consumption absorbed by bricks and tiles was twice as high in the maintenance and new construction of buildings as in the maintenance and new construction of other structures; therefore, $a_{31} = 2a_{32}$, and $a_{33} = 2a_{34}$. The other three constraints refers to plaster. Of these, the first two assume that plaster was used exclusively in buildings; therefore, $a_{12} = 0$ and $a_{14} = 0$. The last assumes that buildings were replastered, on average, every 45 years. The total stock of buildings to be maintained (measured in embodied construction value added at 1911 prices) is estimated at 5,290 million lire (of which 4,566 private buildings, from Table K.53, col. 30 and Table K.58, col. 6, and 724 public buildings, estimated as the private stock times the ratio of Table C.03, col. 2 to col. 1); one forty-fifth of that is equivalent to 117.6 million lire of new construction, or 1.47 times the actual flow (80.1 million lire of 1911-price construction value added, including railway buildings; this is equal to

col. 11, divided by (.34/.34)). This last assumption thus yields the equation $a_{11}21.8 = 1.47(a_{13}80.1)$. The present estimates of the a_{ij}, reported above, are the solutions to this system of twelve equations.

C02.03 Binders, bricks, and tiles: production estimates

The binder and brick and tile production estimates are presented in Table C.04. Cols. 1 - 4 cover the differences between output on the one hand and construction-related consumption on the other. Col. 1 refers to the net imports of plaster. These figures are calculated directly from the *Movimento commerciale* in 1861-77 and 1892-1913; in 1878-91, when the source includes plaster with sundry other materials, the present figures geometrically interpolate those for 1877 and 1892.

Col. 2 refers to the net imports of lime and cement together. The *Movimento commerciale* includes disaggregated data for lime in 1861-77, for cement and hydraulic lime together from 1884, and for other lime from 1897. In these later periods, cement and hydraulic lime together were imported primarily from France, other lime from Austria-Hungary; in the early period, since imports were primarily from France and exports primarily to Switzerland, it is not unreasonable to suppose that lime includes hydraulic lime and cement (which presumably dominated the import side) as well as other lime (which presumably dominated the export side). The present estimates in col. 2 are accordingly obtained as follows. From 1861 to 1877, they are the net imports of "lime" alone. In subsequent years, they are the sum of separate net imports of cement and hydraulic lime on the one hand, and other lime on the other. The net imports of cement and hydraulic lime are calculated from the data in 1884-1913; in 1878-83, the comparable figures are obtained on the assumption that net imports grew by 4,000 tons p. a. from 2,000 tons in 1877 (the approximate average gross imports of "lime" in 1875-77) to 30,000 tons in 1884 (the first documented figure). The net imports of other lime are calculated from the data in 1897-1913; in 1878-96, the comparable figures are obtained on the assumption that net imports grew by 500 tons p. a. from −3,000 tons in 1877 (the approximate average gross exports of "lime" in 1875-77) to 7,000 tons in 1897 (the first documented figure).

Col. 3 refers to the net imports of bricks and tiles. In 1888-1913, these figures are calculated directly from the *Movimento commerciale* (categories 917-925 in 1913). In 1878-87, they are calculated from the corresponding figures in the source, deducting an allowance for terra cotta pipes (600 tons of net imports p. a.; these correspond to 30,000 units p. a., as over 1873-77, and 20 kg per unit, against a weight range of 7 to 55 kg per unit reported in the *Rivista mineraria 1890*, p. 250). In 1867-77, they are obtained from the corresponding figures in the source, allowing 3.4 tons per thousand bricks and tiles (the average of the 4.0 kg per tile and 2.8 kg per brick used in estimating output below); and in 1861-66, they are estimated as in 1867-77, with an allowance for the trade of the Venetian provinces (3 million units of net exports p. a., extrapolated from the half million units of net exports in November-December 1866).

Col. 4, finally, is an estimate of consumption for purposes other than construction. It covers lime consumption in sugar extraction; for simplicity, it is obtained as the sugar-beet output reported in the *Sommario*, p. 108, times .0275 (tons per ton: *Enciclopedia italiana*, vol. 35, p. 1037). Construction-related consumption equals cols. 1 plus 5 for plaster, cols. 2 plus 6 - 7 minus 4 for lime and cement, and 3 plus 8 for bricks and tiles. The benchmark estimates for 1901 are described above; they equal 348 thousand tons for plaster, 1,478 for lime and cement, and 4,593 for bricks and tiles. The corresponding figures for 1890, obtained directly from the output data in the *Rivista mineraria 1890*, p. CXIX (transcribed in cols. 5 - 8) and the figures in cols. 1 - 4, equal 276 thousand tons for plaster, 1,361 for lime and cement, and 3,579 for bricks and tiles.

The *Statistica mineraria*, pp. 78-83, reports output levels of 108 thousand tons of

plaster, 571 of lime, and 9 of cement. It also reports (pp. 83, 85) the output of ordinary bricks and tiles (*laterizi*: 423,921,000 *mattoni*, l03,641,000 *tegole* and *embrici*, 41,853,000 *quadrelle*, and 102,910,000 *diversi*) and refractories (30,000 *mattoni refrattari*). Since the corresponding data for terra cotta are labeled "crockery," terra cotta pipes are presumably included among *laterizi diversi*. The latter are here decomposed on the assumption that their average value of 32.00 lire per thousand reflected the combination of two sorts of goods: first, products akin to bricks and tiles, worth an average of 31.21 lire per thousand (like the *mattoni*, *tegole*, *embrici*, and *quadrelle* together); second, terra cotta pipes and the like, worth an average 140 lire per thousand (against export prices of 43 and 47 lire per thousand for bricks and tiles, and 160 lire per thousand for terra cotta pipes). These assumptions attribute 99.27% of the *laterizi diversi*, or 102,159,000 units, to bricks and tiles, and 0.73%, or 751,000 units, to terra cotta. The bricks and tiles are here converted to tonnage figures at a unit weight of 4 kg per *tegola* and *embrice*, 2.8 kg per *mattone* and *quadrello* (compared to 4 kg per *tegola* and *embrice*, 3 kg per *mattone pieno*, 2.2 kg per *mattone forato*, and 2.8 kg per *quadrello*, used in later years by the Corpo delle miniere; e.g., *Rivista mineraria 1901*, p. 138), 3 kg for the *laterizi diversi* (again corresponding to the average of the other items together), and 4 kg per firebrick (based on the reported value figures, and assuming a value per ton 5 times that of ordinary *laterizi*, as in 1890), for a total of 2,025 thousand tons. Adding estimates for Lazio that allow it 67% of Roma province's share in 1890 (0.3% for plaster, 7.7% for lime, 0.0% for cement, 7.2% for bricks and tiles: *Rivista mineraria 1890*, pp. CXXVI, 727), these point to output levels equal to 108 thousand tons of plaster, 602 of lime, 9 of cement, and 2,128 of bricks and tiles. The corresponding consumption estimates for 1865 equal 108 thousand tons of plaster, 536 of lime and cement, and 2,122 of bricks and tiles.

The ratios of these consumption estimates for 1865, 1890, and 1901 to the corresponding consumption indices in Table C.03, cols. 13 - 15, are not constant. In the case of plaster, that ratio displays an average growth rate of about 2.9% p. a. from 1865 to 1890, and 1.1% p. a. from 1890 to 1901; in the case of lime and cement, of about 2.8% p. a. from 1865 to 1890, and 2.8% p. a. from 1890 to 1901; and in the case of bricks and tiles, of about 1.2% p. a. from 1865 to 1890, and 2.6% p. a. from 1890 to 1901. Interestingly, the growth rates over the first period are not systematically higher than in the second; this is at least consistent with the hypothesis that the early figures for kiln products are not, as those for quarry products seem to be, grossly incomplete. Moreover, these different patterns of acceleration and deceleration are similar to those described by these products' average values, as reported by the Corpo delle miniere. Plaster averaged 14.8 lire per ton in 1865, 8.4 in 1890, and 8.3 in 1901 (declining at about 2.2% p. a. from 1865 to 1890, and 0.1% p. a. from 1890 to 1901); fat lime averaged 20.8 lire per ton in 1865, 17.2 in 1890, and 15.4 in 1901 (declining at about 0.8% p. a. from 1865 to 1890, and 1.0% p. a. from 1890 to 1901; cement and hydraulic lime prices appear less significant, given the very small quantities produced in 1865); and ordinary bricks and tiles averaged 10.5 lire per ton (given the present estimate) in 1865, 10.9 in 1890, and 8.8 in 1901 (growing at about 0.1% p. a. from 1865 to 1890, and declining at 1.9% p. a. from 1890 to 1901). By way of comparison, builders' wage rates grew at about 1.3% p .a. from 1865 to 1890, and declined at 0.2% p. a. from 1890 to 1901 (Table K.06, col. 7); but the significance of this is not clear, since these wages presumably track the price of low-grade materials (including reclaimed rubble), which are substitutes for these kiln products, as well as the price of labor which is a complement to them (though construction in concrete may be sufficiently labor-saving to make labor a gross substitute for, rather then complement to, lime and cement). In general, the paths of the goods' prices seem to track their relative use better than their prices divided by the wage; but in either case there seems to be good reason to attribute the movements in the ratios of actual consumption to the corresponding consumption index at least partly to movements in

relative prices. For simplicity, however, actual consumption is here estimated from the consumption indices in Table C.03 (cols. 13 - 15) on the assumption that the ratios of the one to the other grew at uniform rates from 1861 to 1890, and again from 1890 to 1901.

The corresponding growth rates in the ratios of actual consumption to the corresponding consumption index in 1901-13 are not easily estimated from contemporary data, and could usefully be anchored by estimates for a later year. For the present, one notes that the average values of the kiln products reported by the Corps delle miniere for 1911 equaled 8.4 lire per ton for plaster (a growth of 0.1% p. a. from 1901), 16.1 lire per ton for fat lime (a growth of 0.4% p. a. from 1901), and 8.5 lire per ton for ordinary bricks and tiles (a decline of 0.3% p. a. from 1901). These averages may of course be contaminated by their inclusion of components that refer to years before 1911; by way of comparison, Cianci (1933) reports prices that drift upward from 1901 to 1911 (from 19.5 to 19.8 lire per ton of hydraulic lime, from 39.0 to 39.6 lire per ton of cement, from 26.0 to 28.9 lire per thousand bricks, and from 66.0 to 66.9 lire per thousand tiles). At the same time, however, builders' wage rates grew at about 2.9% p. a. from 1901 to 1911 (Table K.06, col. 7), so that these goods' prices divided by the wage rate display an accelerating, rather than decelerating, decline in comparison to the previous period. Very tentatively, the ratio of actual consumption to the corresponding consumption index is here assumed to grow, after 1901, at 1% p. a. in the case of plaster and in that of bricks and tiles, and 2.5% p.a. in the case of lime and cement (reflecting the growing use of concrete, and binder-intensive construction such as hydroelectric projects).

The output of plaster (Table C.04, col. 5) and that of bricks and tiles (col. 8) are estimated directly as actual construction-related consumption less net imports (cols. 1 and 3, respectively). In 1878, the estimated output of plaster equals 159 thousand tons, or 22% more than the 130 thousand tons indicated by the *Notizie minerarie* (p. 38); since the latter provided no more than a rough estimate, it may well understate actual output by such a margin.

The output of lime and cement together (cols. 6 plus 7) is estimated as actual construction-related consumption less net imports (col. 2) plus other lime consumption (col. 4). Cement output (col. 7) is then estimated first, and lime output (col. 6) is obtained as a residual. Cement output is set equal to the figure reported by the Corpo delle miniere in 1865 and 1890, noted above, and again in 1878 (10,000 tons: *Notizie minerarie*, p. 38), on the assumption that the essential lack of growth since 1865 had been correctly observed. In 1899-1912, in addition, the cement output figures in the *Rivista mineraria* appear to contain enough new observations, district by district, to allow the construction of direct estimates (Table C.05, cols. 1 - 9). In the sources, data gaps were filled by repeating the last available observation; here, they are filled by linear interpolation of the neighboring observations, or by extrapolations constructed ad hoc (that for the Milano district after 1910 mimics the movement of output in the rest of northern Italy; the others, of little importance, simply repeat the closest entry). The resulting figures are also included in Table C.04, col. 7. The other years' figures are obtained on the assumption that cement output remained constant in 1861-77, and grew at a constant geometric rate from 1878 to 1890 and again from 1890 to 1899. In 1913, finally, cement production is estimated on the assumption that it equaled 32.2% of that of lime and cement together, against 24.1% in 1906 and 30.9% in 1912. Lime output, as noted, is obtained as a residual. The output estimate for 1878 equals 704 thousand tons, or 5% less than the 740 thousand tons indicated by the *Notizie minerarie* (p. 38). Once again, the attribution of such a margin of error to that rough estimate by the Corpo delle miniere does not appear unreasonable; interestingly, though, the sum of the present 1878 output estimate for lime and plaster (854 thousand tons) is quite close to the sum of the corresponding figures in the *Notizie minerarie* (870 thousand tons).

