Tax Britannica: Nineteenth Century Tariffs and British National Income*

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Abstract

The literature on British economic history presumes that Britain was a free trader after the repeal of the Corn Laws. Thus her tariff levels were below those which were optimal for maximizing utility. Presumably, if the optimal British tariff was positive and greater than the levels established by mid-century, a reduction to zero of all tariffs that remained would have lowered British welfare even further. In this paper, we use a simple computable general equilibrium model to simulate a drop in all British tariffs to zero. The resulting substantial net increase in British welfare suggests that British tariffs were much higher than would be consistent with an optimum tariff policy. More important, the size of British losses from her high tariff levels suggest that British policy was not consistent with the stance of an ideological free trader.

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1 Introduction

Traditional accounts of commercial history have treated nineteenth-century Britain as the lone European free-trader in the decades following the repeal of the Corn Laws. Such a transformation was important on both political and ideological grounds. It supposedly encouraged reform in the institutions of international trade and in support of free markets. However, British moves toward trade liberalization seem to have been especially anomalous because Britain might have stood to lose from a move to lower tariffs. As the leader in world trade, Britain may have had substantial market power and if so, would have gained more in the short run by maintaining a positive optimal tariff. Work by both McCloskey (1980) and Irwin (1988) supports this traditional view of a magnanimous Britain suffering static losses and spurning the advantages of an optimal tariff in order to promote worldwide free trade.

But there are serious difficulties with the calculations on which these claims have been based. For one thing, more recent research points to Britain having had substantially higher tariffs than had hitherto been suspected, tariffs which were not fully eradicated in the quarter century after Peel's reforms had begun in the 1840s (Nye, 1991). For the most part these took the form of extremely high tariffs on wine and brandy, coffee, tea, sugar, and tobacco. The persistence of these tariffs, especially on wine and brandy, is remarkable because these duties indicate a Britain unwilling to lower tariffs on her prime imports. Furthermore, the duties on wine and brandy go back to the beginnings of English mercantilism and struggles with France as far back as the late seventeenth century. They were designed to be both protective and in some cases prohibitive. This leads us to two essential flaws in the existing empirical work on British tariff reform.

First, Britain may have lowered her tariffs but was not a free trader after the 1840s. Moreover, previous attempts to model the drop in British tariffs have not dealt with the problem of British market power and treated Britain as a small country whose decisions had no effect on world trade. This is self-evidently not the ideal method of studying how a country that loomed large in international commerce might have benefited from a positive economic tariff and its subsequent reduction.

In this paper we simulate a drop in all British tariffs to zero and demonstrate that British tariffs even after the Corn Law repeal were not only far too high to be consistent with the stance of a committed free trader, but even too high to be consistent with an optimum tariff policy. This one example of nineteenth-century Britain - perhaps the most famous free trader in history - has become so embedded in our received wisdom that whole literatures in history and political economy have been constructed which presumes British ideological purity. But new research (Nye, 2001) suggests that the politics of trade reform were much more consistent with the cynical view of self-professed reform typical of work in the public choice and the evolution of institutions. We speculate on the importance of this work for further analysis of political economy. The size of these losses is large enough, especially when compared to comparable figures for France, that we are forced to reconsider the impact of these results on the political economy of trade and the history of trade reform. Indeed such an analysis forces a reinvestigation of the problems of strategic theories of hegemonic trade and raise difficulties about the subtlety required to understand the course of all political economic reforms.

2 Measuring a large country's level of protectionism

Traditional tariff indices have usually focused on one of three measures: (1) the nominal level of tariffs per class of goods, (2) weighted measures of average tariffs defined as total revenues divided by total value of imports (and various modifications to this basic idea) or (3) measures of effective protection on an item by item basis where nominal tariff levels are corrected for tariffs on inputs used in production of these goods. All three suffer from a variety of theoretical and empirical problems. The first measure ignores the relative importance of a good in total trade, the second has serious problems with respect to trade weights, given the problem that a nearly prohibitive tariff might add little to the revenues received, and the third is not only problematic when used to create an overall index but also suffers from the fact that effective protection measures ignore the costs of tariff restrictions to the consumer. The most widely cited recent attempt to create a more universal tariff measure is the *Trade Restrictiveness Index* (TRI) first promoted by Anderson and Neary (1994).

