
Effective Protection and Industrial Growth: The Case of Italian Engineering, 1898-1913

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According to Gerschenkron « at least in principle, Italy's industrialization could have been aided by a rationally conceived and executed tariff ».¹ Anyone who reads the debate on the reform of the customs duties that took place in the Chamber of Deputies between the 21st. and the 24th. of June 1887,² however, would only be surprised if the outcome had been reasonably coherent and rational. The near unanimity by which the bill was passed³ does not, in fact, reflect general agreement on a strategy for industrial development. It reflects rather a tendency to seek out compromises among divergent interests and pressure groups within the Chamber. It is not only a question of the *pactum sceleris* between industrialists and large land owners under which Italy irrationally exposed « the tender plant of its industrial growth to the rigors of a protectionist climate in agriculture »⁴ but, and of much greater importance, the lack of rationality in the tariff rates applied to different industrial products. The 1887 tariff gave greater protection to those industrial sectors which were already developed and which possessed considerable bargaining power, while shortsightedly ignoring the demands of those sectors which were to become the most

* I am grateful to Ira Glazier, Aldo Montesano and John Smith for their helpful comments. Responsibility for errors and omissions is obviously my own.

¹ A. GERSCHENKRON, *Economic Backwardness in Historical Perspective*, Belknap-Harvard, Cambridge (Mass.), 1961, p. 81.

² ATTI DEL PARLAMENTO ITALIANO, Camera dei Deputati, Sessione 1886-87, *Discussione*, Vol. VI, Roma 1888, pp. 3867-4039.

³ The result of the secret ballot was: present 236, for 199, against 37.

⁴ A. GERSCHENKRON, *loc. cit.*

dynamic in the Italian economic system. Both the cotton and the iron and steel industries were particularly favoured while the engineering and chemical industries were neglected.⁵

In particular, the duty on iron and steel resulted in the Italian engineering industry being placed at a disadvantage with respect to its foreign competitors: the price paid for the « irrationality » of the tariff being an effective growth rate continually below the potential one (as measured by growth in demand). It is this particular aspect of the problem that will be examined in this paper. In the following sections, after a short summary of the existing literature (section I), an attempt is made to calculate the degree of effective protection in some relevant sectors of the engineering industry (section II). This is followed by an upper bound estimate of the benefit that would, theoretically, have resulted from the application of the best possible alternative tariff policy (sections III-IV). A number of general considerations including those related to the cost of the alternative policies (section V), together with a summary of the main findings (section VI), conclude the paper.

I

While the tariff bill was being debated in the Chamber of Deputies, a number of its members (such as Colombo) pointed out that it was inadvisable to protect a « raw material » (sic!) like steel, and Pelloux even succeeded in having a motion passed that invited the Government « to verify whether the necessary harmony existed between the duties for railway engines, tenders, boilers, machinery and rolling stock and those on the raw materials used in the manufacture of similar products ».⁶ The problem of the engineering industry, therefore, had not passed unnoticed by the shrewder members of the Parliament but their views apparently did not carry sufficient weight in the Assembly or with the Government.

Among the numerous critics of the tariff, Pareto was one of the first to point out that the duty on steel was extremely damaging to the engineering industry.⁷ Even though this particular aspect of the problem was occasionally emphasized, the free traders were however mainly concerned with its effect on monopolies in the steel industries and stressed — in the

⁵ Amongst evidence that two yardsticks were in use at the time is the claim, made by Luzzatti while presenting the bill that was to grant-as we shall see — considerable protection to the iron and steel industry: « we don't want to create chemical industries, which would be the favoured children of the customs, but those industries which can stand on their own feet » (ATTI PARLAMENTARI, *cit.*, p. 3896).

⁶ ATTI PARLAMENTARI, *cit.*, p. 3967.

⁷ V. PARETO, *Le industrie meccaniche e la protezione*, « Il Giornale degli Economisti », 2nd. series, II (1891), pp. 308-12.

framework of what they believed to be Italy's comparative advantage — the effects of the tariff on consumers, agriculture, and the South.