C02.04 Binders, bricks, and tiles: consumption-tax evidence

Further evidence on the consumption of binders and bricks and tiles is provided by the consumption-tax data collected in Tables K.26 to K.51 below. Table C.06 is derived from these tables, analogously to Table K.52 (see below, section K08.28). Cols. 1 - 22 report the ratio of the current year's brick and tile consumption figure to the previous year's; these ratios are omitted if the underlying data are not available or non-comparable (e.g., across years when the customs perimeter underwent a significant alteration, or the taxed unit changed from numbers to weight), and also if corresponding direct evidence of binder consumption is not available (so that the years in which binder consumption is estimated from aggregate yields and the like are deleted from the sample). Interpolations across gaps in the data, revealed by a repetition of the calculated ratio over a number of years, follow the rule described in section K08.28. The figures for Milano (col. 11) ignore the apparently spurious "cartload" label; those for Savona (col. 19) are based on the sum of the brick data and tile data; and those for Treviso (col. 21) treat the averages for 1891-95 and 1896-99 simply as figures specific to 1893 and 1897 (see below, sections K08.13, K08.22, and K08.25). Col. 23 is the geometric average of cols. 1 - 22; and col. 24 is the index of brick and tile consumption obtained by setting 1911 = 100 and extrapolating on the basis of the average ratios in col. 23. Col. 26 is the comparable index of binder consumption obtained by setting 1911 = 100 and extrapolating on the basis of the ratios in col. 25. The latter ratios are the geometric averages (analogous to those in col. 23) of the ratios of binder consumption for the same cities and year pairs, including interpolations, as those in cols. 1 - 22. The binder-consumption series analogous to cols. 1 - 22 are those in Table K.52, col. 1 (1862-89), col. 2 (setting 1871-73 equal to .984 in each year, and omitting 1892), col. 3 (1866-85 and 1910-13), col. 4 (setting 1888-89 equal to .623 in each year), col. 5 (1867-88, setting 1883-87 equal to 1.029 in each year, 1907-08, and 1910-13), col. 6 (1868-94, setting 1876-79 equal to .801 in each year, and 1897-1913), col. 7 (1868-86, setting 1884-86 equal to 1.118 in each year), col. 8 (1881-1908), col. 9 (1872-1903), col. 10, col. 12 (1882-1913), col. 13 (1868-1911, setting 1880-84 equal to 1.238 in each year and 1885 equal to .906, to exclude the allowances noted in Table K.38), col. 14 (omitting 1904-05), col. 15 (1866-72 and 1890-1913, setting 1891-95 equal to 1.025 in each year and 1901-08 equal to 1.068 in each year), col. 17 (1862-72), col. 18, col. 19 (1866-78), col. 20, col. 21, col. 23, col. 24 (1882-1910, setting 1886-93 equal to .991 in each year, 1894-97 equal to 1.123 in each year, and 1898-1905 equal to .987 in each year), and col. 26 (1909-13).

Comparing the tax-based indices of brick and tile consumption and of binder consumption (Table C.06, cols. 24 and 26), one notes the largely parallel movement of the two indices (at least from 1865, when the underlying sample increases beyond its very small initial size). Brick and tile consumption increased and decreased more than binder consumption over the cycle of the 1880s, but not in the upswing after the turn of the century. The relative cyclical sensitivity of the two series before 1900 is consistent with the present assumption that bricks and tiles are weighted more heavily towards new construction (and correspondingly less towards maintenance) than binders are; the further assumption of a strong relative growth of binder consumption within new construction early in this century would correspondingly account for the failure of brick and tile consumption to outstrip binder consumption in the post-1900 upswing.

C02.05 Binders, bricks, and tiles: value added

The value added estimates are here derived on the basis of the data reported in the *Rivista mineraria*, the resulting per-unit figures being then applied to the present estimates of production in 1911.

In the case of cement and hydraulic lime, the outputs reported in the *Rivista mineraria*

1911 (p. LXXXIX) were 979.6 and 597.1 thousand tons, respectively; the corresponding values were 31.72 and 18.66 lire per ton, and 31.07 and 11.14 million lire overall. According to the *Rivista mineraria 1901*, p. 423, the cement kilns consumed 1.65 tons of limestone and perhaps .30 tons of New Pelton coal per ton of output; a ton of hydraulic lime probably consumed as much limestone, but only two thirds as much coal (Eckel, 1928, p. 181). New Pelton coal cost 26.5 lire per ton in Genova, and perhaps 33 lire per ton (with the transport costs calculated in section A03.04 above) at the point of use; that consumed in the production of cement (294,000 tons) and hydraulic lime (119,000 tons) would thus be worth 9.70 and 3.94 million lire, respectively.

Limestone costs are more difficult to ascertain, but appear to have been close to 2 lire per ton. At 1.65 tons of limestone per ton of output, the reported production of fat lime (864,500 tons), hydraulic lime, and cement consumed just over 4 million tons of stone; according to the *Rivista mineraria 1911*, p. XCII, these were produced by 5,779 *operai* (all but 152 of them adult males) and 561 non-hydraulic horsepower. The working year was probably close to 300 days, and white-collar personnel perhaps 12% of blue-collar employment (the census data for category 2.22 suggest some 280 days and 17%, respectively; but these figures reflect the short year and small firms found in quarrying other kiln materials, as noted below). At wages of 3 lire per man-day and salaries of 2,000 lire p. a., these suggest a wage bill of 5.1 million lire and a salary bill of 1.4 million lire, to which are to be added (at the rates used in section B above) perhaps .3 million lire in capital costs. Value added in quarrying this limestone thus works out to some 6.8 million lire; 2.2 million lire of that may be attributed to the 1.42 million tons of ordinary limestone consumed by fat lime (based on the price of 1.55 lire per ton for construction limestone in the *Rivista mineraria 1911*, p. LXXXI, and assuming zero rent). This leave a value added of 4.6 million lire, or 1.8 lire per ton, for the 2.6 million tons of limestone consumed by hydraulic lime and cement; and an extra .2 lire per ton for the scarcity rent earned by naturally hydraulic stone does not seem inappropriate. At 2 lire per ton and 1.65 tons per ton of output, then, the limestone input is estimated to have cost 3.23 million lire in the production of cement, and 1.97 million in that of hydraulic lime.

Power costs (as distinct from heat costs) in the production of cement and hydraulic lime, finally, can be approached through the installed horsepower figures reported in the *Rivista mineraria 1911*, p. XCIII (2,299 hydraulic, 5,618 electric, 10,054 steam and gas). Assuming a long working year of 7,000 hours (not unreasonable, in view of the pressure on capacity implied by rapid output growth), and at the usual rates of 43 lire per thousand steam and gas horsepower-hours, 19 lire per thousand electric horsepower hours (if water-generated, as these are presumed to be) and none for water power, these figures yield a total power cost of 3.77 million lire for nearly 126 million horsepower hours. Eckel (1928, pp. 430, 490) suggests that power needs absorbed some 340 kg of coal per ton of cement, and perhaps 150 kg per ton of hydraulic lime (which requires grinding the limestone, but not the much harder clinker); at these rates, the outputs reported in the *Rivista mineraria* would have consumed nearly 423,000 tons of coal, equivalent to the 126 million horsepower hours obtained here at a specific fuel consumption of 3.4 tons of coal per thousand horsepower hours. This figure does not seem unreasonable for the United States; and a lower one would require an implausible increase in the Italian power units' work year beyond the 7,000 hours assumed here. Retaining the present global estimate, then, and allowing unit power needs in cement and hydraulic lime in the proportion of 340:150, cement manufacture is attributed 79% of the joint total, or 2.98 million lire, leaving .79 million lire for hydraulic lime.

To recapitulate, cement production worth 31.07 million lire consumed materials, heat, and power worth 3.23, 9.70, and 2.98 million lire, respectively, for a total of 15.91 million lire; the implied value added is 15.16 million lire, or approximately 15.48 lire per ton. Applied to

the 1911 output estimate, this estimate yields an aggregate value added of 16.22 million lire. Hydraulic lime production worth 11.14 million lire consumed materials, heat, and power worth 1.97, 3.94, and .79 million lire, respectively, for a total of 6.70 million lire; the implied value added is 4.44 million lire, or approximately 7.44 lire per ton. Since the price difference between fat and hydraulic lime (2.6 lire per ton) and the plausible difference in their limestone costs (.7 lire per ton of output, as estimated above) seems essentially exhausted by the greater fuel costs of hydraulic lime production (200 kg of coal v. 100 kg; Eckel, 1928, pp. 113, 181), the unit value added estimate calculated for the latter can be applied to the former as well. Applied to the 1911 aggregate lime output estimate, this estimate yields an aggregate value added of 18.49 million lire; applied to the output of fat lime reported in the *Rivista mineraria 1911*, it yields a value added of 6.43 million lire, implying that the corresponding 11,000 *operai* worked a very short year (i.e., that production was in fact intermittent).

The employment data for cement and hydraulic lime together in the *Rivista mineraria 1911*, p. XCIII (7,482 *operai*, 6,857 of them adult males, and 17,971 horsepower) can usefully be compared to the corresponding value added estimate of 19.6 million lire. Assuming a full 300-day working year (justified by the rapid growth of output; the census data for category 5.15 reflect the shorter work year in the production of fat lime and plaster), and a standard wage of 3 lire per man-day, the wage bill totaled 6.45 million lire; salaried personnel were probably just under 1,000, or 13% of blue-collar employment (the corresponding census figure of 23% reflects the much smaller firm scale prevalent in fat lime and plaster production: 3.2 *operai* per kiln, against 11.5 in cement and hydraulic lime production, according to the *Rivista mineraria 1911*, p. XCIII). Wages and salaries thus sum to some 8.4 million lire; this leaves a balance of 11.2 million lire as the return to capital, or 623 lire per horsepower.

Value added in plaster and brick and tile production is estimated in a similar way. The *Rivista mineraria 1911* (p. LXXIX) reports not quite 382,000 tons of plaster output, worth 3.19 million lire, or 8.36 lire per ton; this same price applied to the Bologna district data, revised that year. According to Eckel (1928), p. 59, materials consumption per ton of output included 1.2 tons of gypsum and .1 to .2 tons of coal, the lower figures being no doubt more representative of Italian practice. Gypsum prices are not available, but a price of 1.5 lire per ton (687,000 lire for 458,000 tons) seems compatible with the unit values of comparable materials (*Rivista mineraria 1911*, p. LXXXI) and with the reported employment in gypsum extraction (1,500 *operai*, all but 100 adult males, and no horsepower; *ibid.*, p. XCII), assuming negligible rent and a short but not unreasonable working year of perhaps 120 days. Allowing 1.8 lire for 1.2 tons of gypsum, 3.3 lire for a quintal of coal (assumed to be New Pelton, as in cement kilns), and .06 lire for other costs, value added per ton of plaster reduces to 3.20 lire per ton, or 2.25 million lire for the 704,000 tons produced in 1911. At this same unit value added, the 382,000 tons reported in the *Rivista mineraria 1911* correspond to 1.22 million lire, implying that the corresponding 3,600 *operai* worked a very short year.

The *Rivista mineraria 1911* (p. LXXXIX) reports 6,584 thousand tons of ordinary brick and tiles, worth an average 8.46 lire each, and 24 thousand tons of refractories, worth an average 57.4 lire each. A ton of ordinary brick and tiles probably consumed 1.6 tons of clay and 60 kg of coal, most of it for heat rather than power (compare Davis, 1889, pp. 242, 243, 422). The coal, if New Pelton, would cost some 2 lire; the clay may have cost another 1.6 lire (at 1.0 lire per ton, comparable to the price of other easily obtained materials, *Rivista mineraria 1911*, p. LXXXI). Allowing another .06 lire per ton for sundry other costs, value added is here estimated at 4.80 lire per ton, or 65.32 million lire for the 13,609 thousand tons (including refractories) produced in 1911.

According to the *Rivista mineraria 1911* (pp. LXXXIX, XCII, XCIII), the 6.6 million tons of bricks and tiles (plus another .1 million tons of terra-cotta) were produced by some

57,000 *operai* (48,000 of them adult males) and 6,000 horsepower; an additional 14,000 *operai* quarried the clay for these and other products (whose quantities are negligible in comparison). At the prices and technical coefficients assumed above, these figures yield a value added per *operaio* of roughly 800 lire in clay extraction and 600 lire in brick and tile manufacture; the implied working years are obviously short, though perhaps not quite so short as in the production of gypsum and plaster.

C02.06 Terra cotta, ceramic, and glass: production estimates

The estimates of terra cotta, ceramic, and glass production are developed in Table C.07. Col. 1 transcribes the index of construction-related consumption; it is estimated as the sum of Table C.03, cols. 5, 6, 11, and 12, weighted respectively by .1589, .0794, .1589, and .0794 (i.e., as the estimated aggregate construction-related consumption of kiln products, less the part attributed to binders, bricks, and tiles). Other consumption is tentatively assumed to vary as the weighted sum of three time series. These are population (represented by the numbers actually present within constant borders, *Sommario*, p. 39); household formation (Table C.07, col. 2, obtained as the product of the preceding population series and the marriage rates reported in the *Sommario*, p. 44, setting 1861 equal to 1862); and the construction of private buildings (Table K.58, col. 5, considered an index of durable-goods consumption). Col. 3 is the aggregate index of consumption; it is obtained as the sum of these four series, each scaled to set 1901 = 1.00, with weights equal to .225, .500, .175, and .100, respectively. As indicated below, the weight of col. 1 in col. 3 reflects the estimated share of construction in the total consumption of these products; the other weights distribute the residual arbitrarily but not unreasonably.