By basing the TRI on the uniform tariff which would have the same

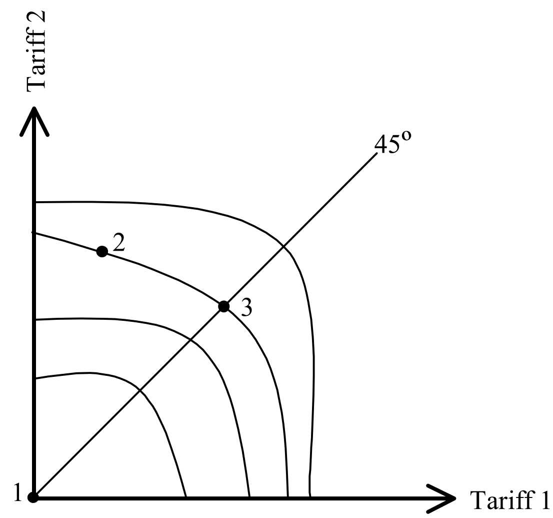


Figure 1: TRI Existence and uniqueness for a small country

static welfare effect as the actual system of tariffs and quotas, Anderson and Neary were able to provide a theoretically satisfying alternative to the ad-hoc specification of indexing weights. The underlying idea is shown in Figure 1, which contains the country's (or the representative consumer's) welfare level curves with respect to tariffs on two goods. Since the country is assumed to be small, the optimal tariff would be no tariffs at all, represented by point 1 in the graph. Let the historic tariff structure be represented by point 2; then point 3 represents the uniform tariff that generates the same welfare loss as the historic tariff.

While the uniform tariff equivalent (UTE)[1] is still a weighted average tariff, Anderson and Neary show that the tariffs are now weighted with their marginal welfare effects rather than with trade shares. In order to derive those marginal welfare weights, the economy must be explicitly modeled in a general equilibrium framework. In practice, a computable general equilibrium (CGE) model must be specified and calibrated using the available his-

[1]The TRI is equal to the inverse of 1 plus the UTE.

toric data as well as many assumptions on preferences and technology. Thus the index number problem is replaced by –or rather *transformed* into– a debate over the correct specification of the CGE model, in particular over the elasticities of substitution both in preferences and in technology. O'Rourke (1997) makes this point forcefully in his TRI-based contribution to the debate on whether nineteenth century France, rather than Britain, was the freer trader.

O'Rourke's model, however, implicitly assumes that Britain is a small country, an assumption we wish to relax here.[2] Unfortunately, relaxing this assumption forces us to abandon the TRI-based measure of protection. The reason is that under the large-country assumption, we can generally expect the UTE to either be ambiguous or not to be defined at all. The intuition is shown in Figure 2. Since the country is large, the optimal tariff vector, represented by point 1, is inside the positive orthant and the welfare level curves are concentric around the optimum. We can now visualize three cases: (1) the actual tariff is given by point 2, whose welfare curve does not intersect the 45 degree line, hence the UTE is not defined; (2) the actual tariff is given by point 3, whose welfare curve intersects the 45 degree line twice at points 4 and 5, thus the UTE is not uniquely defined, hence ambiguous; and (3) the actual tariff is given by point 6 with UTE at point 7. The last case, however, appears to be non-generic.

This cracks open the lid of a Pandora's Box. Whereas in the small country case, we were able to identify and gauge protection through the degree of self-inflicted welfare loss, we must now not only look for a new measure, but also need to rethink and clarify what we mean by protection. One possibility would to look at the effects of a country's tariffs on worldwide welfare, begging the question of worldwide welfare aggregation. Instead we shall simply look at the various national welfare effects of a progressive counterfactual tariff reduction down to zero.

Whereas the TRI-based measure must be abandoned, the CGE framework should not, of course, since it continues to be the appropriate tool to perform comparative statics exercises in trade.

[2] O'Rourke's work also took no notice of the fact that the measures he uses for French tariff levels from Nye, 1991 were purposely biased upward to demonstrate the relative openness of French trade. A more realistic set of figures would show results even more favorable to France vis-à-vis Britain than O'Rourke found.