On the other side, among those who saw the tariff from an « infant industry » point of view, Rodolfo Morandi (writing in 1931) had a clear understanding of the problem when he wrote: « Adequate protection was totally lacking for our engineering industry. The duty on certain categories of machinery and tools was often lower than the duty on the raw materials necessary for their construction ».⁸

Gerschenkron, as we have seen, raised the problem of the irrational treatment of the engineering industry under the 1887 tariff in a more precise effective protection context, while this point has become one of the cardinal elements of Fenoaltea's re-appraisal of « liberal » Italy's economic policy. He suggests that « Italy could have expanded much more rapidly if, instead of a reduction in comparative advantage of the engineering industry, there had been intervention aimed at increasing it and deliberately lowering its supply curve. The failure to intervene in such a way represents (...) the most important « missed opportunity » of increasing the long term rate of industrial growth, not only at a level above the historical one, but also above the level that would have been possible by following a *laissez-faire* policy ».⁹

Fenoaltea's « missed opportunity » refers particularly to the decade 1887-1896, when a high level of engineering exports would have reduced the seriousness of the crisis and thus permitted industry to start the « big spurt » of the « Giolittian age » in much more favourable conditions. The present paper does not deal with that decade, and, therefore, does not attempt to test this hypothesis.

There are two reasons for not venturing into an analysis of the decade preceding the fall of Crispi. The first, as Fenoaltea has pointed out, is that the substitution of Depretis by Crispi resulted in a political and « ideological » climate less favourable to industrial interests. In particular, the economic policy of the period tended to divert national resources towards unproductive uses, industrial investment — both domestic and foreign — was not particularly encouraged and the international scene was dominated by widespread depression. Only after the definitive fall of Crispi and after the major world economies recovered from the slump was it possible for the political and « ideological » climate to become decidedly favourable to industrial growth. Under Giolitti, in fact, « entrepreneurs were offered for the first time the possibility of playing an innovative and, at the same time, dominant

⁸ R. MORANDI, *La storia della grande industria Italiana*, Einaudi, Torino 1966, p. 201 (First edition by Laterza, Bari 1931).

⁹ S. FENOALTEA, *Riflessioni sull'esperienza industriale italiana dal Risorgimento alla prima guerra mondiale*, in G. TONIOLO ed., « Lo sviluppo economico italiano 1861-1940 », Laterza, Bari 1973, pp. 142-43.

role ».¹⁰ Only in such a context does it seem appropriate to try and measure the effect of a permanent incongruity in the tariff structure. In a different and more hostile climate not even a more rational tariff structure would have been of much help to Italian industry. The second reason for limiting the analysis to the Giolittian period lies in the difficulty of estimating price elasticities for engineering exports during the late 1880s and early 1890s characterized as they were by a drop in aggregate demand in nearly all countries and by a tendency for tariffs to rise everywhere in Europe. Particularly it seems uneasy to make assumptions as to how other European powers would have reacted, in a period of high depression and unemployment, to an attempt by Italy to acquire a larger share of their markets through an aggressive export policy for her engineering products.

II

Before discussing the degree of effective protection enjoyed by the Italian engineering industry between 1898 and 1913, a few words on terminology used may be useful. Let f_e be the effective protection granted to the engineering industry and assuming that the latter's only importable input comes from the iron and steel industry and that this has a perfectly elastic supply curve, we have:¹¹

$$f_e = \frac{t_e - a_{s,e} t_s}{V_e}$$

where: t_e and t_s are *ad valorem* tariff rates on imports that are perfect substitutes for products of the Italian engineering and steel industries

¹⁰ G. BAGLIONI, *L'ideologia della borghesia industriale nell'Italia liberale*, Einaudi, Torino 1974, p. 161.