The estimates of net imports are transcribed in Table C.07, cols. 4 - 6. The net imports of terra cotta (col. 4) are calculated directly from the *Movimento commerciale* in 1888-1913 (categories 926-929 in 1913). In 1878-87, they are calculated from the corresponding figures in the source, including the *ambrogette verniciate o smaltate* which were then separately counted, and adding an allowance for terra cotta pipes (600 tons of net imports p. a., as estimated in section C02.03 above). In 1867-77, they are calculated from the corresponding figures in the source, allowing 2 tons per hundred terra cotta pipes. In 1861-66, they are calculated as in 1867-77, deducting an allowance for the trade of the Venetian provinces (140 tons of net exports p. a., extrapolated from the 24 tons of net exports in November-December 1866).

The net imports of ceramic (col. 5) are calculated directly from the *Movimento commerciale* (categories 930-938 in 1913), with the addition of an allowance for the trade of the Venetian provinces in 1861-66 (110 tons p. a., extrapolated from the 18 tons of net imports in November-December 1866).

The net imports of glass (col. 6) are the sums of two or three major components calculated, with some *ad hoc* corrections, from the *Movimento commerciale*. The first component is simply the quantity of the glass traded and included, in units of weight, in the statistics for glass from 1861 to 1913 (categories 939-957 in 1913; category 958, broken glass, is considered an input rather than an output and excluded from the present tally). In 1861-66, this component includes an allowance for the net imports of the Venetian provinces (800 tons p. a., extrapolated from the 131 tons of net imports in November-December 1866). In 1861-73, moreover, this component is reduced by 4,100 tons p. a., as an allowance for unrecorded exports of glass beads. These appear, at that level, in the statistics for 1874; earlier recorded exports were negligible, even though glass beads were produced mainly for export in earlier years as well (*Statistica mineraria*, p. LXXVIII; where, or whether, the *Movimento commerciale* counted the bulk of these exports before 1874 is far from clear).

The second component is the number of bottles traded and counted as such in the statistics for glass from 1861 to 1887. In 1861-66, this component includes an allowance for the

net imports of the Venetian provinces (.22 million bottles p. a., extrapolated from the 36,000 units of net imports in November-December 1866). These are here converted into units of weight at the standard allowance of 1,400 bottles per ton (*Movimento commerciale 1888*, p. 634). These first two components appear to include the glass imported as containers of imported liquids: this is explicitly indicated in the 1900s (e.g., *Movimento commerciale 1907*, pp. 302-303), and the absence of any obvious break in the calculated total net imports of bottles (in these two components) suggests that this was the case from the very beginning of the series. On the other hand, it is clear that the glass export data do not include the glass exported as containers of exported liquids: the quantities are too small, the destinations too few, in comparison to the export data for liquids exported in bottles. The third component accordingly refers to the bottles exported and counted as such in the statistics for wine, brandy, and the like from 1861 to 1913 (categories 4, 6, 9, 12 - 13, and 15 - 16 in 1913; no allowance is added for the Venetian provinces in 1861-66, given negligible exports in November-December 1866). These bottles also are converted to units of weight at the rate of 1,400 bottles per ton. Unfortunately, the number of bottles exported for liquids other than alcoholic beverages remains unknown; and it is plausibly significant (on the import side, for example, the weight of bottles imported full according to the glass trade data sum to 20,600 tons over the years 1909-13; the wine trade data account for 7.50 million bottles, equivalent to just 5,400 tons at the rate recalled above). The present glass consumption figures are correspondingly partial; by the same token, the present estimates are intermediate between those that would be obtained if international trade were ignored altogether, and taken fully into account.

Estimated consumption equals cols. 4 plus 7 for terra cotta, 5 plus 8 for ceramic, and (with the above caveat, and the further exceptions noted below) 6 plus 9 for glass. The figures for 1865, 1890, and 1901 are benchmarks obtained as the sum of output and net imports. The *Rivista mineraria 1901*, p. LV, reported 78.2 thousand tons of terra cotta, 40.7 thousand tons of ceramic (china, majolica, porcelain, and the like), and 67.7 thousand tons of glass. Evaluated at the average values reported in the *Rivista mineraria 1911*, p. LXXXIX, these were worth 6.86, 18.42, and 22.24 million lire, respectively. Allowing for net exports (0.8 thousand tons of terra cotta, 0.1 of ceramic, and 2.6 of glass), consumption equaled 77.4 thousand tons of terra cotta, 40.6 of ceramic, and 65.1 of glass. Evaluating these quantities at the same average rate as domestic output, aggregate consumption at 1911 prices is measured at 46.6 million lire. Of that, 10 to 11 million lire were assigned to construction-related consumption in section C02.02 above. The relative weight of col. 1 in col. 3 reflects the ratio of these consumption figures ((10.5/46.7) = .225).

The *Rivista mineraria 1890*, p. CXIX, reported 64.0 thousand tons of terra cotta, 25.8 of ceramic, and 48.6 of glass. Allowing for net imports (3.1 thousand tons of terra cotta, 0.8 of ceramic, and 7.7 of glass), consumption equaled 67.1 thousand tons of terra cotta, 26.6 of ceramic, and 56.3 of glass.

The third set of benchmarks is from the *Statistica mineraria*; but these figures are relatively weak, since the desired output tonnages are not themselves reported in the source. As noted in section C02.03 above, the *Statistica mineraria* appears to include terra cotta pipes and the like among the *laterizi diversi* (p. 83). These items were estimated above to number 751,000 units, equivalent to 15.0 thousand tons at 20 kg per unit. The output of other terra cotta and that of ceramic, in turn, are estimated as follows. The *Statistica mineraria* (pp. 84-85) reports ceramic production (*maioliche*, *terraglie*, *porcellane*) worth 1,877,425 lire; quantities are listed as 160 tons plus 11.8 million pieces. This total, however, refers only to Piedmont, Liguria, Lombardy Venetia, and Tuscany; the ceramic produced elsewhere is said to have been included with ordinary kiln products -- plaster, lime, cement, bricks and tiles, and crockery (*stoviglie*) -- in the preceding table (pp. 78-83). Crockery production is said to have been worth

2,698,581 lire (ostensibly for 65,639,000 pieces; but the disaggregated data strongly suggest that the Torino quantities refer to hundreds rather than thousands, for a corrected figure of 37,328,000 pieces). This crockery figure almost certainly includes all ordinary terra cotta crockery on the one hand, and the ceramic output excluded from the source's next table on the other. The latter presumption is confirmed by the far lower unit value for the crockery produced in the *compartimenti* where ceramic was separately counted (56 lire per thousand, with the corrected Torino figures, or 25 lire per thousand, as published, v. 101 lire per thousand elsewhere; the corresponding figures for *laterizi diversi*, 29 to 37 lire per thousand respectively, are much closer). On these assumptions, total production of terra cotta (other than pipes and the like) in Piedmont, Liguria, Lombardy, Venetia, and Tuscany was worth 1,396,804 lire (1,319,604 for crockery, p. 83, plus 77,200 for terra cotta ornaments, p. 85), against 1,877,425 for ceramic; distributing the 1,378,977 lire of crockery production in the rest of Italy between terra cotta and ceramic in those same proportions, the value of Italy's total production can be estimated at 2.67 million lire for ceramic and 1.99 million lire for terra cotta other than pipes and the like.

In Piedmont, Liguria, Lombardy, and Tuscany, ceramic (and terra cotta ornaments) worth 1.75 million lire were obtained from 7,000 tons of materials (pp. 84-85; the data for Venetia are excluded from the calculation, as two provinces there did not report inputs at all, and the third reported a most implausible 10,800 cubic meters of materials for only 77,000 lire worth of output). At an input/output ratio of 1.4 -- scaled down from the 1.6 of bricks and tiles toward the 1.25 of glass (Hodkin and Cousen, 1925, p. 145), to allow for the lower share of weight-losing clay in ceramic (*Enciclopedia italiana*, vol. 9, p. 771 ff.) -- these yield an output of 5,000 tons, and an average value of 350 lire per ton; dividing this figure into the national aggregate value estimate of 2.67 million lire, one obtains an aggregate output estimate of approximately 7,600 tons of ceramic in 1865. Further assuming that the ratio of terra cotta and ceramic unit values was the same in 1865 as in 1890 (70.8 and 465 lire per ton, respectively; *Rivista mineraria 1890*, p. CXXVI), one obtains an average value for terra cotta of 53.3 lire per ton; dividing this figure into the national value estimate of 1.99 million lire yields an aggregate output estimate of approximately 37,300 tons of terra cotta other than pipes and the like. Adding the above estimate for pipes and the like, the aggregate terra cotta output in 1865 covered by the *Statistica mineraria* is estimated at 52.3 thousand tons.

The estimates of the glass production covered by the *Statistica mineraria* (pp. 86-89) are similarly tentative. That source reports the production of 1,745 tons of beads in Venice, and indicates that twice as much was produced in Murano (for an estimated total of 5,235 tons). The production of other glass and crystal was reported in a variety of disparate units, worth a total of 3,827,734 lire; 9,166 tons of materials were consumed to produce output worth 3,022,762 lire, implying a total materials consumption of perhaps 11,600 tons for glass and crystal other than beads. At a net yield of 80% (Hodkin and Cousen, 1925, p. 145), these yield an output of some 9,300 tons, for a total production of 14,500 tons in 1865.

These output estimates (52.3 thousand tons of terra cotta, 7.6 of ceramic, and 14.5 of glass) for the area covered by the *Statistica mineraria* are then expanded by estimates for Latium that allow it 67% of Roma province's shares in 1890 (0.0% for terra cotta, 3.4% for ceramic, and 0.7% for glass: *Rivista mineraria 1890*, pp. CXXVI, 727-734) into totals equal to 52.3 thousand tons of terra cotta, 7.8 of ceramic, and 14.6 of glass. Adding net imports equal to −.1 thousand tons of terra cotta, 2.2 of ceramic, and 6.2 of glass, the 1865 benchmark consumption estimates equal 52.2 thousand tons of terra cotta, 10.0 of ceramic, and 20.8 of glass.

The ratios of these benchmark consumption estimates for 1865, 1890, and 1901 to the consumption index in Table C.07, col. 3 display growth rates equal to about 0.4% p. a. from

1865 to 1890, and 0.7% p. a. from 1890 to 1901, in the case of terra cotta; about 3.4% p. a. for 1865 to 1890, and 3.3% p. a. from 1890 to 1901, in that of ceramic; and about 3.5% p. a. from 1865 to 1890, and 0.8% p. a. from 1890 to 1901, in that of glass. Since these growth rates changed little from the first period to the second in the case of terra cotta and ceramic, the consumption of these goods is here estimated on the simple assumption that its ratio to the consumption index in col. 3 grew at a constant rate from 1861 to 1890, and again from 1890 to 1913. The output series in cols. 7 and 8 are then obtained as estimated consumption minus net imports. Exceptionally, the terra cotta output figures for 1887 and 1888 are respectively increased and decreased by one thousand tons, on the assumption that the strong tariff increases in 1888 led to super-normal imports and inventory accumulation in 1887, and an offsetting adjustment the following year. As noted below, the output estimates for 1911 appear to be compatible with the census data, which thus loosely confirms the present extrapolations.

The glass estimates are analogous to the preceding from 1861 to 1901. Consumption (cols. 6 plus 9) is estimated on the assumption that its ratio to the index in col. 3 grew at a steady rate from 1861 to 1890, and again from 1890 to 1901. The sharp deceleration in that growth rate does not appear unreasonable, as it mirrors the apparent movement of glass prices. The import prices (net of tariffs) quoted in the *Movimento commerciale* for unpolished plate glass thus equaled 90 lire per quintal in 1865, 25 to 50 in 1890, and 28 to 50 in 1901; for polished plate glass, 350 lire per quintal in 1865, 120 to 150 in 1890, and 90 to 120 in 1901. The import price for ordinary bottles dropped from 28 lire per quintal (20 lire per hundred) in 1865 to 18 in 1890, and then, even more rapidly, to 14 in 1901; but barrel prices rose from 4.04 lire per hl of capacity in 1865 to 7.00 in 1890, and then dropped to 6.00 in 1901, so that the relative price of glass containers also displayed a sharp deceleration around 1890. Output, in turn, is estimated as consumption minus net imports, again with an adjustment to the figures for 1887 and 1888 (plus and minus 3.3 thousand tons, respectively) to reflect likely import and inventory movements induced by the tariff increases. The figures obtained for 1875-76 are curiously lower than those of the neighboring years, reflecting the unusually high imports; some slight evidence that the latter indeed reflected a loss of competitiveness by domestic producers (as opposed to a spurt in consumption missed by the present index) may be found in the price series for firewood (*Sommario*, p. 181; the *Statistica mineraria*, pp. 86-89, lists wood as the only fuel used by the glass works), which displays unusually high prices in those years.