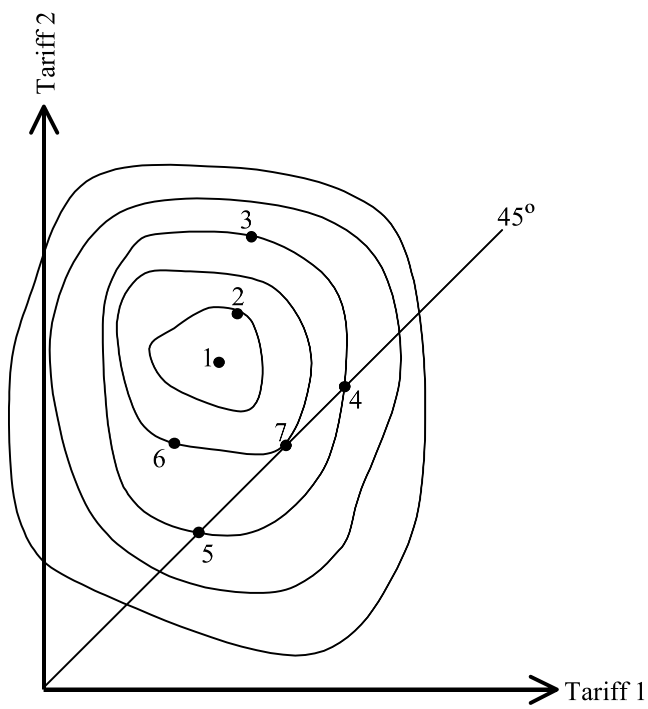


Figure 2: Nonexistence or non-uniqueness of a uniform tariff equivalent

3 The Model

Nineteenth Century Britain is better described by a specific factors model (Jones, 1971 and Samuelson, 1971) than by the one-factor model Ricardo (1817) used to criticize the Corn Laws. Thus, besides labor, which is fully mobile, there is also capital (or skill), which is specific to each sector of production: a brewery cannot be transformed into a steel mill. As a consequence, falling tariffs can increase capital incomes in some sectors at the expense of others.

The world economy consists of three regions, Britain, France, and the rest of the world. We identify sectors of activity by indices $s, t \in \mathcal{S}$, with $\mathcal{S} = \{1, 2, \ldots, S\}$ representing the set of all industries. Regions are identified by indices $i, j \in \mathcal{W}$, with $\mathcal{W} = \{\text{Br,Fr,RW}\}$. To keep track of trade flows, we follow the usual practice that identifies the first two indices with, respectively, the region and the industry supplying the good and the next two with the client region and industry.[3]

3.1 Consumption

Each region i has a representative consumer who values a large variety of imports as well as a generic, non-traded, domestic product. This specification, also used by Anderson and Neary for their TRI computations, conforms to the available records, which are rich on import and export data, but scarce on non-traded commodities.

A two-level nested CES utility function allows us to specify different elasticities of substitution *within* bundles of goods as well as *among* bundles. The maleability of nested CES offers an attractive compromise between realism on one hand and computational expedience on the other. The first utility level combines bundles of consumption goods c_{jsi} into aggregates c_{ki}, while assuming constant expenditure shares δ_{jsi}. Wine and brandy, for instance, which can be considered close substitutes, belong to the same bundle generically called alcohol. Formally, we shall partition the set $\mathcal{S}$ into bundles or "nests" $\mathcal{S}_k$, $k \in \mathcal{K} = \{1, 2, \ldots, K\}$, $K \leq S$. The second utility level determines the optimal composition of the consumption aggregates c_{ki}, such as

[3]Mercenier's sophisticated GAMS code for a general equilibrium model of trade and production provided a perfect starting point for our own programming. See Mercenier and Yeldan (1999), for example, for a description of their (dynamic) model.

alcohol and fabrics. The constant expenditure shares are ρ_{ki}. Formally, the consumer's preferences are thus:

$$C_i = \left(\sum_{k \in \mathcal{K}} \rho_{ki} c_{ki}^{\frac{\sigma_i - 1}{\sigma_i}} \right)^{\frac{\sigma_i}{\sigma_i - 1}},$$

where

$$c_{ki} = \left(\sum_{s \in \mathcal{S}_k} \sum_{j \in \mathcal{W}} \delta_{jsi} c_{jsi}^{\frac{\sigma_k - 1}{\sigma_k}} \right)^{\frac{\sigma_k}{\sigma_k - 1}}.$$

The consumer maximizes C_i with respect to c_{jsi} and subject to

$$p_{ci} C_i \geq \sum_{j \in \mathcal{W}} \sum_{s \in \mathcal{S}} (1 + \tau_{jsi}) p_{jsi} c_{jsi},$$

where τ_{jsi} are tariff rates, p_{jsi} are prices, and σ_i and σ_k are elasticities of substitution.