¹¹ Given that $1 = V_e + a_{s,e}$, imposing a duty t_e on engineering imports we obtain $1 + t_e = V_e + a_{s,e}$; the duty will change the coefficient of value added by primary resources of the engineering industry from V_e to V_e . Imposing a duty t_s on imports of iron and steel (which are inputs for the engineering industry) as well, we obtain:

$$V'_e = 1 + t_e - a_{s,e}(1 + t_s) = 1 - a_{s,e} + t_e - a_{s,e} t_s = V_e + t_e - a_{s,e} t_s$$

Given that, generally, $f_e = \frac{V'_e - V_e}{V_e}$, we immediately obtain:

$$f_e = \frac{t_e - a_{s,e} t_s}{V_e}$$

Among the many formulations of the problem existing in the large body of literature on effective protection, I have followed G. BASEVI, *The U.S. Tariff Structure, Estimates and Effective Rates of protection of U.S. Industries and Industrial Labour*, « Review of Economics and Statistics » 48 (1966), pp. 147-160.

point of view of maximizing the growth rate of Italian manufacturing between 1898 and 1913. The first alternative was politically unacceptable and although it offered the engineering industry the same advantages as the third, it would have involved a considerable reduction in value added by the iron and steel industries. The second alternative would have resulted in an increase in the price of engineering products and was therefore, aside from welfare considerations, less likely to maximize output, neglecting for the moment the cost of its implementation. The third alternative policy, therefore, provides the framework for the *upper bound* estimate of the production that Italian engineering theoretically could have achieved.

For the sake of simplicity, let us suppose that in 1898 the Italian Government had decided: a) to abolish the duty on imported iron and steel, b) to replace the duty with a subsidy of an equal amount to be paid to the iron and steel industry for every ton produced, c) to leave unchanged the import duties on engineering products.

In making an upper-bound estimate of the increase in value added by the engineering industry resulting from the introduction of the alternative policy — the subsidy and the elimination of the duty on imports — we can exclude, *a priori* an increase in exports. An Act of 1903 allowed imports of iron and steel duty free for engineering plant which exported their product. This put Italian engineering on an equal footing with foreign competitors. Even before 1903, however, favourable conditions existed for temporary imports of various metal materials (for the construction of boilers machines and rolling stock) although there is no evidence that manufacturers took advantage of these opportunities to increase sales abroad.¹⁶ Nor is there any evidence of a negative correlation between the iron and steel content of engineering products ($a_{s,e}$) and the volume of exports in the period 1898-1913. Italian products, especially producers' goods, could not compete in foreign markets on *qualitative* grounds. At least until 1907-08, the Italian engineering industry relied only on domestic demand.¹⁷

¹⁶ In 1898 the value of temporary imports of «various metal materials (for the construction of boilers, machines and rolling stock)» was 990,515 lire, while the value of re-exports of these products was only 534,249 lire. It is clear that either the imports were made in the hope of making sales abroad and that these hopes were not realized, or, worse, they were only a convenient expedient — involving corruption or criminal complicity — used by certain national manufactures to avoid paying part of the customs duties (cf. MINISTERO DELLE FINANZE; *op. cit.* (1898), p. 935).

¹⁷ Supporting evidence for this view is to be found in the data relating to engineering exports; in 1897 their value was about 25% that of engineering imports whereas in 1907 it was only about 9% (18% in 1913). In fact, the rapid industrial growth of the decade between 1898 and 1907 created a very large demand for investment goods which domestic supply was insufficiently elastic to satisfy (for a more detailed view of this problem see G. TONIOLO, *Patterns of Industrial Growth and Italy's industrialization from 1894 to 1913*, in G. FRANCO ed., «Rendiconti», Vol. I, CEDAM, Padova 1969, pp. 257-283).

Under these conditions, to estimate the maximum benefit, in terms of growth rate coming from the alternative policy, we assume first that such a policy resulted in a complete import substitution and second that a reduction in the price of engineering products led to a corresponding increase both in domestic demand and supply. From a "static" point of view this is the upper limit of the potential benefit of the alternative policy. The limit will be reached if: a) the supply schedule of the engineering industry is infinitely elastic, b) its products are perfect substitutes for foreign ones and c) there is perfect competition i.e. cost reductions are immediately followed by price reductions. These conditions, however, particularly a) and b) as Morandi remarks¹⁸ are very different from those prevailing in the engineering industry in the period under consideration.