For the years after 1901, glass output estimates obtained by extrapolating the ratio of consumption to the consumption index at its 1890-1901 growth rate do not appear realistic. These yield an output level of 75 to 80 thousand tons in 1904-08, and under 100 thousand tons in 1911. The earlier magnitudes appear low next to those reported by the Corpo delle miniere (above, Table C.01), which grew to 80.4 thousand in 1904, 94.7 in 1906, and 96.6 in 1908 on the basis of an incomplete revision. The 1911 extrapolation appears low next to the census data (20.6 and 17.8 thousand blue-collar workers; above, Table B.18), given that the 1901 output recorded by the Corpo delle miniere (67.7 thousand tons) corresponded to an employment of just 9.1 thousand blue-collar workers (the 1911 output of 92.6 thousand tons corresponded to an employment of just 11.2 thousand blue-collar workers; but these two figures need not in fact be consistent, as those for 1901 presumably were).

The solution adopted here is to incorporate this problematic evidence in the output estimates. A further benchmark for 1906 is thus estimated from the Corpo delle miniere data by increasing the Firenze and Milano district figures (which had remained essentially unchanged since 1901) by 50%, against a 70% increase for the rest of Italy and a 31% increase in the Torino district; this yields an output estimate of 109.6 thousand tons, and a consumption estimate of 115.3 thousand tons. A final benchmark is obtained for 1911 on the basis of the census data, as the product of the blue-collar labor force listed by the *Censimento demografico*

(20.6 thousand workers, which presumably somewhat overstates actual employment) and an output per worker equal to the average of the figures obtained from the *Rivista mineraria 1901* and *1911* (7.44 and 8.27 tons, respectively, their average presumably somewhat understating, on balance, actual labor productivity). This yields an output estimate of 161.8 thousand tons, and a consumption figure of 171.7 thousand tons. These new consumption figures, in turn, yield average growth rates in the ratio of consumption to the corresponding index in col. 3 close to 8.2% p. a. from 1901 to 1906, and 3.0% p.a. from 1906 to 1911. The underlying reason is not easily identified, since the *Movimento commerciale* suggests that glass prices remained relatively stable, and that the sharp increase in barrel prices occurred after 1906 rather than before it. Perhaps the growing industrial use of glass made consumption react to other quantities, and other prices, than those considered here. Be that as it may, the present glass consumption estimates assume a steady growth in the ratio to the corresponding index in 1901-06 and again in 1906-13; and the output estimates are obtained as consumption minus net imports.

C02.07 Terra cotta, ceramic, and glass: value added

The value added estimates are also extremely crude. The *Rivista mineraria 1911* (p. LXXXIX) cites an average value for terra cotta of 87.75 lire per ton; allowing for the fact that most components of that figure were quite out of date, and noting the increase in the average value of the Caltanissetta district output with the revision in 1912 (*Rivista mineraria 1911*, p. LXXXVI, *1912*, p. C), a figure of perhaps 90 to 95 lire per ton may be considered appropriate. Materials costs are quite sensitive to the quality of the clay in use; an allowance of 20 to 25 lire per ton (including fuel), for a value added of 70 lire per ton, does not seem unreasonable.

In the case of ceramic products, the *Rivista mineraria 1911* (p. LXXXIX) yields an average value of 451 lire per ton; the price stability suggested by the revision of the Caltanissetta district figures in 1912 (*Rivista mineraria 1912*, p. C) suggests that this figure is essentially accurate. The *Statistica mineraria* (pp. 84-85) reports materials and fuel costs (excluding Venetia) at 775,300 lire, against an output value of 1,755,000 lire, for a value added/value ratio of 56%; applied to the 1911 price of 451 lire, this ratio yields a value added estimate of approximately 250 lire per ton. Multiplied by the 1911 output figures in Table C.07, these unit value added estimates yield aggregate values added of 9.44 million lire in terra cotta production and 19.88 million lire in ceramic production, for a total of 29.32 million lire.

The value added estimates for glass also rely on the output and input values reported in the *Statistica mineraria* (pp. 86-89). According to this source, materials and fuel cost .92 million lire for beads worth 2.2 million lire; these suggest that total bead output, worth 6.60 million lire, consumed perhaps 2.76 million lire of fuel and materials. Other glass products worth 3.02 million lire consumed fuel and materials worth 1.66 million lire, suggesting that a total production excluding beads worth 3.83 million lire consumed fuel and materials worth 2.10 million lire. In all, output worth 10.43 million lire consumed fuel and materials costing an estimated 4.86 million lire, for a value added/value ratio of 53%. Applied to the average value of 339 lire per ton obtained from the *Rivista mineraria 1911* (p. LXXXVII), this ratio yields a value added estimate of approximately 180 lire per ton. Multiplied by the 1911 output figure in Table C.07, this estimate yields an aggregate value added of 29.12 million lire.

These aggregate value added estimates appear compatible with the 1911 census figures. The latter point to aggregate employment levels close to 20,000 in terra cotta and ceramic, and to perhaps 22,000 in glass (above, Table B.18); and most of these kilns, unlike those for binders or bricks and tiles, appear to have worked relatively full years (*Censimento industriale*, vol. 4, p. 514).

C02.08 Other kiln products

Census category 5.19 groups a variety of disparate kiln products excluded from categories 5.15-5.18: the legend mentions burnt ochre, asphalt products (mastic, paving stones, tiles, and others), cement products (a list of sixteen items including blocks, tiles, beams, columns, tanks, and the like), and plaster and stucco products. In contemporary practice (compare *ISIC* 3540 and 3699), however, asphalt products are considered chemicals (like other hydrocarbons) rather than (other) non-metallic mineral products; they are accordingly excluded from the present residual kiln-products category.

The *Rivista mineraria 1890* (p. CXX) appears to contain the only national output data: 17,755 tons of cement objects, worth 1.69 million lire. Of these, 16,125 tons were produced by 592 *operai* and 61 horsepower. In 1911, employment in the industries at hand was probably close to that listed in category 5.19 by the *Censimento industriale* (Table B.18; the *Censimento demografico* does not list any artisans in that category): since asphalt-producers apparently combined the production and sale of ground asphalt (category 5.12) with that of the related kiln products (*Rivista mineraria 1911*, pp. XL, XLI), most asphalt-related employment should be counted in category 5.lω; and any discrepancies from non-integrated asphalt producers on the one hand and integrated cement or plaster producers on the other are of course mutually offsetting. Assuming that average output per blue-collar worker was the same in 1911 as in the observed subset of the industry in 1890, or 27.24 tons, aggregate output in 1911 is here estimated at 340,000 tons.

This production figure, identified essentially with cement and plaster objects, is here extrapolated as the sum of two components, each of which is obtained rather arbitrarily and very simply. The output of plaster objects is assumed to equal 10% of plaster consumption (Table C.04, cols. 1 plus 5); that of cement objects is extrapolated from just three benchmarks. In 1890, output is taken as reported, rounded to 17,800 tons. In 1911, the estimated output of plaster objects equals 70,700 tons, leaving 269,300 tons as the output of cement objects. In 1901, the output of cement objects is estimated as the sum of two components: some 12,400 tons in Sicily, as reported (*Rivista mineraria 1901*, p. 68), plus 46,300 in the rest of Italy, calculated from the above output per blue-collar worker and an estimated 1,700 workers (against a labor force of 1,773 such workers, in Italy less Sicily, indicated by the 1901 census, category V.7), for a total of 58,700 tons. Output of cement products is estimated by simple geometric interpolation between 1890 and 1901, and again between 1901 and 1911; the mean 1890-1901 growth rate is also used to extrapolate the series back to 1861, and again, assuming the pre-war boom was by then largely spent, from 1911 to 1913. This extrapolation implies, not unreasonably, that the production of these goods was essentially insignificant in the 1860s and early 1870s (*Enciclopedia italiana*, vol. 9, p. 714).

The sum of these separate estimates for plaster and cement objects yields the present series, transcribed in Table C.07, col. 10.

As indicated above, employment in this industry in 1911 is estimated to have corresponded to that indicated by the *Censimento industriale*. Since these kilns also appear to have worked relatively long years, like those for terra cotta, ceramic and glass, value added per person in the industry at hand is assumed to equal the corresponding average figure for those industries (58.44 million lire for some 42,000 persons, or 1,390 lire per person; above, section C02.07). These figures yield an aggregate value added estimate of 20.81 million lire, or about 61.2 lire per ton of output. This figure does not appear unreasonable in light of the average value of the cement objects covered by the *Rivista mineraria 1890* (about 95 lire per ton, against some 33 lire per ton for cement, pp. CXIX-CXX).

C03. Other non-metallic mineral products

C03.01 Introduction

In the near-total absence of useful output data, the production of other non-metallic products is estimated indirectly and at a high level of aggregation. Most of this residual is represented by a single series, estimated on the basis of quarry-output benchmarks and construction movements; the single exception is marble cutting and carving, which was largely influenced by foreign demand, and which can be separately estimated on the basis of the output and net exports of block marble.

The Carrara district reports allow one to estimate the value added in marble cutting and carving with a fair degree of confidence. The rest of the industry is far less well documented; the only useful evidence on value added is in the 1911 census reports, and its significance is clouded by the importance of artisanal and domestic production on the one hand, and the likelihood of short work years on the other. The corresponding value added estimate is thus extremely tentative.

C03.02 Cut or carved marble

The output of cut or carved marble (Table C.08, col. 3) is here estimated, in the main, by deducting net exports of block marble (Table C.08, col. 2) from the corresponding output estimates (Table C.08, col. 1, transcribed from Table B.19, col. 17), and reducing the resulting availabilities by 25% to allow for the average weight loss in cutting and carving (e.g., *Rivista mineraria 1894*, p. 78). The net export figures, taken from the *Movimento commerciale*, naturally refer to Italy's current political borders; but the separate Veneto figures for November-December 1866 indicate negligible trade in block marble, suggesting that errors from this source are comparatively unimportant. In addition, of course, the output estimates incorporate errors from neglected changes in inventories and in the mix of final products, as well as the errors of the quarry-output series; but these are not easily evaluated.

The only emendation to this simple algorithm refers to the years 1908-10, which appear to have been marked by a particularly severe inventory cycle (*Rivista mineraria 1909*, pp. 157-159) . From 1907 to 1911 the production of cut or carved marble in the Apuan Alps reported by the Corpo delle miniere equaled successively 146, 142, 150, 174, and 192 thousand tons (e. g., *Rivista mineraria 1911*, p. 45); deducting these from 75% of the difference between the production and net exports of marble would leave to the rest of Italy an output equal to 64,000 tons in 1907 and 40,000 tons in 1911, but to an implausibly low 20,000 tons in 1910. In 1908-10, therefore, the present figures in Table C.08, col. 3 are obtained as the sum of the reported product for the Apuan Alps, and a simple linear interpolation of the residual for the rest of Italy in 1907 and 1911. The net effect of this correction is to reduce the national output estimate by 7,000 tons in 1908, and to augment it by 22,000 and 26,000 tons, respectively, in 1909 and 1910.

According to the *Rivista mineraria 1911*, pp. 45-46, the workshops of the Alpi Apuane produced 192,000 tons of cut and carved marble products worth 27.2 million lire, consuming 261,000 tons of marble worth 18.3 million lire. The gross margin between these two value figures (each calculated f.o.b. at the railway station) is 8.9 million lire, or 46.4 lire per ton of output. Allowing for other charges (which were relatively minor, as 2,700 out of 3,600 available horsepower were water-powered), value added is here estimated at 44.8 lire per ton of output, or some 10.4 million lire in all.

A complete estimate of marble products would include the marble cubes, grains, and powder obtained from the scrap generated in marble extraction, cutting, and carving; since these outputs are difficult to estimate with any precision (though as we shall see they appear to have

been relatively unimportant), they are included in the residual category considered in the following section.

C03.03 Other processed stone, sand and earth

The balance of the non-metallic mineral products industry corresponds to census categories 5.11-14, less marble cutting and carving, considered above, and the grinding of asphalt rock, considered part of petrochemical production. It covers a variety of heterogeneous products, including abrasives and ground minerals such as talc, pumice, and salt, as well as construction materials; but these last provided the overwhelming bulk of the industry's physical output.

The present output estimates are simply the corresponding quarry output estimates obtained in section B03.04 above, reduced to allow for weight losses in processing. Allowing for weight losses (with respect to quarry output) equal to 25% for building stone and 10% for other materials, output is here estimated at 11.009 million tons in 1890 and 8.720 in 1901; the ratio of these benchmarks to the corresponding quarry output in Table B.21, col. 4 is very similar in 1890 (some .888 tons per ton) and 1901 (.886 tons per ton). For simplicity, the present output estimates in Table C.08, col. 4 extrapolate the above output benchmarks on the assumption of a constant ratio to Table B.21, col. 4 in 1861-90 and again in 1901-13, and a geometrically interpolated ratio in 1891-1900. In practice, therefore, the present estimates are obtained from the 1890 and 1901 benchmarks provided by the Corpo delle miniere, extrapolated on the basis of the consumption of construction materials suggested by the present estimates of construction movements.