3.2 Production

The representative firm of region i, sector s, owns fixed, sector specific capital $\bar{K}_{is}$, while labor is assumed to be fully mobile. Hence there are decreasing returns to labor. Material inputs, all imported, along with capital and labor enter a nested CES production function along the same principle as in the consumer's utility function. Output supply and input demands result from maximizing profit

$$\Pi_{is} = p_{is} Q_{is} - \sum_{j \in \mathcal{W}} \sum_{t \in \mathcal{S}} (1 + \tau_{jti}) p_{jti} x_{jtis} - w_i L_{is}$$

subject to

$$\Pi_{is} \geq 0,$$

and

$$Q_{is} = \left(\alpha_{Kis} \bar{K}_{is}^{\frac{\sigma_{is} - 1}{\sigma_{is}}} + \alpha_{Lis} L_{is}^{\frac{\sigma_{is} - 1}{\sigma_{is}}} + \sum_{k \in \mathcal{K}} \alpha_{kis} x_{kis}^{\frac{\sigma_{is} - 1}{\sigma_{is}}} \right)^{\frac{\sigma_{is}}{\sigma_{is} - 1}},$$

where

$$x_{kis} = \left(\sum_{t \in \mathcal{S}_k} \sum_{j \in \mathcal{W}} \beta_{jtis} x_{jtis}^{\frac{\sigma_k - 1}{\sigma_k}} \right)^{\frac{\sigma_k}{\sigma_k - 1}}.$$

4 Data and calibration

Overall the model should be sufficiently complex to shield itself from the Fogel critique (1967) and leave room for the data to matter. Tables showing French and English import figures and tariff rates for the most important commodities traded in the years 1841 and 1854 are relegated to the appendix. The main sources for our data are McCloskey –who provides British and French import volumes and tariffs– and the Tableau Décennal du Commerce, which contains a detailed list of imports and exports between France and Britain, including French tariffs on imports. Import and export figures with the Rest of the World are computed as residuals. However, to balance trade among the three regions, we must introduce an artificial commodity produced in France and/or Britain and exported to the Rest of the World. Finally, we assume that each region produces a generic non-exportable good for domestic consumption. For lack of better data, a region's expenditures on this generic domestic good is assumed to equal GDP plus intermediate imports (including tariff revenues) minus exports.

Production uses three types of input: fixed capital, labor and imported intermediate inputs. Output consists of the non-traded good and of exported goods. None of the exportables are consumed at home. Consumers are endowed with labor (a non-traded input) and receive all profits and tariff revenue. They consume imported final goods and their non-traded good.

Empirically, input substitution elasticities tend to be below 1 and final substitution elasticities tend to be above 1. Following Anderson (1995), our base case calibration specified elasticities of substitutions of 0.7 among inputs bundles and 2.0 among bundles of consumption goods. Within the bundles, we chose 3.0 among textiles, 5.0 between tea and coffee, 5.0 among various alcohols, and 8.0 between foreign and colonial sugar. We also assume that the rest of the world produces the same goods as Britain and France and in the same amounts. Clearly, these parameters are not estimates, but rather assumptions that strike us as reasonable. Of course, this type of ad-hoc calibration requires some sensitivity analysis over a wide domain of parameter values.

A final caveat: despite the quantitative – or rather numerical – nature of our simulations, we feel that only their qualitative implications deserve attention and interpretation. The shape of curves and their positions relative to other curves are more important than their absolute magnitudes.

5 Results

5.1 The big picture

Over a wide range of alternative calibrations, calculations that simulate a drop in all British tariffs to zero show a substantial net increase in British welfare suggesting that British tariff levels were substantially higher than would be consistent with an optimum tariff policy.[4] Under our base case assumptions on elasticities of substitution for preferences and technology and on the size of Britain and France relative to the rest of the world, we found that the static welfare loss for Britain was over 9% in 1841, while tariffs were roughly 30 times larger than the optimal tariff. 1854 shows a considerable improvement in the static welfare losses to below 2% of national income. Nevertheless, actual tariffs are still significantly higher than the optimal tariffs. Another interesting observation is that forgone potential gains of an optimal tariff policy relative to unfettered free trade (McCloskey's concern) are dwarfed by the sizable losses of an overly protectionist policy.

French tariffs led to much smaller French static welfare losses, which, in 1841, were between 0.8 and 1.6% of income. Optimal tariffs in 1841 were between a tenth and a fifth the size of their actual historic levels. We also note that the French results were robust to quite severe respecifications of the tariff equivalents on cotton and woolen textiles given the relatively small share of French trade that was taxed. Around 1854, French tariffs lead to even smaller welfare losses, indeed tariffs may have been very close to optimal. Figure 3 summarizes those findings by plotting welfare (the utility of the representative consumer) against percentage of the original tariff vector. The graph is best read from right to left: we start with 100%, the historic tariff vector, and then observe changes in welfare as we scale the tariff vector down to 0%.

[4]It is important to point out that in our simulations, we restrict our attention to tariff vectors that are collinear to the historic tariff vector. Therefore our computed "optimal tariffs" are not global, but rather constrained to the segment connecting zero tariffs to the historic tariffs. As a consequence, we are likely to *underestimate* the welfare losses associated with protection.