The increase in engineering production due to the implementation of the alternative tariff policy could, in addition, induce technical progress, learning by doing and economies of scale that could increase the sector's output beyond the "static" upper-bound limit as defined above.

We are concerned first of all with advanced technology incorporated in new capital goods. Since technology was more advanced abroad than in Italy, we may assume that the total elimination of foreign products from the Italian market (as a consequence of the import-substitution) would have caused *ceteris paribus*, a reduction in the gross product — not only in engineering but in all industries which used its products as inputs. As advanced technology in imported capital goods is one of the critical factors leading to a faster growth rate in the "latecomers",¹⁹ we may assume that the effects of the alternative policy would reduce the upper-bound limit. It is thus safe to neglect the effect of the alternative tariff policy on incorporated technical progress. Dealing with "learning by doing" process, if one accepts Arrow's definition whereby "learning by doing" depends on cumulative gross investment, we may apply the same reasoning that we have used for technical progress.²⁰ Econometric estimates of economies of scale have produced to date widely divergent results and are in any case, based on data which are not available for the period under consideration. Denison has estimated that from 1950 to 1962 economies of scale in Italy, resulting from changes in market size, led to a long-term growth in income at a rate of 0.55% per year (i.e. about 10% of the total average annual growth rate of G.N.P.).²¹ Denison's estimates, although not beyond criticism and highly aggregative, are the best available. Economies of scale are generally con-

¹⁸ R. MORANDI, *op. cit.*, pp. 199-204.

¹⁹ A. GERSCHENKRON, *op. cit.*, p. 9.

²⁰ K. ARROW, *The Economic Implications of Learning by Doing*, « Review of Economic Studies » 29 (1962).

²¹ E. DENISON, *Why Growth Rates Differ*, Brookings Inst., Washington D.C., 1967, p. 246.

respectively, $a_{s,e}$ is the value of the iron and steel inputs for one lira of product of the engineering industry and V_e is the generalized value added (i.e. including inputs not traded internationally) for one lira of product of the engineering industry.

In estimating the effective protection accorded to the engineering industry between 1898 and 1913 we consider only those sectors with a sizeable input of iron and steel ($a_{s,e}$ considerably > 0) (sectors 1-3 in tab. 2 p. 668). Shipbuilding is omitted, not only because of the very substantial subsidies that the sector actually received from the State (sometimes in the form of political prices for government contracts), but because of the special treatment that it was accorded in the tariff law.¹² Finally motor vehicles and airplanes are excluded from the present analysis since a significant volume of production was achieved only towards the end of the period under consideration. Our calculations are, thus, limited to the three sectors shown in Table 1. In 1911 these sectors made up more than 50% of the total value added of the Italian engineering industry. The values of t_e and t_s are obtained by dividing the duty paid on imported goods by their c.i.f. values: these rates are therefore weighted averages taking into account the fact that imports from countries with which Italy had commercial treaties paid a lower duty.¹³ The results can be seen in Table 1, from which we may argue: a) that the effective protection enjoyed by the Italian engineering indus-

TABLE 1
DEGREE OF EFFECTIVE PROTECTION TO THE ENGINEERING INDUSTRY
(percent ad valorem rates)

Sector	1898		1911	
	nominal	effective	nominal	effective
1) Tools, instruments for arts and crafts, cutlery	17.8	3.1	14.0	1.2
2) Boilers, machines and machine parts (including locomotives)	9.1	1.1	7.4	0.7
3) Rolling stock	14.6	1.0	13.9	1.5

Sources: import, export and duty data from: MINISTERO DELLE FINANZE, *Movimento Commerciale*, Rome 1899 and 1912.

Methods: see text.