The value added in this residual group of industries is here estimated on the basis of employment. The *Censimento demografico* lists some 61,900 persons, including independent artisans, in categories 5.11 through 5.14, suggesting an actual employment of perhaps 60,000 persons. Against this total, the marble cutting and carving workshops in the Carrara district covered by the *Rivista mineraria 1911*, p. 45, employed 4,970 *lavoranti*, and accounted for about 83% of the value added (10.4 million lire) estimated for marble cutting and carving in Italy as a whole. Assuming that the label *lavoranti* includes artisans as well as dependent laborers, but not supervising and managerial personnel, national employment in marble processing is here tentatively estimated at some 6,600 persons in all, corresponding to a value added of almost 1,600 lire per person. Deducting that estimated marble employment from the above total (derived from the *Censimento demografico*), and allowing another 1,000 people for asphalt processing (included by the above census figures, but here excluded from the non-metallic mineral products industry), the total employment in the residual stone, sand and earth processing industries can be estimated at about 52,400 persons. Since the marble-workers were no doubt the elite of the industry -- earning higher daily wages, and less likely to spend part of their days at other jobs -- value added per worker can be presumed significantly lower in the residual at hand. A figure close to 1,200 lire per person does not seem unreasonable; it yields an estimated aggregate value added of 62.88 million lire, or 3.17 lire per estimated ton of output.

The census figures reported in Table B.18 point to an employment of perhaps 4,900 persons in categories 5.11-12 (breaking, sorting, and grinding), excluding asphalt-processing; this subtotal suggests a value added of perhaps 5.88 million lire, leaving 57.00 million for the cutting and carving (5.13-14) of stone other than marble. The latter categories clearly include the cutting of low-grade stone, such as volcanic tufa, which the Corpo delle miniere listed under sundry materials rather than under (high-grade) building stone (above, Table B.17).

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Table C.01
Reported Output of Kiln Products, 1901-1912 (tons)

Year	(1) fat lime	(2) hydraulic lime	(3) cement	(4) plaster	(5) calcined magnesite
1901	819,879	430,594	215,130	342,031	600
1902	827,281	410,390	229,184	341,883	600
1903	830,850	417,285	288,614	341,883	600
1904	829,900	404,525	315,135	341,883	600
1905	830,510	435,015	333,400	341,783	600
1906	841,768	465,905	388,975	341,783	200
1907	843,768	494,855	460,730	342,083	200
1908	858,297	480,788	514,690	361,138	200
1909	858,297	483,338	592,300	361,138	200
1910	864,478	571,708	846,968	361,538	200
1911	864,478	597,070	979,578	381,538	200
1912	898,478	641,400	1,091,976	421,538	

Year	(6) bricks and tiles	(7) refrac-tories	(8) terra cotta	(9) ordinary ceramic	(10) artistic ceramic
1901	4,643,569	22,730	78,184	34,361	2,281
1902	4,754,705	22,730	78,221	34,401	2,331
1903	4,792,209	22,730	78,121	34,656	2,328
1904	4,770,758	23,230	77,821	35,013	2,328
1905	4,840,088	23,230	77,841	35,243	2,328
1906	4,893,305	23,330	77,841	35,293	2,290
1907	5,432,834	23,330	77,841	35,293	2,280
1908	6,087,392	23,880	80,091	35,343	2,281
1909	6,583,851	23,880	80,091	35,343	2,281
1910	6,584,051	23,880	80,091	35,343	2,281
1911	6,584,051	23,880	80,091	35,343	2,281
1912	6,889,151	23,880	88,721	36,703	3,231

Year	(11) porcelain	(12) glass and crystal		(13)	(14)	(15)
		sundry		panes	art-work	beads
1901	4,026	45,220		17,050	143	5,300
1902	4,026	45,205		17,080	143	5,300
1903	4,011	46,167		17,080	143	5,300
1904	4,011	55,847		18,080	1,943	4,500
1905	4,011	62,565		19,650	1,943	4,500
1906	4,011	68,565		19,650	1,943	4,500
1907	4,011	69,965		19,650	1,943	4,500
1908	4,011	70,515		19,650	1,943	4,500
1909	4,011	70,515		19,650	1,943	4,500
1910	4,011	70,515		19,650	1,943	4,500
1911	4,011	66,515		19,650	1,943	4,500
1912	4,011	70,515		19,650	1,943	4,500

Source: *Rivista mineraria*.

Table C.02
Reported Output of Non-Metallic Mineral Products
Other than Kiln Products, 1897-1913 (tons)

Year	(1) worked asbestos	(2) ground talc	(3) ground graphite	(4) ground barite	(5) refined kaolin	(6) quartz, feldspar
1897	992	10,750	4,960		1,885	
1898	970	12,090	5,837		1,050	
1899	1,010	10,830	8,740	20	560	
1900	1,555	9,930	8,890	13	1,200	1,720
1901	1,735	7,890	9,193		1,200	1,720
1902	1,258	8,645	6,440	300	1,200	1,720
1903	1,258	6,300	7,007	800	600	1,400
1904	1,500	6,740	8,765	360	1,200	1,200
1905	1,700	6,626	10,341	590	1,200	1,200
1906		7,894	9,898	800		
1907		8,850	9,260	1,720		
1908		9,410	8,781	1,895		
1909		9,530	8,780	1,950		
1910		11,580	10,165	1,333		
1911		14,136	9,273	1,452		
1912		14,324	10,390	1,088		
1913		21,350	9,460	792		

Year	(7) ground marble	(8) crushed marble	(9) marble cubes	(10) ground rock salt	(11) ground tripoli	(12) ground pumice
1897						
1898						
1899						
1900						
1901						
1902	12,700					
1903	10,074	6,062	2,136	1,050		
1904	10,300	6,200	2,200	1,400		
1905	600	18,000	2,400	3,445	30	
1906	10,500	9,500	1,700	3,000	30	10,631
1907	8,500	12,550	2,200	3,105		11,500
1908	7,000	16,500	1,500	3,070		15,000
1909	6,850	11,500	3,530	3,700		10,000
1910	7,500	12,900	4,160	4,000		15,400
1911	7,990	15,060	4,254	14,220		19,600
1912	8,487	14,875	5,420	13,700		18,850
1913	11,220	16,480	5,810	13,940		20,000

Sources: 1897-1901: *Rivista mineraria* (Torino district reports).
1902-1913: *Rivista mineraria* (national reports).

Table C.03
Construction-Related Kiln Products Consumption, 1861-1913:
Initial Estimates (million lire at 1911 prices)

	(1)	(2)	(3)	(4)	(5)	(6)
	Consumption for maintenance					
	Of private	Of public works[a]		Of rail-	Total	
Year	buildings	Buildings	Other	ways	Buildings	Other
1861	13.5	2.0	16.2	.5	15.6	16.7
1862	13.5	2.2	17.5	.6	15.8	18.0
1863	13.6	2.2	18.0	.7	15.9	18.6
1864	13.7	2.2	17.8	.8	16.0	18.5
1865	13.7	2.2	17.7	.9	16.0	18.5
1866	13.9	2.2	17.4	1.1	16.2	18.4
1867	14.0	2.3	18.2	1.1	16.4	19.2
1868	14.1	2.2	17.5	1.2	16.4	18.6
1869	14.2	2.2	17.7	1.3	16.5	18.9
1870	14.3	2.2	17.6	1.4	16.6	18.9
1871	14.4	2.2	17.7	1.6	16.8	19.1
1872	14.4	2.2	17.8	1.8	16.8	19.4
1873	14.5	2.2	17.7	2.0	16.9	19.5
1874	14.5	2.3	18.7	2.0	17.0	20.5
1875	14.7	2.2	18.1	2.1	17.1	20.0
1876	14.8	2.3	18.4	2.3	17.3	20.5
1877	14.9	2.4	19.1	2.3	17.5	21.2
1878	15.1	2.4	19.5	2.4	17.7	21.7
1879	15.2	2.4	19.2	2.5	17.9	21.5
1880	15.4	2.5	19.8	2.7	18.2	22.2
1881	15.5	2.4	19.6	2.9	18.2	22.2
1882	15.6	2.5	20.6	3.1	18.4	23.4
1883	15.6	2.5	20.3	3.3	18.4	23.3
1884	15.8	2.4	19.7	3.6	18.6	22.9
1885	15.9	2.5	20.0	3.6	18.8	23.2
1886	16.1	2.6	21.1	3.9	19.1	24.6
1887	16.2	2.7	21.7	4.1	19.3	25.4
1888	16.4	2.8	22.3	4.5	19.7	26.4
1889	16.6	2.8	22.9	4.6	19.9	27.0
1890	16.8	2.8	22.9	4.7	20.1	27.1
1891	16.9	2.9	23.2	4.7	20.3	27.4
1892	17.0	2.9	23.2	4.7	20.4	27.4
1893	17.0	2.9	23.5	4.9	20.4	27.9
1894	17.2	2.8	23.0	5.0	20.5	27.5
1895	17.4	2.9	23.3	5.0	20.8	27.8
1896	17.5	3.0	24.0	5.2	21.0	28.7
1897	17.7	3.0	24.3	5.4	21.2	29.2
1898	17.8	3.0	24.4	5.5	21.4	29.4
1899	18.0	3.0	24.1	5.7	21.6	29.2
1900	18.1	2.9	23.1	5.9	21.6	28.4
1901	18.3	2.9	23.3	6.0	21.8	28.7
1902	18.4	3.0	23.9	6.3	22.0	29.6
1903	18.6	3.0	24.1	6.5	22.3	30.0
1904	18.7	3.0	24.7	6.8	22.4	30.8
1905	18.9	3.1	25.0	6.9	22.7	31.2
1906	19.1	3.0	24.1	7.4	22.8	30.8
1907	19.4	3.0	24.2	7.5	23.2	31.0
1908	19.7	3.0	24.2	8.0	23.5	31.4
1909	19.9	3.1	24.9	8.3	23.8	32.4
1910	20.2	3.2	26.0	8.7	24.3	33.8
1911	20.6	3.4	27.8	9.0	24.9	35.9
1912	21.0	3.5	28.2	9.4	25.4	36.7
1913	21.5	3.5	28.7	9.7	26.0	37.4

Table C.03 (continued)

Year	(7)	(8)	(9)	(10)	(11)	(12)
	Consumption for new construction					
	Of private buildings	Of public works[a]		Of rail-ways	Total	
		Buildings	Other		Buildings	Other
1861	34.0	4.5	17.2	29.6	41.5	43.8
1862	53.7	4.9	17.9	33.2	61.9	47.8
1863	45.7	5.0	23.2	33.8	54.1	53.6
1864	52.1	5.0	23.5	30.2	60.1	50.7
1865	43.6	7.7	28.2	28.8	54.2	54.1
1866	33.2	5.7	20.8	24.8	41.4	43.1
1867	37.3	4.9	17.9	17.9	44.0	34.0
1868	30.1	5.0	20.3	17.6	36.9	36.1
1869	36.3	4.6	18.5	15.2	42.4	32.2
1870	32.3	5.4	22.3	16.8	39.4	37.4
1871	41.5	6.3	19.8	18.0	49.6	36.0
1872	43.0	7.2	23.7	19.3	52.1	41.1
1873	59.1	7.4	26.1	21.4	68.6	45.4
1874	72.0	5.8	23.8	22.3	80.0	43.9
1875	51.8	7.0	21.6	17.5	60.6	37.4
1876	47.1	5.4	22.3	15.3	54.0	36.1
1877	46.6	6.4	26.6	13.2	54.3	38.5
1878	43.1	5.8	27.8	14.1	50.3	40.5
1879	40.7	4.9	25.5	19.4	47.5	43.0
1880	43.0	5.8	27.0	23.2	51.1	47.9
1881	49.9	6.7	24.1	26.6	59.3	48.0
1882	60.5	5.7	27.7	33.3	69.5	57.7
1883	59.6	7.4	31.4	37.2	70.7	64.9
1884	62.1	8.0	35.2	36.4	73.7	68.0
1885	70.3	7.8	35.2	36.9	81.8	68.4
1886	71.1	8.8	38.2	35.3	83.4	70.0
1887	54.5	9.3	44.9	31.3	66.9	73.1
1888	39.5	11.2	47.7	32.4	53.9	76.9
1889	42.1	11.5	45.4	27.7	56.4	70.3
1890	55.9	10.2	39.0	27.6	68.9	63.8
1891	61.6	9.0	33.0	28.6	73.5	58.7
1892	55.3	9.7	27.7	28.2	67.8	53.1
1893	63.2	10.1	24.5	23.8	75.7	45.9
1894	62.1	8.1	22.8	26.0	72.8	46.2
1895	60.1	7.4	21.8	11.5	68.7	32.2
1896	60.1	7.0	21.8	6.7	67.8	27.8
1897	59.7	6.5	22.0	7.2	66.9	28.5
1898	60.0	7.3	21.9	5.7	67.9	27.0
1899	60.3	8.2	23.3	5.4	69.0	28.2
1900	62.1	8.7	25.1	6.9	71.5	31.3
1901	69.5	9.8	25.9	8.0	80.1	33.1
1902	81.3	11.0	28.5	9.5	93.3	37.1
1903	93.1	12.0	30.0	9.1	106.0	38.2
1904	103.9	11.7	29.4	11.0	116.7	39.3
1905	114.0	12.9	33.9	11.6	128.1	44.3
1906	111.9	16.4	41.3	13.2	129.6	53.2
1907	118.6	19.4	44.1	14.4	139.4	57.1
1908	126.7	24.1	48.0	15.0	152.3	61.5
1909	150.8	32.4	57.1	18.3	185.0	73.6
1910	176.4	38.2	65.5	22.3	216.8	85.6
1911	188.7	38.3	68.8	23.7	229.4	90.1
1912	191.9	37.2	71.4	24.4	231.5	93.4
1913	186.0	36.7	70.8	23.9	225.1	92.3