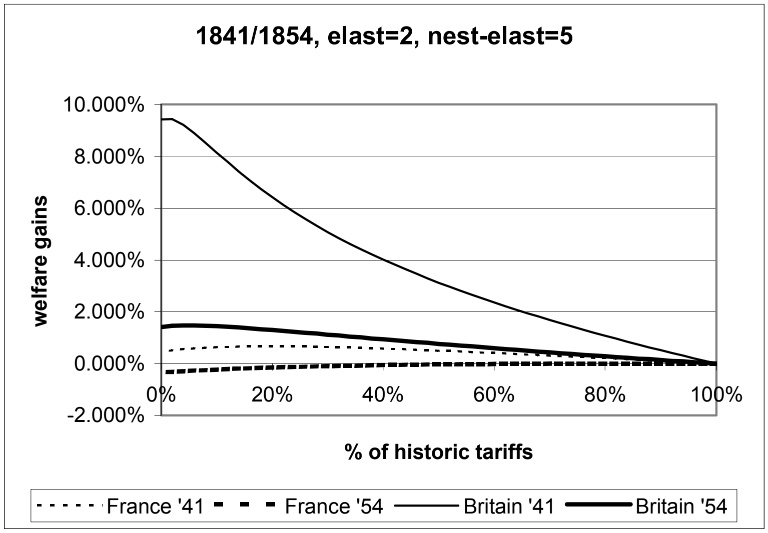


Figure 3:

5.2 Sensitivity analysis

As expected, the simulation results are sensitive to calibration, in particular to the specified elasticities of substitution.

First, we recognize that Britain was mainly an importer of consumption goods, while France's imports were dominated by inputs. Since we typically assume an elasticity of substitution of 0.7 among inputs and 2.0 among most consumption goods, this asymmetry clearly lowers Britain's optimal tariff relative to France. To see how much of the result rests on this asymmetry, we performed simulations with identical calibrations of both the supply and the demand side. Specifically, we assumed that *both* elasticities of substitution were equal to 2.0.

As can be seen in Figure 4, increasing the elasticity of substitution among inputs to 2.0 greatly diminishes Britain's gains from a counterfactual move to free trade, even if those potential gains are still higher than France's. Under this higher elasticity of substitution, Britain's tariff vector was only about 7 times higher than the optimal tariff vector, as opposed to 50 times for the lower elasticity of 0.7. For comparison, the increase in the elasticity of

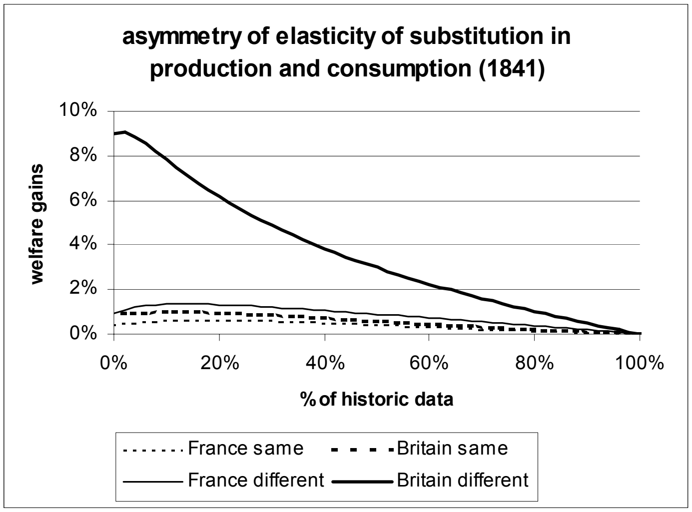


Figure 4:

substitution among inputs only has a small effect on France. France's tariffs went from roughly 6 times the optimal tariff under the original calibration, to 9 times for an elasticity of 2.0.

Second, we peform a sensitivity analysis on the elasticity of substitution among (bundles of) consumption goods. The next two graphs (Figures 5 and 6) show the static welfare effects for 1841 and 1854 Britain of elasticities ranging from 0 to 3.0.