¹² Section 20 of the Law 14/1/1887 no. 4703 (3rd Series) made it obligatory for the government to establish by royal decree « the payments to be made, as a result of the customs duty in question, for the construction of boilers, machines and hulls for ships built in national shipyards ».

¹³ The data relating to total value of imported goods, the duty paid on them and their weight are to be found in MINISTERO DELLE FINANZE, *Movimento Commerciale*, Roma 1899 and 1912. The duties, which were paid in gold, have been converted into paper lire.

try was anything but large and, in any case, considerably lower than the nominal rate, b) that it was nonetheless not negative, c) that it decreased during the « Giolitti age », partly because of new trade agreements and partly as a result of the increase in the value of the lira with respect to gold (customs duties being collected in gold).

III

In the following section, tariff protection in the iron and steel industry is considered from the point of view of its effects on the growth rate of the engineering industry.

No consideration is given to more general aspects of the problem, such as those which prompted Gino Luzzatto to write in 1919: « the question of protection for the iron and steel industry » is « central to our economic policy and, in a certain sense, to all Italian politics ».¹⁴

The cost of protection is defined as the difference between the growth rate that Italian manufacturing industry could have achieved if the best alternative trade policy had been adopted and its actual growth rate between 1898 and 1913.¹⁵

My assumption being that such a cost was not, in fact, particularly high I shall estimate the *highest possible* growth rate that the Italian manufacturing industry could theoretically have achieved if the best tariff policy had been applied to the iron and steel industries.

There were three possible alternative tariff policies which could have been followed to help the engineering industry: 1) reduction or elimination of the import duty on iron and steel without providing national producers with any form of compensation, 2) an increase in the duty on engineering products so as to provide producers with adequate effective protection, 3) a subsidy to the iron and steel industry for every ton of its product, equal to the import duty, together with the elimination of the duty on iron and steel imports.

The third alternative would appear to be the most efficient from the

¹⁴ G. LUZZATTO, *Protezione doganale e arrembaggio finanziario*, « L'Unità » 7, August 1919.

¹⁵ It is worth emphasizing that the use of the so called « counterfactual analysis » does not imply that the alternatives were in fact practicable in the historical context of the period. This is nothing more than a *technical device* designed to *measure* the effects of a particular policy or economic factor (in this case the customs duties on iron and steel). Those who claim that protectionism either handicapped or favoured Italian industry are really making a comparison with a model of industrial development *without* any form of protection. These models are sometimes implicit and therefore neither clearly defined nor verifiable. Within the limited scope of this paper an attempt has been made to render explicit an *alternative tariff policy* that is both measurable and verifiable: so that the effects of the policy of protecting iron and steel can be estimated.

centrated in the non-agricultural sector although by no means in manufacturing alone. They are, therefore, likely to be higher in the second half of the twentieth century than at the end of the nineteenth. Thus, it would seem reasonable to assume 20% of the additional output as the upper-bound limit of the possible contribution to growth provided by economies of scale resulting from the application of the alternative policy.²² We also take into account — in an input-output framework — an increase in demand for engineering goods generated by the increase in engineering production itself.

The benefit of the alternative tariff, however, would also involve a cost which can be estimated as follows:

$$C_T = T + D_s + D_e - R$$

where: C_T is the opportunity cost of the subsidy to the Italian government, T is the total effective monetary expenditure on the subsidy, D_s is the net income from the duties on iron and steel imports (which the government has to relinquish), D_e is the net income from duties on engineering imports (which are substituted by national products), R is the increase in fiscal revenue resulting from the increase in engineering production.

IV

The cost of the protection provided to the iron and steel industries between 1898 and 1913 has been calculated using the method outlined above (section III) and the values of the separate component variables estimated as follows.