Table C.03 (continued)

Year	(13) Consumption indices Plaster	(14) Lime and cement	(15) Bricks and tiles
1861	3.69	47.50	52.53
1862	4.31	52.20	69.41
1863	4.10	55.39	65.85
1864	4.29	54.17	69.25
1865	4.12	55.64	66.12
1866	3.78	48.77	52.52
1867	3.89	44.69	51.20
1868	3.68	44.88	46.63
1869	3.85	43.40	49.33
1870	3.78	46.10	49.05
1871	4.11	46.27	56.19
1872	4.19	49.47	59.99
1873	4.69	53.06	73.92
1874	5.04	53.85	81.98
1875	4.48	48.64	65.08
1876	4.32	47.98	59.78
1877	4.36	49.98	61.01
1878	4.28	51.30	58.88
1879	4.23	52.42	57.75
1880	4.38	56.05	62.40
1881	4.62	56.65	68.54
1882	4.95	63.71	79.93
1883	4.98	67.66	83.50
1884	5.10	69.32	86.89
1885	5.37	70.42	93.15
1886	5.47	72.68	95.16
1887	5.02	74.01	84.15
1888	4.70	76.22	76.08
1889	4.80	73.35	75.60
1890	5.20	70.80	82.54
1891	5.37	68.64	84.15
1892	5.22	65.24	77.84
1893	5.45	62.23	81.10
1894	5.38	61.92	79.03
1895	5.31	54.35	70.86
1896	5.31	52.70	68.69
1897	5.32	53.52	68.38
1898	5.38	53.02	68.63
1899	5.44	53.68	69.92
1900	5.51	54.90	72.85
1901	5.80	56.80	80.00
1902	6.22	60.69	91.47
1903	6.64	62.61	101.46
1904	6.97	64.62	109.95
1905	7.35	68.58	120.41
1906	7.41	73.28	124.82
1907	7.76	76.42	133.69
1908	8.18	80.16	145.05
1909	9.19	89.92	174.09
1910	10.20	99.99	202.52
1911	10.66	105.27	213.95
1912	10.80	108.10	216.94
1913	10.71	107.92	211.98

Table C.03 (continued)

[a]excludes railways

Sources: col. 1: (.20/.60) (Table K.58, col. 8)
col. 2: (.20/.60) (.11) (Table K.05, col. 4)
col. 3: (.20/.60) (.89) (Table K.05, col. 4)
col. 4: (.14/.60) (Table K.10, col. 24)
col. 5: col. 1 + col. 2 + .1 (col. 4)
col. 6: col. 3 + .9 (col. 4)
col. 7: (.34/.34) (Table K.58, col. 5)
col. 8: (.34/.34) (Table K.05, col. 6)
col. 9: (.18/.51) (Table K.05, col. 10)
col. 10: (.15/.51) (Table K.10, col. 21)
col. 11: col. 7 + col. 8 + .1 (col. 10)
col. 12: col. 9 + .9 (col. 10)
col. 13: .1583 (col. 5) + .0293 (col. 11)
col. 14: .4615 (col. 5) + .8099 (col. 6) + .0668 (col. 11) + .5481 (col. 12)
col. 15: .2213 (col. 5) + .1107 (col. 6) + .7450 (col. 11) + .3725 (col. 12)

Table C.04
Estimated Output of Binders, Brick, and Tiles, 1861-1913
(thousand tons)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Net imports			Industrial	Estimated output			
Year	Plaster	Lime, cement	Bricks, tiles	lime consumption[a]	Plaster	Lime	Cement	Bricks, tiles
1861	0	-2	-84	0	86	403	9	1,691
1862	0	3	-29	0	104	451	9	2,178
1863	2	2	-27	0	100	494	9	2,090
1864	0	3	-18	0	109	496	9	2,214
1865	0	-75	-6	0	108	602	9	2,128
1866	0	21	-11	0	102	453	9	1,717
1867	0	1	-16	0	108	445	9	1,699
1868	0	-1	-43	0	105	462	9	1,595
1869	0	-1	-75	0	113	459	9	1,736
1870	0	-1	-60	0	114	502	9	1,732
1871	1	0	-71	0	127	517	9	2,009
1872	1	-1	-99	0	133	570	9	2,194
1873	2	-10	-112	0	152	639	9	2,724
1874	2	-7	-113	0	168	663	9	3,045
1875	2	-4	-70	0	154	613	9	2,426
1876	3	0	-35	0	151	617	9	2,225
1877	3	-1	-32	0	157	663	9	2,294
1878	3	3	-23	0	159	695	10	2,233
1879	4	8	-38	0	161	724	12	2,232
1880	4	12	-32	0	171	791	14	2,431
1881	4	17	-40	0	186	815	17	2,707
1882	5	21	-41	0	205	940	21	3,189
1883	5	26	-40	0	212	1,021	25	3,368
1884	6	30	-48	0	223	1,070	29	3,553
1885	7	35	-28	0	241	1,109	35	3,831
1886	7	43	-41	0	252	1,166	42	3,973
1887	8	60	-29	0	237	1,200	50	3,548
1888	9	41	-40	0	227	1,285	60	3,260
1889	10	37	-37	0	238	1,263	72	3,276
1890	11	36	-39	0	265	1,239	86	3,618
1891	12	27	-53	0	276	1,235	94	3,796
1892	13	23	-58	0	270	1,200	102	3,610
1893	21	23	-75	0	278	1,165	111	3,871
1894	10	17	-92	0	289	1,191	121	3,887
1895	13	17	-113	1	285	1,052	131	3,604
1896	10	15	-125	1	291	1,038	143	3,596
1897	21	19	-107	1	284	1,073	156	3,652
1898	12	19	-104	1	300	1,083	169	3,754
1899	8	18	-114	5	311	1,125	184	3,929
1900	12	24	-97	13	315	1,180	199	4,174
1901	6	24	-73	16	342	1,251	219	4,666
1902	5	17	-105	21	372	1,385	238	5,409
1903	10	15	-135	29	396	1,397	329	6,077
1904	5	10	-138	17	426	1,431	387	6,642
1905	1	8	-126	20	458	1,547	435	7,320
1906	10	16	-113	23	457	1,643	521	7,645
1907	14	28	-41	28	480	1,682	624	8,189
1908	11	27	-12	45	515	1,823	674	8,940
1909	19	26	-18	35	578	2,046	814	10,841
1910	13	21	-36	45	656	2,369	904	12,752
1911	3	16	-40	43	704	2,485	1,048	13,609
1912	2	-34	-52	49	721	2,608	1,166	13,948
1913	2	-37	-61	78	722	2,639	1,253	13,775

[a]in the manufacture of sugar

Sources: see text.

Table C.05
Estimated Output of Cement, 1861-1913 (tons)

Year	(1) Bologna district 1899-1912	(2) Caltanis. district 1899-1912	(3) Carrara district 1899-1912	(4) Firenze district 1899-1912	(5) Milano district 1899-1911
1861					
1862					
1863					
1864					
1865					
1866					
1867					
1868					
1869					
1870					
1871					
1872					
1873					
1874					
1875					
1876					
1877					
1878					
1879					
1880					
1881					
1882					
1883					
1884					
1885					
1886					
1887					
1888					
1889					
1890					
1891					
1892					
1893					
1894					
1895					
1896					
1897					
1898					
1899	2,180	1,175	2,000	4,100	48,700
1900	3,980	1,175	2,400	4,100	49,700
1901	4,790	2,053	2,800	7,588	52,850
1902	5,093	2,931	7,300	11,075	58,020
1903	5,395	3,809	7,533	14,563	84,518
1904	5,698	4,688	7,767	18,050	111,015
1905	6,000	5,566	8,000	21,538	137,513
1906	7,000	6,444	8,500	25,025	164,010
1907	12,000	7,322	8,625	28,513	190,508
1908	15,000	8,200	8,750	32,000	217,005
1909	36,667	15,000	8,875	46,000	243,503
1910	58,333	20,000	9,000	60,000	270,000
1911	80,000	25,000	12,000	35,000	328,441
1912	100,000	30,000	12,000	70,000	343,696
1913					

Table C.05 (continued)

Year	(6) Napoli district 1899-1912	(7) Roma district 1899-1912	(8) Torino district 1899-1912	(9) Vicenza district 1899-1912	(10) Estimated total 1861-1913
1861					9,070
1862					9,070
1863					9,070
1864					9,070
1865					9,070
1866					9,070
1867					9,070
1868					9,070
1869					9,070
1870					9,070
1871					9,070
1872					9,070
1873					9,070
1874					9,070
1875					9,070
1876					9,070
1877					9,070
1878					10,000
1879					11,967
1880					14,321
1881					17,138
1882					20,509
1883					24,543
1884					29,371
1885					35,149
1886					42,063
1887					50,337
1888					60,238
1889					72,087
1890					86,267
1891					93,849
1892					102,098
1893					111,072
1894					120,835
1895					131,455
1896					143,009
1897					155,579
1898					169,254
1899	0	18,800	98,700	8,475	184,130
1900	0	19,900	106,200	11,225	198,680
1901	20	27,870	110,200	11,325	219,496
1902	6,020	27,970	103,900	15,909	238,218
1903	8,020	30,580	161,320	13,309	329,047
1904	15,020	28,260	165,970	30,500	386,968
1905	17,275	41,100	155,730	42,000	434,722
1906	27,000	45,900	195,600	41,680	521,159
1907	36,000	53,060	240,875	47,000	623,903
1908	38,000	47,840	263,000	44,130	673,925
1909	46,000	48,500	309,600	59,680	813,825
1910	54,800	67,400	266,800	97,768	904,101
1911	63,600	60,500	325,180	118,298	1,048,019
1912	91,500	54,400	344,250	119,826	1,165,672
1913					1,253,224

Table C.05 (continued)

Sources: col. 1: 1899-1901, 1905-08, 1911-12: *Rivista mineraria*;
1902-04, 1909-10: see text.

col. 2: 1900, 1908-09, 1912: *Rivista mineraria*;
1899, 1901-07, 1910-11: see text.

col. 3: 1899, 1901-02, 1905-06, 1910-11: *Rivista mineraria*;
1900, 1903-04, 1907-09, 1912: see text.

col. 4: 1900, 1908, 1910-12: *Rivista mineraria*;
1899, 1901-07, 1909: see text.

col. 5: 1899-1902, 1910: *Rivista mineraria*;
1903-09, 1911-12: see text.

col. 6: 1899-1909, 1911-12: *Rivista mineraria*;
1910: see text.

col. 7 - 9: *Rivista mineraria*;

col. 10: 1899-1912: sum of cols. 1 - 9;
1861-98, 1913: see text.

Table C.06
Brick and Tile and Binder Consumption in a Sample of Urban Areas, 1861-1913

Year	(1) Alessandria	(2) Bologna	(3) Brescia	(4) Carrara	(5) Ferrara	(6) Firenze	(7) Forlì	(8) Genova
	Ratio of current year's brick and tile consumption to previous year's							
1861								
1862	2.408							
1863	.993							
1864	.390							
1865	.536							
1866	.350	.597	.950					
1867	1.286	.973	.950		.749			
1868	1.333	1.229	.950		1.120	1.150	1.072	
1869	.861	1.108	.950		.874	1.261	1.072	
1870	1.484	.737	.950		.874	1.036	1.072	
1871	1.500	.973	.950		1.310	.526	.855	
1872	1.377	.973	1.183		.938	.860	1.017	
1873	.747	.973	.933		.937	1.241	1.533	
1874	.925	1.159	1.396		.827	.826	.717	
1875	.925	.788	.942		1.217	.840	.939	
1876	.925	1.003	.942		1.015	.783	1.081	
1877	.925	1.089	.942		1.015	.783	1.060	
1878	1.596	.973	.942		1.015	.783	1.099	
1879	1.265	1.251	.967		1.015	.783	1.013	
1880	1.265	1.070	1.155		1.015	1.195	1.000	
1881	1.265	1.272	1.129		1.327	1.193	1.038	.872
1882	1.265	.820	.751		1.393	1.066	1.207	1.124
1883	1.265	.861	1.434		.938	1.250	.879	.779
1884	1.265	1.429	.918		.938	1.293	1.172	.858
1885	1.265	1.134	1.010		.938	1.058	1.172	1.041
1886	2.313	1.359			.938	1.117	1.172	1.644
1887	1.009	.742		1.273	.938	.930		1.277
1888	1.009	.887		.513	.952	.923		1.080
1889	1.111	1.032		.513		.834		.834
1890		.990		1.128		.911		1.424
1891		.810		.893		1.207		1.092
1892				1.097		.660		
1893		1.337		.584		1.185		
1894		.864		.736		.878		.794
1895		1.278		.736				1.634
1896		.874						.997
1897		.922				.761		.775
1898		1.013				1.042		1.284
1899		1.042				1.055		1.284
1900		.810				1.072		1.096
1901						.833		.603
1902						.833		1.460
1903		.871				1.150		1.154
1904		.928				1.152		1.152
1905		1.328				1.074		1.238
1906		1.380				1.123		1.073
1907		1.217			.817	1.374		.859
1908		1.123			1.339	.984		1.036
1909		.852				1.024		
1910		1.407	1.100		1.190	1.051		
1911		.984	.882		.782			
1912		.912	1.024		1.255			
1913		1.246	.870		.842	.890		