The graphs are very similar between the two years, the main difference being the relative magnitude of welfare losses. As seen earlier, for an elasticity of substitution of 2.0 among consumption bundles, Britain's high tariffs cost her close to 10% of her static income in 1841, but only 1.5% in 1854. Increasing the elasticity of substitution from 2.0 to 3.0 dramatically increases the welfare cost of protection to over 20% of income in 1841 and to close to 4% in 1854. Decreasing the elasticity also lowers the welfare losses, but the critical result here is that in either year the elasticity must be very close to zero (certainly below 0.5) before it can be claimed that Britain's tariffs were anywhere close to welfare maximizing. Thus, even under very extreme assumptions on elasticities of substitution in consumption, Britain's tariffs

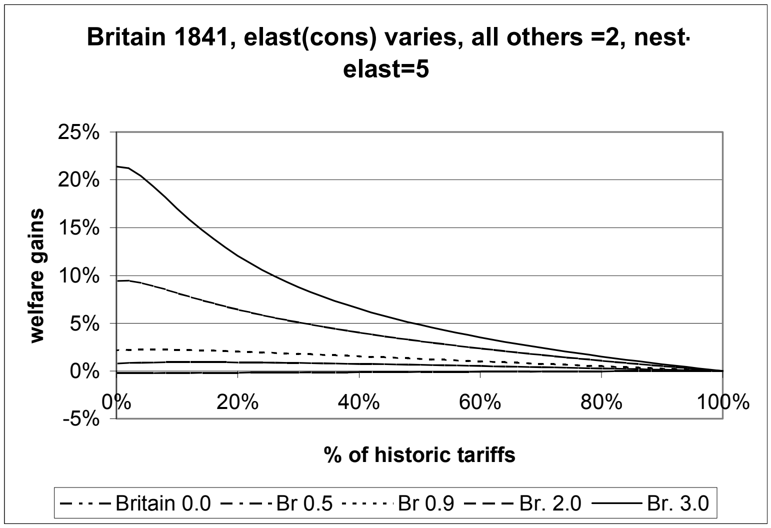


Figure 5:

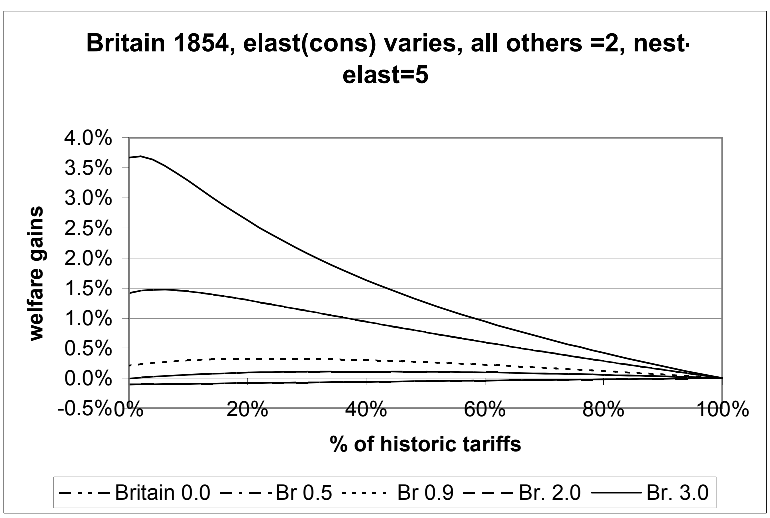


Figure 6:

were larger than those suggested by an optimal tariff policy.

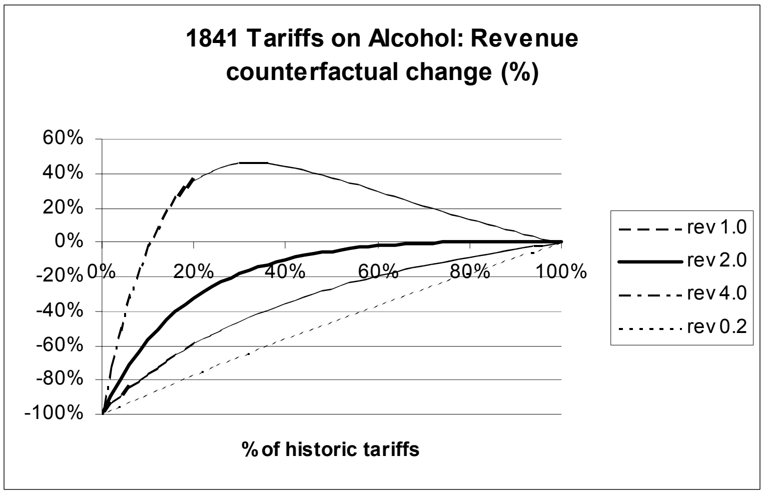
5.3 The revenue story

Irwin argued that Britain's high tariffs on select goods such as wines, rum, and brandy were levied not for protection but for revenue alone. As such, he claimed, unless given a very small weight, their inclusion into a measure of protection, such as a tariff index, would be misleading. His rationale was that those goods had no close domestic substitutes, in particular that even high wine prices would only have a negligible effect on beer consumption.