1. *Value added by the engineering industry.*

The two available estimates of value added by the Italian engineering industry — those of Fuà²³ and Fenoaltea²⁴ — show substantially different results as the latter yields much higher values for the last years of the period under review. In order to determine which series to use, we have subdivided

²² Denison, for example, feels justified in stating that most economists consider 20% as the maximum contribution of economies of scale to the growth of any one sector of the American economy (*ibidem*, p. 227). In fact, the few opponents of this view (Diwan, Stigler) have been heavily criticized on econometric grounds. It must be added that recent econometric work on the Italian economy shows that the scale factor is rather unimportant (and anyway much lower) for the periods preceding 1950 (cf. R. FILOSA, G. M. REY, B. SITZIA, *Note per uno schema quantitativo dell'economia italiana negli anni 1922-1938*, « Quaderni Storici » 29:30, 1975, pp. 438-467).

²³ G. FUA' ed., *Lo sviluppo economico in Italia*, Angeli, Milano 1969, p. 411.

²⁴ Fenoaltea's estimate are yet unpublished and contained in his: *Public Policy and Italian Industrial Development 1861-1913*, Harvard University Doctoral Dissertation, 1967, which I could consult by courtesy of the Author.

the engineering industry into seven sectors, following the 1911 industrial census (Table 2).²⁵ For each of these sectors the labour force has been broken down into four separate classes. The average annual wage has been estimated for each class in order to compute the total wage bill for 1911.²⁶ We have assumed using supplementary industrial census data, and particularly of the Industrial Census of 1937, that wages amount to about half of value added. This gives a figure of 680 million lire as the value added in 1911; as this figure is very close to Fua's estimate of 648.4 million, his series has been used for our calculations.²⁷

TABLE 2

ENGINEERING WAGES AND VALUE ADDED IN 1911
(million of lire)

Sector	Wages	Value added	%
1. Tools, equipment for works, etc.	18.0	36.0	5.3
2. Boilers, machines, etc.	155.5	311.0	45.7
3. Rolling stock			
4. Precision instruments	45.7	91.4	13.4
5. Vehicles, automobiles	23.0	46.0	6.8
6. Shipbuilding	39.0	78.0	11.5
7. Various	58.8	117.6	17.3
Total for engineering industry	340.0	680.0	100.0

Sources: see text.

2. *Import substitution.*

For reasons already explained (p. 664) the last four sectors in table 2 have been excluded from our analysis (note that a_{11} is very low for « Precision instruments » while the sector « Various » consists almost entirely of products whose principal inputs are not iron and steel). To calculate value added obtained by the substitution of imports belonging to the first three sectors of the engineering industry, I have adopted the ratio of total value to value added formed in the U.S. Industrial Census of 1899.²⁸

²⁵ MINISTERO DELL'AGRICOLTURA, INDUSTRIA E COMMERCIO, *Censimento degli opifici e delle imprese industriali al 10 giugno 1911*, Roma 1913.

²⁶ The average annual wages used in this estimate are as follows: White collars workers and artisans: 1,950 lire; Male blue collar workers: 1,350 lire; Female blue collar workers: 810 lire; Workers less than 15 years old: 660 lire.

²⁷ Unfortunately I had to deflate the value added by the engineering industry, given by Fuà in 1938 prices, with the same author's price index for manufacturing industry as a whole (G. FUA, *op. cit.*, pp. 403-4).

²⁸ Such ratios are: "Tools, etc." 0.435, "Machinery etc." 0.489, "Rolling stock" 0.449.

3. *The increase in the home market.*

Price elasticities of the three relevant sectors of the engineering industry were estimated on the basis of the performance of imports using the following simple model:

$$\log M_i = a_i - b_i \log P_i + c_i \log \Delta K + d_i \log Y$$

where: M_i is the quantity imported of the product i , P_i is its price, ΔK is the total national investment in machinery and vehicles and Y is the national income.

The results of the regressions are shown in table 3. It is noteworthy that none of the price coefficients (b_i) is statistically significant even at a 10% confidence level. Moreover, the « Boilers, machines etc. » sector has a « perverse » price elasticity. This is consistent with the assumption that the demand for investment goods is not particularly sensitive to price changes. In order to get an upper-bound estimate of the effects of the best alternative tariff policy, however, the increase in domestic demand due to the price decrease derived from such policy has been taken into account (using price elasticities b_i) for sectors 1 and 3.

