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ABSTRACT

This paper provides a quantitative general equilibrium evaluation of the repeal of Britain's Corn Laws in 1846, the signature trade policy event of the nineteenth century. In studying the impact of abolishing the import duty on wheat, our framework highlights (a) the large open economy impact on the country's terms of trade and (b) the distribution impact on the factor earnings and the expenditure patterns of two different income groups. Based on a detailed input-output matrix of the British economy in 1841, our model suggests that the repeal left Britain's overall welfare roughly unchanged as the static efficiency gains are offset by the adverse terms-of-trade effects. Laborers and capital owners gained a slight amount at the expense of landowners (whose income fell about 3-5 percent). Combining these changes in factor payments with the different consumption patterns across income groups, we find that the top 10 percent of income earners lose while the bottom 90 percent of income earners, who spent a disproportionate amount of their income on food, gain.

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1. Introduction

Trade policy affects both the efficiency of a country's resource allocation and the distribution of its national income. The distributional effects operate through changes in earnings (factor income) and, it is increasingly recognized, through the different composition of spending across income groups (Fajgelbaum and Khandelwal 2016). Recent research has used household surveys to study the effects of trade policy on both the income and expenditure channels that ultimately determine the welfare of different groups (Porto 2006, Nicita 2009, Nicita, Olarreaga, and Porto 2014, Artuc, Porto, and Rijker 2019).

This paper examines a unique case in which we can evaluate the efficiency, earnings, and expenditure impact of a major change in trade policy: the repeal of the Corn Laws by the British parliament in 1846. This hugely controversial decision, perhaps the signature trade policy event of the nineteenth century, eliminated duties on imported grain despite strong opposition from Britain's landowning aristocracy.[1] This episode is a particularly rich one to study: Britain was a large economy that could affect its external terms of trade; the distribution of factor ownership was very unequal, with the highly concentrated ownership of land and capital; and the pattern of consumer expenditures was vastly different between high and low income households, with the latter spending a much larger share of their income on food.

[1] The Corn Laws originated in the mid-seventeenth century as a complex schedule of duties on imported grains designed to protect domestic farmers from low prices. The Corn Laws became an explosive political issue at the conclusion of the Napoleonic Wars in 1815, when restrictions on imports were significantly tightened. The repeal owes its passage to the lobbying pressure of Richard Cobden's Anti-Corn Law League and the leadership of Robert Peel, the Conservative prime minister, who split his party and sacrificed his political career by endorsing the move. This unilateral policy reform opened Britain's market to the world's grain and helped ushered in a policy of free trade that lasted until World War I. Because of its fascinating economic, political, and social dimensions, the repeal of the Corn Laws has always attracted widespread interest among scholars across many disciplines. The historical literature on the Corn Laws is enormous, but see Schonhardt-Bailey (2006) on the political economy of the repeal and Howe (1997) for an overview of Britain's trade policy during this period.

This paper provides a quantitative general equilibrium assessment of the Corn Law repeal to evaluate its impact on different sectors of the British economy, on domestic income distribution (through changes in both earnings and expenditures), and on overall economic welfare. Our model is based on the input-output table for the British economy in 1841 constructed by Horrell, Humphries, and Weale (1994). The availability of a consistent accounting of Britain's commodity production, inter-sectoral flows of goods and services, international trade, and final consumption during this period is an enormous aid to evaluating the impact of the Corn Law repeal.

We build two important features into our model that are relevant to mid-nineteenth century British economy. First, we take Britain as a large country in world markets that can influence the export price of its cotton textiles and the import prices of cotton and wheat. By expanding Britain's foreign trade, the repeal of the Corn Laws could reduce the export price of textiles and increase the import price of cotton and wheat, thereby adversely affecting the terms of trade. Second, we examine the effects of the repeal on incomes of three factors of production (land, labor, and capital) while also taking into account the unequal ownership of those factors and the different consumption patterns across two income groups. Specifically, we contrast the repeal's impact on the top 10 percent of the income distribution, which captures most of the country's land and capital income, with the bottom 90 percent of income distribution, where earnings are derived mainly from labor income and whose consumption expenditures are skewed toward food.

The general equilibrium approach gives us a unified framework in which we can pose and answer some of the key questions about the repeal of the Corn Laws: Would the terms of

trade have deteriorated as a result of the tariff reduction and what would have been the consequences for aggregate welfare? How much did the Corn Law repeal harm British agriculture and reduce land rents? To what extent did the repeal promote manufactured exports and increase real wages? How sharp were the distributional consequences of the Corn Law repeal, and was the repeal a progressive policy whose benefits flowed disproportionately to the working class? We also compare the results of our model with the ex-post outcomes of prices, trade, and factor income to see how closely they line up.