However, 1841 tariffs of about 115% on wines and over 200% on rum and brandy could conceivably have been too high and prohibitive to even maximize tariff revenues. Our simulations suggest, though, that for a range of plausible elasticities of substitution those high tariffs were indeed on the reasonable side of the Laffer curve. In particular, for an elasticity of substitution of 2.0 between alcohol imports and the domestic good (which would include beer), the vector of tariffs on alcohol was precisely revenue maximizing: in Figures 7 and 8, the thick tariff revenue curve is flat and reaches a maximum at 100% of historic tariffs on alcohols. Only for elasticities of substitution above 2.0 would the historic tariffs have been excessive.

We should add, however, that these revenue maximization calculations are somewhat misleading for wine and spirits because these goods were uniquely taxed by volume rather than ad valorem. Thus, our calculations ignore the prohibitive effect of British tariffs on the cheapest class of wines which did not enter into British consumption at all after the eighteenth century. In contrast, the finest products of Burgundy and Bordeaux naturally received much later tariffs on an ad valorem basis for a fixed tariff.

Figures 9 and 10 show the welfare effects of the same simulations. At an elasticity of substitution of 2.0, for which the tariffs are close revenue-maximizing, the welfare losses also amount to a non-negligible 1 to 1.5% of national income. While we thus agree with Irwin that tariffs –except for those on table wine– can be construed as revenue maximizing, the associated utility loss suggests that the tariffs cannot be exempted from a protective role.



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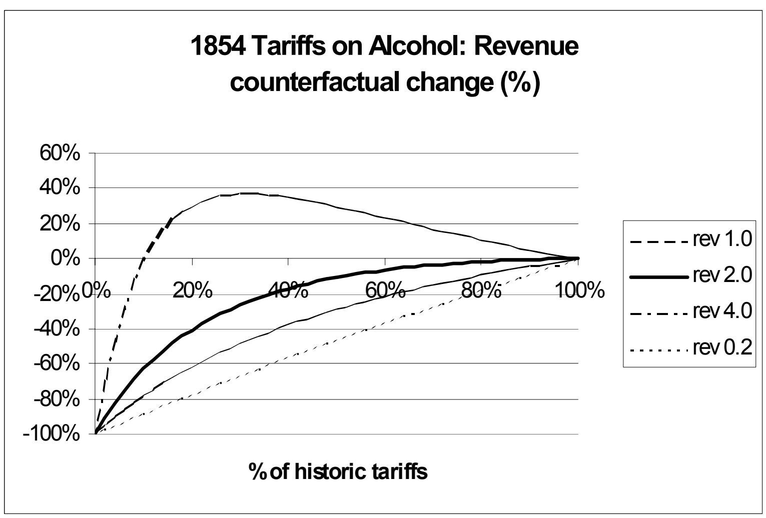

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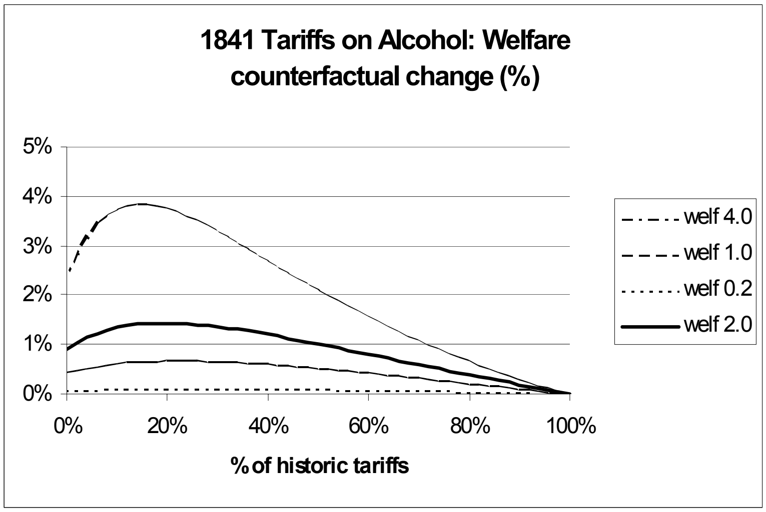