TABLE 3
DEMAND ELASTICITIES OF ENGINEERING PRODUCTS

Sector	Coefficients			R ²
	b _i	c _i	d _i	
1. Tools, equipment for works, etc.	-0.703 (0.625) [-1.125]	0.471 (0.126) [3.734]	1.890 (0.531) [3.561]	0.985
2. Boilers, machines, etc.	1.857 (1.303) [1.425]	0.824 (0.278) [2.961]	-0.831 (1.118) [-0.742]	0.932
3. Rolling stock	-3.659 (2.181) [-1.677]	2.451 (1.834) [1.336]	-6.398 (8.232) [-0.777]	0.552

() standard error of regression coefficient.
[] computed t value.

4. *Economies of scale and input-output relations.*

Rough estimates have been made of the incidence of these factors adopting parameters which are much higher than those resulting from other econometric estimates made in conditions that permitted a fair degree of accuracy. On the assumption that the values obtained from a more developed economy would overestimate the degree of integration present in the less developed Italian engineering industry, Whitney's input-output coefficients for

the U.S.²⁹ economy of 1898 have been used to calculate the increased production of the engineering industry resulting from the demand generated by the expansion of the engineering industry itself. Finally, all the computed increases in value added have been further increased by 20% (a deliberately exaggerated extent) so as to take account of economies of scale.

5. *The opportunity cost of the alternative policy.*

My assumption being that the opportunity cost of the alternative tariff policy would have been extremely high, a *lower bound* estimate has been provided. The total value of the subsidy to be paid to the iron and steel manufactures has been obtained assuming a subsidy of 10 lire per ton for cast iron and of 62 lire per ton for steel. The loss of revenue to the government (the foregone customs duties on iron and steel and imports) is equal to the customs duties actually paid.

The extra revenue derived from increased production must be subtracted from the above amounts. It has been assumed, that 50% of value added in the engineering industry consisted of wages and the other 50% of return on capital. The corresponding tax rates were 9% and 15% respectively of taxable income.³⁰ Since we want a lower-bound estimate of the opportunity cost, I have assumed that a) all income was taxable, b) there was no tax evasion, c) no firms paid the reduced artisans' rate of 10% instead of the normal 15%. Finally, an increase in revenue from indirect taxation has been assumed, taking it to be proportional to the increase in G.N.P. that would have been obtained under these conditions.³¹

V

These results permit an examination of the effects on the Italian economy of the largest possible increase in engineering production that could be obtained by means of a more rational tariff policy. Table 4 compares the actual growth rates of value added by engineering with the upper-bound estimates of the growth rates obtainable with the alternative tariff policy. The difference between these two growth rates shows the highest possible

²⁹ W. G. WHITNEY, *The structure of the American Economy in the Late Nineteenth Century*, Harvard University Doctoral Dissertation, 1968, which I could consult by courtesy of the author.

³⁰ Law 22/7/1894 no. 339.

³¹ The data were taken from MINISTERO DEL TESORO, *I bilanci dello Stato italiano dal 1862 al 1967*, Roma 1969, vol. III, *Le entrate*, p. 161. The data for 1908 are the arithmetic mean of those for the financial years 1907-8 and 1908-9. Further evidence that the estimate of the financial cost of the alternative policy is a lower bound one is provided by the value of direct taxation revenue obtained if we take it to be proportional to the increase in G.N.P.: it is only 23% of the value adopted here.

TABLE 4
AVERAGE ANNUAL GROWTH RATES OF VALUE ADDED
BY ENGINEERING, 1898-1913

Period	actual growth	maximum growth obtainable with the alternative tariff policy *
	(current prices)	
1898-1907	14.3	21.0
1908-1913	7.1	2.8
1898-1913	11.6	14.0

* Assuming that the best alternative policy outlined above (pp. 664-65) came into force on Jan. 1, 1898 and immediately produced all its effects. Methods of calculation are described in Section IV.

cost to the engineering industry of the protection given iron and steel products.