Table C.06 (continued)

Year	(9) Grosseto	(10) Mantova	(11) Milano	(12) Novara	(13) Padova	(14) Pavia	(15) Piacenza	(16) Prato
	Ratio of current year's brick and tile consumption to previous year's							
1861								
1862							2.427	
1863							.613	
1864							1.170	
1865							1.170	
1866						1.014	1.500	
1867						1.014	.602	
1868				.634		1.014	.502	
1869				.864		1.014	.620	
1870				1.745	.975	1.014	.866	
1871				.955	1.665	1.014	.966	
1872	1.000			.812	.966	1.646	.518	
1873	.642			.855	.904			
1874	.966			1.763	1.535			
1875	1.329			.327	.781			
1876	.575			1.559	1.145			
1877	.607			4.415	.736			1.708
1878	1.369			.363	.909			.805
1879	.787			.894	1.363			1.242
1880	1.014			1.338	.751			1.805
1881	1.338			1.338	1.128			.095
1882	.621		.854	1.338	.973			1.143
1883	1.237		1.083	1.338	.880			6.625
1884	.904		.980	1.338	1.168			1.566
1885	.773		.874	.764	1.084			1.108
1886	5.000		.824	2.474	.873			1.120
1887	.478		1.130	.685	1.011			1.272
1888	.631		1.789	.865	2.101			.794
1889	2.558		1.165	1.290	.772			1.356
1890	.949		.697	.883	.675	.389		.319
1891	.786		.814	.654	.968	1.128		2.200
1892	.571	1.187	.738	.239	.756	1.128		1.030
1893	.857	.666	1.192	.338	1.210	1.128		.775
1894	.944	.920	1.057	4.636	1.152	1.128		1.278
1895	2.588	.993	.763	.902	.884	1.128		.713
1896	.602	.973	.848	1.663	1.011	1.099		1.528
1897	.821	.882	1.332	.706	.828	.721		1.409
1898	1.299	1.027		1.019	1.093	.990		.516
1899	1.593	1.198		1.691	1.004	1.088		.988
1900	.422	.758	1.099	.581	1.031	.925		.899
1901	2.276	1.118	.916	.806	.798	1.181		1.451
1902	.768	1.034	1.530	.713	1.235	1.181		.864
1903	.768	1.000	.933	2.548	1.236	1.181		1.303
1904		1.000	1.261	2.449		1.181		.888
1905		1.004	1.034	.809		1.181		1.175
1906		.996	.931	1.013	2.176	1.181		.777
1907		1.545	1.244	.987	.710	1.181		.926
1908		1.927	1.106	.546	1.427	1.181		1.632
1909		.919		.649	1.016	.938		1.035
1910		.730	.974	1.243	1.444	.781		.565
1911		2.315	.951	1.986	1.029	1.096		1.867
1912		.773	.811		.781	1.232		1.039
1913		1.044	.807		.815	.472		1.286

Table C.06 (continued)

Year	(17) Ravenna	(18) Roma	(19) Savona	(20) Torino	(21) Treviso	(22) Vicenza
	Ratio of current year's brick and tile consumption to previous year's					
1861						
1862			1.500			
1863			1.500			
1864			2.000			
1865			.722			
1866	.735		.269			
1867	.640		2.286			
1868	.896		1.688			
1869	1.186		1.259			
1870	.627		2.353			
1871	1.625		.600			
1872	1.212	1.162	1.083			
1873	.952	1.762	1.000			
1874	1.050	1.789	1.365			
1875	.889	.489	.606			
1876	1.268	.961	3.535			
1877	.803	1.058	.303			
1878	.702	1.034	.717			
1879		1.367	2.061			
1880		1.415	.750			
1881		1.129	2.333			
1882		1.164	1.126		1.245	
1883		1.263	1.045		1.016	
1884		1.113	1.086		1.516	
1885		1.352	.987		.617	
1886		1.220	.740		1.007	
1887		1.308	1.027		1.007	
1888		.684	.939		1.007	
1889		.636			1.007	
1890		.807			1.007	
1891		.618			1.007	
1892		.634			1.007	
1893		.865			1.007	
1894		.920			1.195	
1895		.715			1.195	
1896		1.128			1.195	
1897		1.102			1.195	
1898		.902			.897	
1899		1.928			.897	
1900		1.031		1.025	.897	
1901		1.261		.957	.897	
1902		1.082		.969	.897	
1903		.953		1.237	.897	
1904		1.112		1.283	.897	
1905		.977		.946	.897	
1906		1.240		1.069	1.994	
1907		.958		.889	1.581	
1908		.809		1.183	.857	
1909		1.400		1.171	1.434	.817
1910		.718			1.339	1.272
1911		1.073				1.062
1912		1.073				1.173
1913		.886				.875

Table C.06 (continued)

Year	(23) Bricks and Tiles: Average ratio	(24) Bricks and Tiles: Consumption index[a]	(25) Binders: Average ratio[b]	(26) Binders: Consumption index[a]
1861		33.0		25.8
1862	2.062	68.1	1.351	34.9
1863	.970	66.1	.801	27.9
1864	.970	64.1	1.269	35.4
1865	.768	49.2	1.115	39.5
1866	.669	32.9	.814	32.2
1867	.972	32.0	1.031	33.1
1868	1.004	32.1	.928	30.8
1869	.987	31.7	1.107	34.1
1870	1.069	33.9	.985	33.5
1871	1.018	34.5	1.023	34.3
1872	1.020	35.2	1.107	38.0
1873	1.001	35.2	1.040	39.5
1874	1.142	40.2	.976	38.6
1875	.790	31.8	.927	35.7
1876	1.105	35.1	.976	34.9
1877	.972	34.1	.935	32.6
1878	.897	30.6	.979	31.9
1879	1.126	34.5	1.016	32.4
1880	1.115	38.5	1.053	34.2
1881	1.021	39.3	1.051	35.9
1882	1.048	41.1	1.037	37.2
1883	1.211	49.8	1.108	41.3
1884	1.149	57.3	1.111	45.8
1885	.993	56.9	1.038	47.6
1886	1.336	76.0	1.169	55.6
1887	.973	73.9	1.022	56.8
1888	.946	69.9	.998	56.7
1889	1.004	70.2	.974	55.3
1890	.788	55.3	.856	47.3
1891	.958	53.0	.921	43.6
1892	.760	40.3	.876	38.2
1893	.873	35.2	1.016	38.8
1894	1.100	38.7	.976	37.8
1895	1.043	40.3	1.015	38.4
1896	1.046	42.2	1.008	38.7
1897	.928	39.2	.958	37.1
1898	.983	38.5	1.100	40.8
1899	1.215	46.8	1.070	43.6
1900	.868	40.6	.959	41.9
1901	1.028	41.7	1.026	42.9
1902	1.019	42.5	1.059	45.5
1903	1.118	47.5	1.072	48.8
1904	1.160	55.1	1.088	53.0
1905	1.050	57.9	1.008	53.5
1906	1.192	69.0	1.285	68.7
1907	1.067	73.6	1.052	72.3
1908	1.113	82.0	1.064	76.9
1909	.999	81.9	1.041	80.1
1910	1.022	83.7	1.054	84.4
1911	1.195	100.0	1.185	100.0
1912	.992	99.2	1.056	105.6
1913	.886	87.9	.907	95.8

Table C.06 (continued)

[a]1911 = 100

[b]of current year's binder consumption to previous year's, in sample urban areas.

Sources: cols. 1 - 22: calculated from Tables K.26 - K.51; see text.
col. 23: calculated from cols. 1 - 22; see text.
col. 24: calculated from col. 23; see text.
col. 25: calculated from Tables K.26 - K.51; see text.
col. 26: calculated from col. 25; see text.

Table C.07
Estimated Output of Terra Cotta, Ceramic, Glass, and Other Kiln Products, 1861-1913 (thousand tons)

Year	(1) Indices of consumption: Construction-related[a]	(2) Indices of consumption: Household formation[b]	(3) Indices of consumption: Aggregate index[c]	(4) Net imports: Terra cotta	(5) Net imports: Ceramic	(6) Net imports: Glass
1861	13.9	211	.735	-.2	1.2	2.1
1862	17.6	213	.807	-1.0	1.5	3.4
1863	16.9	214	.791	.1	2.0	4.6
1864	17.6	210	.807	.3	2.1	5.0
1865	16.9	241	.813	-.1	2.2	6.2
1866	14.0	149	.703	.9	.1	4.3
1867	13.8	180	.732	.0	.2	6.3
1868	12.8	195	.725	1.0	.0	7.6
1869	13.4	218	.759	4.6	1.3	9.1
1870	13.4	200	.743	.1	2.1	9.3
1871	14.9	204	.778	.7	2.4	8.9
1872	15.8	208	.795	-.4	2.5	11.7
1873	18.7	221	.861	.2	1.6	9.3
1874	20.5	213	.896	-2.5	1.3	8.4
1875	16.9	237	.848	-.5	1.8	13.1
1876	15.8	233	.830	1.7	1.8	12.4
1877	16.1	223	.827	1.2	1.2	9.1
1878	15.7	207	.809	.1	.9	8.6
1879	15.5	220	.815	.3	-.2	7.2
1880	16.6	204	.821	3.7	.5	6.1
1881	17.9	237	.872	3.3	.8	7.9
1882	20.4	230	.912	2.1	.8	6.5
1883	21.2	241	.930	4.2	1.2	8.2
1884	21.9	248	.949	3.4	1.3	10.1
1885	23.3	241	.974	3.6	1.5	11.4
1886	23.8	240	.983	5.1	1.6	13.5
1887	21.5	245	.942	6.0	2.2	16.6
1888	19.9	243	.905	1.7	1.1	8.8
1889	19.8	239	.908	2.2	.9	9.7
1890	21.4	228	.940	3.1	.8	7.7
1891	21.7	236	.960	2.3	1.0	7.3
1892	20.4	237	.941	.6	1.2	7.9
1893	21.1	236	.963	1.6	1.7	6.0
1894	20.7	237	.961	.4	.4	3.4
1895	19.0	236	.942	.0	.5	.8
1896	18.6	231	.937	-.2	-.1	-.5
1897	18.6	235	.943	-.3	.0	.0
1898	18.7	227	.942	-.6	.2	.6
1899	19.0	242	.959	-.6	.1	.0
1900	19.5	240	.969	-1.0	.0	.5
1901	21.1	241	1.000	-.8	-.1	-2.6
1902	23.6	246	1.050	.2	.3	.5
1903	25.8	243	1.090	-1.6	.4	.4
1904	27.7	256	1.139	-1.3	.6	.5
1905	30.0	263	1.185	-1.1	2.0	.7
1906	30.9	268	1.198	-.9	3.5	5.7
1907	32.8	270	1.233	-1.0	3.2	4.6
1908	35.3	293	1.293	.3	4.9	9.6
1909	41.6	275	1.385	1.4	5.0	8.0
1910	47.8	277	1.495	-.3	7.6	9.7
1911	50.4	269	1.540	-6.6	7.3	9.9
1912	51.2	275	1.562	-9.4	7.7	4.4
1913	50.2	272	1.542	-10.3	6.6	4.2

Table C.07 (continued)

Year	(7) Terra cotta	(8) Ceramic	(9) Glass	(10) Other products
		Estimated output		
1861	46.6	6.7	14.3	9
1862	52.2	7.5	15.2	11
1863	50.3	7.1	14.3	11
1864	51.3	7.5	15.0	12
1865	52.3	7.8	14.6	12
1866	44.4	8.8	14.3	12
1867	47.4	9.4	13.7	12
1868	46.1	9.9	12.9	12
1869	45.0	9.4	13.1	13
1870	48.6	8.7	13.2	13
1871	50.5	9.3	15.5	15
1872	53.0	9.8	14.1	16
1873	57.0	12.2	19.6	18
1874	62.3	13.6	22.7	20
1875	57.3	12.8	17.4	19
1876	54.1	12.9	18.5	19
1877	54.7	14.0	22.7	20
1878	54.8	14.4	23.6	21
1879	55.2	16.2	26.4	22
1880	52.5	16.1	28.9	24
1881	56.6	17.5	30.6	26
1882	60.8	19.0	35.1	28
1883	60.2	19.6	35.7	30
1884	62.6	20.7	36.2	32
1885	64.5	21.8	37.8	35
1886	63.9	22.7	37.9	37
1887	61.4	21.9	37.6	37
1888	61.4	22.9	38.5	38
1889	62.3	24.0	42.9	41
1890	64.0	25.8	48.6	45
1891	66.7	27.1	50.6	49
1892	67.6	27.2	49.3	50
1893	68.7	28.4	53.0	55
1894	70.2	30.6	55.9	57
1895	69.8	30.9	57.8	60
1896	70.1	32.4	59.2	64
1897	71.2	33.6	59.6	69
1898	71.9	34.5	59.3	74
1899	73.7	36.4	61.5	79
1900	75.5	38.1	62.1	85
1901	78.2	40.7	67.7	94
1902	81.7	43.8	73.4	106
1903	87.2	46.9	82.6	120
1904	91.4	50.4	93.3	136
1905	95.6	52.9	104.8	154
1906	97.1	53.8	109.6	172
1907	100.7	57.8	117.6	196
1908	105.1	61.2	122.4	223
1909	112.3	68.1	137.6	258
1910	123.9	74.0	152.2	298
1911	134.9	79.5	161.8	340
1912	140.5	83.3	175.0	372
1913	140.7	86.2	178.1	407

Table C.07 (continued)

[a]million 1911 lire.