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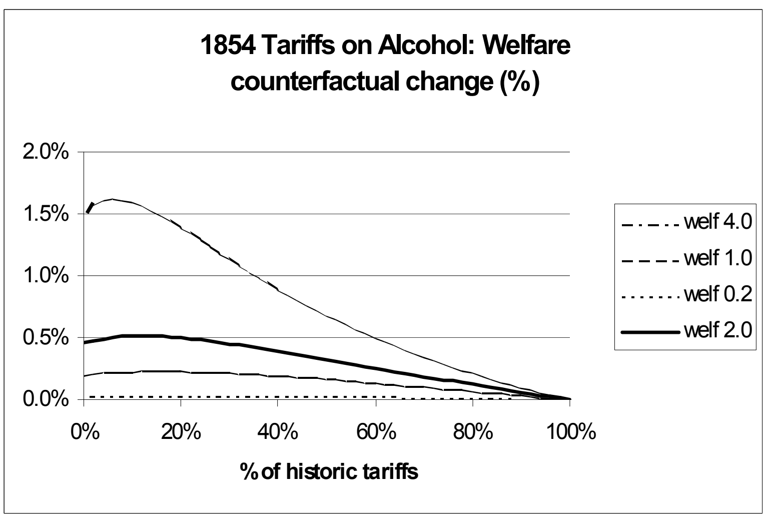

Figure 10:

6 Conclusion

In this paper, we evaluate the claims of both McCloskey and Irwin in the context of a simple computable general equilibrium model rather than the simple partial equilibrium context of the previous essays. We find that British tariff levels even a decade or more after the abolition of the Corn Laws were still high in absolute terms (and indeed were high relative to those of important rivals like France). Moreover, calculations that simulate a drop in all British tariffs to zero show a substantial net increase in British welfare suggesting that British tariff levels were substantially higher than would be consistent with an optimum tariff policy. In particular, and more important, the size of British losses from her high tariff levels suggest that British policy was not consistent with the stance of an ideological free trader and confirms other work on average tariff levels that called into question the accuracy of stylized notions of Britain as the preeminent free trader of the nineteenth century. Finally, our results are consistent with a trade policy aimed squarely at revenue maximization.

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7 APPENDIX

All figures are in millions of francs:

7.1 1841

French Imp.	Britain	RoW	Tariff
WOOLTXT	0.465	0.285	50.0%
COTTTXT	19.47		50.0%
COFFEE		26.3	100.8%
SUGAR		10	156.4%
COLSUGR		83.9	71.9%
FATS		5.2	
RAWSILK	7.79	52.21	
WOOL	2	44.04	22.1%
RAWCOTT	1.62	106.7	12.1%
COAL	6.44	20.4	16.5%
HIDES	1.697	25.62	2.2%
FLAX	27.9		
OLEAG	2.79	34.77	3.3%
WOOD		39.2	
COPPIRN	14.9	0.91	
LIVSTCK		10.6	21.8%
BR. OTHER	7.74		76.9%
RW OTHER		397.3	13.5%

British Imp.	France	RoW	Tariff
WOOLTXT	6.95		0.0%
COTTTXT	2.7	270.5	0.0%
COFFEE		45.32	96%
SUGAR		318.5	67%
CEREALS	7.91	204.86	6.5%
WINES	11.59	69.15	113.9%
RUMBRDY	19.283	69.39	206.6%
JEWLRY	0.56		0.0%
FURGDS	4.58		0.0%
EGGS	4.89		0.0%
SILKFBC	28.64		0.0%
TOBACCO		94.8	843.3%
TEA		186.25	114.1%
WOOD		115.7	14%
OTHER	34.35	842.17	15.2%

7.2 1854

French Imp.	Britain	RoW	Tariff
COFFEE		23.3	78.5%
WOOLTXT	0.14	0.56	50.0%
COTTTXT	0.0018	0.7982	50.0%
SUGAR		16.6	107.2%
COLSUGR		48.7	62.2%
FATS		6.2	0.0%
RAWSILK	44.45	77.85	0.0%
WOOL	16.78	35.72	17.9%
RAWCOTT	0.66	99.14	14.3%
WOOD		57.2	0.0%
COAL	8.85	56.65	10.2%
HIDES	1.98	36.12	1.6%
LIVSTCK		21.1	3.8%
FLAX	1.61	21.09	0.0%
OLEAG	1.85	15.95	14.6%
OTHER	56.56	427.14	8.0%

British Imp.	France	RoW	Tariff
COFFEE		22.175	52.8%
SUGAR	16.6	213.75	52.5%
RUMBRDY	8.94	24.26	201.8%
CEREALS	0.64	546.86	1.9%
COTTTXT	9.92	437.58	0.0%
WINES	8.88	47.37	84.9%
SILK	103.3		0.0%
WOOLTXT	33.45		0.0%
FURGDS	14.69		0.0%
TEA		100	119.5%
TOBACCO		24.95	479.0%
OTHER	82.3	1531	8.1%