It is meaningless to ask whether the difference of 6.7 percentage points between the two rates in the period 1898-1907 is very « large » or whether one of 2.4 percentage points over the whole period is « small ».

A more rational tariff policy would have allowed the Italian engineering industry to achieve a higher level of production a little earlier than it actually did: until 1906 the "average gap" between actual value added and the upper-bound estimate of the value added that could have been achieved in the presence of the best alternative policy is less than three years. Even allowing for overestimation implicit in the figures presented here, Italian engineering would have benefited to some extent from a more favourable tariff policy. Such a policy, however, would not have significantly altered the course of Italy's growth. Between 1906 and 1908 value added by Italian manufacturing as a whole with the alternative tariff policy would have been on the average 7.3% higher than actually achieved, while between 1911 and 1913 it would have been 4.6% higher than the actual value added by manufacturing. This implies a G.D.P. respectively 1.4% and 0.9% larger than the actual in the two periods. As we are dealing with an upper-bound estimate, this can hardly be seen as an impressive result. We have also to take into account the cost to public finance of the best alternative tariff policy. The lower-bound estimate of this cost is 76.3 million lire for 1908.³² This figure

³² Using the criteria indicated, the following values for 1908 are obtained:

Subsidy		52,081,000 lire
Customs duties (in paper lire)		53,502,000 lire
— iron and steel	32,481,000	
— engineering	21,021,000	
		105,583,000 lire
New tax revenues		29,282,000 lire
— direct taxes	21,520,000	
— indirect taxes	7,762,000	
		76,301,000 lire

corresponds to 3.6% of the government income in the same year and is one and a half times the budget surplus for the financial year ending 30 June 1908. This last point is of importance if one considers that the policy of surplus budgets pursued after 1900 made financial resources for industry both more abundant and cheaper. Foreign capital, attracted by a "sound" budget policy was also favourable to industrial growth. A return to deficit spending, even on a small scale, for the purpose of creating a more rational tariff structure by subsidizing the iron and steel industry, could have had a negative effect on the ability of Italian industry to raise capital and reduce its rate of growth.

VI

Our results can be summarized as follows: 1) the tariff laws in force between 1898 and 1913 provided the value added by Italian engineering industry with next to no effective protection; the opinion of those who pointed out that the tariff did not protect one of the most important and promising sectors in Italian industry is therefore correct; 2) compared with the level of net output actually achieved between 1906 and 1908, the best alternative tariff policy would have resulted in a maximum theoretically possible increase in engineering production of 50.0%, in total manufacturing and GDP of about 7.3% and 1.4% respectively; 3) the cost of putting the best alternative policy into practice would have resulted in budget deficits in nearly every year between 1898 and 1913.

The study of the tariff structure in economic development shows the inability of single - factor analysis to explain the evolution of a productive sector, let alone of an economic system. It has, however, confirmed the view that the high duty on iron and steel was a handicap to the growth of the engineering industry. The maximum theoretically possible value of this handicap, does not however support the claim that there would have been a radical change in the long-term growth rate of Italian manufacturing, let alone of Italian GDP, had a different tariff policy been introduced after the fall of Crispi. There is on the other hand no evidence to suggest that a *laissez-faire* policy would have been any more beneficial to Italian industry as a whole during the Giolitti age.

A poorly designed tariff was by no means the only handicap which the engineering industry suffered. The technical and organizational backwardness of the sector — which still needs to be examined in detail — were probably a greater obstacle to the expansion of production than the irrationality of the tariff structure. The Italian automobile industry, which

was technically up to date, had no difficulty in finding export markets. While the problem of the effect of protection on iron and steel over a longer period remains unresolved, our analysis suggests that other factors — plant size, technical progress and access to the capital market — must be given equal weight with the tariff, to explain the performance of Italian engineering during the years that preceded the First World War.