[b]thousand marriages.

[c]1901 = 1.000.

Sources: see text.

Table C.08
Estimated Output of Other Non-Metallic Mineral Products, 1861-1913

Year	(1) Marble (thousand tons) Estimated block marble output	(2) Marble (thousand tons) Reported block marble exports	(3) Marble (thousand tons) Estimated output of cut or carved marble	(4) Estimated output of other non-met. mineral products (thousand tons)
1861	112	23	67	6,805
1862	100	19	61	7,789
1863	123	38	64	8,271
1864	113	21	69	8,278
1865	123	41	62	8,585
1866	128	49	59	7,086
1867	157	56	76	6,470
1868	168	69	74	6,485
1869	188	49	104	6,327
1870	175	54	91	6,794
1871	168	57	83	6,875
1872	172	52	90	7,529
1873	210	62	111	8,448
1874	203	71	99	8,615
1875	190	62	96	7,473
1876	170	47	92	7,277
1877	178	50	96	7,717
1878	165	45	90	7,852
1879	193	50	107	7,799
1880	247	70	133	8,368
1881	241	52	142	8,481
1882	248	66	137	9,680
1883	265	58	155	10,405
1884	266	60	155	10,886
1885	260	54	155	11,168
1886	241	51	143	11,584
1887	242	54	141	11,717
1888	244	53	143	11,808
1889	260	61	149	11,401
1890	278	68	158	11,009
1891	252	69	137	10,483
1892	270	78	144	9,677
1893	261	72	142	9,286
1894	248	72	132	9,106
1895	238	75	122	8,033
1896	234	80	116	7,771
1897	264	81	137	7,841
1898	274	86	141	7,781
1899	317	98	164	7,961
1900	316	91	169	8,286
1901	334	96	179	8,720
1902	363	112	188	9,578
1903	376	130	185	10,163
1904	392	131	196	10,587
1905	392	133	194	11,552
1906	436	148	216	12,548
1907	444	164	210	13,259
1908	430	154	200	14,184
1909	396	156	202	16,527
1910	427	169	220	18,868
1911	489	180	232	19,836
1912	514	199	236	20,354
1913	494	182	234	20,162

Table C.08 (continued)

Sources: col. 1: Table B.19, col. 1.
col. 2: *Movimento commerciale*.
col. 3: .75(col. 1 - col. 2).
col. 4: see text.

Summary Table C.1
The non-metallic mineral products industries: physical output, 1861-1913

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Kiln products				
	Plaster (thousand tons)	Lime (thousand tons)	Cement (thousand tons)	Bricks and tiles (thousand tons)	Terra cotta (thousand tons)	Ceramic (thousand tons)	Glass (thousand tons)	Other (thousand tons)
code:	ca01	ca02	ca03	ca04	ca05	ca06	ca07	ca08
source:	c04c05	c04c06	c04c07	c04c08	c07c07	c07c08	c07c09	c07c10
note:	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(b)
1861	86	403	9	1,691	46.6	6.7	14.3	9
1862	104	451	9	2,178	52.2	7.5	15.2	11
1863	100	494	9	2,090	50.3	7.1	14.3	11
1864	109	496	9	2,214	51.3	7.5	15.0	12
1865	108	602	9	2,128	52.3	7.8	14.6	12
1866	102	453	9	1,717	44.4	8.8	14.3	12
1867	108	445	9	1,699	47.4	9.4	13.7	12
1868	105	462	9	1,595	46.1	9.9	12.9	12
1869	113	459	9	1,736	45.0	9.4	13.1	13
1870	114	502	9	1,732	48.6	8.7	13.2	13
1871	127	517	9	2,009	50.5	9.3	15.5	15
1872	133	570	9	2,194	53.0	9.8	14.1	16
1873	152	639	9	2,724	57.0	12.2	19.6	18
1874	168	663	9	3,045	62.3	13.6	22.7	20
1875	154	613	9	2,426	57.3	12.8	17.4	19
1876	151	617	9	2,225	54.1	12.9	18.5	19
1877	157	663	9	2,294	54.7	14.0	22.7	20
1878	159	695	10	2,233	54.8	14.4	23.6	21
1879	161	724	12	2,232	55.2	16.2	26.4	22
1880	171	791	14	2,431	52.5	16.1	28.9	24
1881	186	815	17	2,707	56.6	17.5	30.6	26
1882	205	940	21	3,189	60.8	19.0	35.1	28
1883	212	1,021	25	3,368	60.2	19.6	35.7	30
1884	223	1,070	29	3,553	62.6	20.7	36.2	32
1885	241	1,109	35	3,831	64.5	21.8	37.8	35
1886	252	1,166	42	3,973	63.9	22.7	37.9	37
1887	237	1,200	50	3,548	61.4	21.9	37.6	37
1888	227	1,285	60	3,260	61.4	22.9	38.5	38
1889	238	1,263	72	3,276	62.3	24.0	42.9	41
1890	265	1,239	86	3,618	64.0	25.8	48.6	45
1891	276	1,235	94	3,796	66.7	27.1	50.6	49
1892	270	1,200	102	3,610	67.6	27.2	49.3	50
1893	278	1,165	111	3,871	68.7	28.4	53.0	55
1894	289	1,191	121	3,887	70.2	30.6	55.9	57
1895	285	1,052	131	3,604	69.8	30.9	57.8	60
1896	291	1,038	143	3,596	70.1	32.4	59.2	64
1897	284	1,073	156	3,652	71.2	33.6	59.6	69
1898	300	1,083	169	3,754	71.9	34.5	59.3	74
1899	311	1,125	184	3,929	73.7	36.4	61.5	79
1900	315	1,180	199	4,174	75.5	38.1	62.1	85
1901	342	1,251	219	4,666	78.2	40.7	67.7	94
1902	372	1,385	238	5,409	81.7	43.8	73.4	106
1903	396	1,397	329	6,077	87.2	46.9	82.6	120
1904	426	1,431	387	6,642	91.4	50.4	93.3	136
1905	458	1,547	435	7,320	95.6	52.9	104.8	154
1906	457	1,643	521	7,645	97.1	53.8	109.6	172
1907	480	1,682	624	8,189	100.7	57.8	117.6	196
1908	515	1,823	674	8,940	105.1	61.2	122.4	223
1909	578	2,046	814	10,841	112.3	68.1	137.6	258
1910	656	2,369	904	12,752	123.9	74.0	152.2	298
1911	704	2,485	1,048	13,609	134.9	79.5	161.8	340
1912	721	2,608	1,166	13,948	140.5	83.3	175.0	372
1913	722	2,639	1,253	13,775	140.7	86.2	178.1	407

Summary Table C.1 (continued)

	(9) Other products	(10)
	Cut/carved marble (thousand tons)	Other (thousand tons)
code:	cb01	cb02
source:	c08c03	c08c04
note:	(c)	(d)
1861	67	6,805
1862	61	7,789
1863	64	8,271
1864	69	8,278
1865	62	8,585
1866	59	7,086
1867	76	6,470
1868	74	6,485
1869	104	6,327
1870	91	6,794
1871	83	6,875
1872	90	7,529
1873	111	8,448
1874	99	8,615
1875	96	7,473
1876	92	7,277
1877	96	7,717
1878	90	7,852
1879	107	7,799
1880	133	8,368
1881	142	8,481
1882	137	9,680
1883	155	10,405
1884	155	10,886
1885	155	11,168
1886	143	11,584
1887	141	11,717
1888	143	11,808
1889	149	11,401
1890	158	11,009
1891	137	10,483
1892	144	9,677
1893	142	9,286
1894	132	9,106
1895	122	8,033
1896	116	7,771
1897	137	7,841
1898	141	7,781
1899	164	7,961
1900	169	8,286
1901	179	8,720
1902	188	9,578
1903	185	10,163
1904	196	10,587
1905	194	11,552
1906	216	12,548
1907	210	13,259
1908	200	14,184
1909	202	16,527
1910	220	18,868
1911	232	19,836
1912	236	20,354
1913	234	20,162

Summary Table C.1 (continued)

NOTES

(a) Production is estimated from a very few benchmarks provided by the Corpo delle miniere, interpolated and extrapolated on the basis of construction movements, allowing for international trade.

(b) Production is crudely estimated as the sum of a share of plaster output and a residual attributed a constant growth rate.

(c) Production is estimated by deducting block-marble exports from block-marble production.

(d) Production is estimated from that of the corresponding quarry products.

Summary Table C.2
The non-metallic mineral products industries: value added in 1911

1. By product

(1) Physical series: series code	(2) Physical series: product	(3) Value added per unit	(4) Total value added: million lire	(5) Total value added: series code
Kiln products				
ca01	plaster	3.200 lire/ton	2.253	ca01v
ca02	lime	7.440 lire/ton	18.488	ca02v
ca03	cement	15.480 lire/ton	16.223	ca03v
ca04	bricks and tiles	4.800 lire/ton	65.323	ca04v
ca05	terra cotta	70.000 lire/ton	9.443	ca05v
ca06	ceramic	250.000 lire/ton	19.875	ca06v
ca07	glass	180.000 lire/ton	29.124	ca07v
ca08	other products	61.200 lire/ton	20.808	ca08v
Other products				
cb01	cut/carved marble	44.800 lire/ton	10.394	cb01v
cb02	other products	3.170 lire/ton	62.880	cb02v

2. By industry

(1) Code	(2) Industry	(3) Value added (million lire)	(4) Component series
cav	kiln products	181.537	ca01v--ca08v
cbv	other products	73.274	cb01v--cb02v

3. By industry group

(1) Code	(2) Industry	(3) Value added (million lire)	(4) Component series
cv	non-metallic min. products	254.811	cav--cbv

Note to Panel 1: the disaggregated value added series identified in col. 5 are the physical series identified in col. 1, weighted by by the unit value added estimates in col. 3. The latter are variously obtained from evidence on output prices and per-unit raw material costs, or on (total or per-unit) labor and capital costs.

Note to Panels 2 and 3: the aggregate value added series identified in col. 1 are simple sums of the component series identified in col. 4.

Summary Table C.3
The non-metallic mineral products industries: value added at 1911 prices, 1861-1913
(million lire)

code:	(1) Kiln products cav	(2) Other products cbv	(3) Non-metallic min. products cv
1861	19.591	24.573	44.165
1862	23.220	27.424	50.644
1863	22.710	29.086	51.796
1864	23.706	29.332	53.038
1865	24.152	29.992	54.144
1866	20.694	25.106	45.800
1867	20.819	23.915	44.734
1868	20.327	23.873	44.200
1869	20.902	24.716	45.618
1870	21.301	25.614	46.915
1871	23.603	25.512	49.116
1872	25.014	27.899	52.913
1873	30.125	31.753	61.878
1874	33.297	31.745	65.041
1875	28.343	27.990	56.334
1876	27.398	27.190	54.587
1877	29.225	28.764	57.988
1878	29.522	28.923	58.445
1879	30.814	29.516	60.330
1880	32.689	32.485	65.174
1881	35.352	33.246	68.598
1882	40.319	36.823	77.143
1883	42.204	39.928	82.132
1884	44.209	41.453	85.662
1885	46.864	42.347	89.210
1886	48.436	43.128	91.564
1887	46.296	43.460	89.756
1888	46.142	43.838	89.980
1889	47.590	42.816	90.406
1890	51.196	41.977	93.173
1891	53.298	39.369	92.667
1892	52.165	37.127	89.292
1893	54.671	35.798	90.470
1894	56.431	34.780	91.211
1895	54.753	30.930	85.683
1896	55.708	29.831	85.539
1897	57.171	30.994	88.165
1898	58.514	30.983	89.496
1899	61.237	32.584	93.820
1900	64.093	33.838	97.931
1901	69.777	35.662	105.438
1902	77.510	38.785	116.295
1903	85.964	40.505	126.469
1904	93.997	42.342	136.339
1905	103.051	45.311	148.362
1906	108.949	49.454	158.403
1907	117.679	51.439	169.118
1908	126.893	53.923	180.817
1909	147.153	61.440	208.593
1910	167.735	69.688	237.402
1911	181.537	73.274	254.811
1912	191.637	75.095	266.732
1913	195.826	74.397	270.223