Despite the importance of the Corn Law repeal in British economic history, there are surprisingly few studies of its economic impact and each has limitations. Williamson (1990) employs a simplified general equilibrium model to examine the consequences of the repeal for income distribution, although the model's linear structure likely amplifies the impact of policy changes. In a different general equilibrium model, O'Rourke (1997) looks at income distribution after an exogenous decline in grain prices, not a tariff reduction, which misses terms of trade effects. Ward (2004) developed a partial equilibrium model to study the repeal's implications for British prices, production, and consumption of grain, but does not address income distribution or overall economic welfare.[2]

Our unified framework provides a comprehensive analysis of the Corn Law repeal. To anticipate some of our major conclusions, we find that, in terms of aggregate welfare, the static efficiency gains were negated by the deterioration in the terms of trade owing to the fact that

[2] Heblich, Redding, and Zylberberg (2020) provides a new economic geography look at the repeal of the Corn Laws and the decline in grain prices in the late nineteenth century. Using spatially disaggregated data on England's population, they find substantial rural outmigration from grain-growing regions to urban areas, with sizeable changes in property values.

Britain was a large county on world markets. In line with earlier work, the repeal had pronounced consequences for income distribution: landowners lost roughly 4-5 percent of their income while labor and capital-owners saw their incomes rise about 1 percent. Taking into account the different sources of income and the different pattern of expenditure between high- and low-income groups, we find that the welfare of the top 10 percent of income earners falls by about 1.4 percent and the welfare of the bottom 90 percent increases by about 0.3-0.6 percent. Thus, the repeal was a progressive, "pro-poor" policy.

This paper is organized as follows. Section 2 describes the general equilibrium model used to evaluate the repeal of the Corn Laws. Section 3 presents the main results of the simulations. Section 4 compares our results to the ex-post outcomes of some of the key variables of interest, as well as to the results of other models, and Section 5 concludes.

2. A General Equilibrium Model of the British Economy, c. 1841

The repeal of the Corn Laws was a major policy change that produced a sizeable shock to a large sector of the British economy. The repeal abolished a 28 percent tariff on imported grain (as discussed later) at a time when about 9 percent of total employment was in grain agriculture and 24 percent of total employment was in agriculture (grain and pastoral). The repeal affected resource allocation across the British economy, leading to the movement of labor out of grain agriculture and the redeployment of land for pastoral purposes. The increase in food imports necessitated an increase in exports, manufactured and otherwise, to pay for them.

The only feasible way of assessing these economy-wide impacts is through a general equilibrium model that provides a consistent account of the use of land, labor, and capital across

different sectors of the economy. Such a model also enables us to assess the repeal's impact on wages and other factor prices, as well as on consumer prices and economic welfare. Therefore, we develop a static single country computable general equilibrium (CGE) model and apply it to Britain benchmarked for the year 1841.[3]

Model Structure

Following a conventional CGE framework, producers are assumed to maximize profits as households are maximizing utility. Producers operating under perfect competition and constant returns to scale use primary factors of production (capital, labor, land) and intermediate products to produce goods and services that they sell in domestic and/or foreign markets. In the domestic market, final goods and services, produced at home or obtained from imports, are purchased by households for consumption or businesses for investment (contributing to gross capital formation). In our case, as discussed below, households are separated into two categories based on income level – the top 10 percent and the bottom 90 percent. These representative households earn factor payments and pay taxes, further redistributing funds between final consumption and capital accounts in a complete circular flow of the entire economy.

Capital and labor are assumed to be perfectly mobile between all activities.[4] The assumption of labor mobility is supported by the findings of Heblich, Redding, and Zylberberg (2020), who use spatially disaggregated population data to document significant long-run outmigration of people from grain producing regions of Britain in the aftermath of the repeal.

[3] The model is programmed in GAMS/MPSGE modelling system (Rutherford 1995).

[4] The lack of detailed sectoral data means that we cannot distinguish between skilled and unskilled workers, as Williamson (1990) does.

Land is employed exclusively in agriculture, and a constant elasticity of transformation (CET) production function is used to allocate land between grains and pastoral activities.

Figure 1 depicts the general structure of the main production block of the model. Constant elasticity of substitution (CES) production functions are used to represent production and consumption processes. In the main production block, a multi-nested CES function is used and distinguishes intermediate inputs (domestic and imported) and value-added components (primary factors of production).

The data for the general equilibrium model is based on the detailed input-output table for the British economy in 1841 constructed by Horrell, Humphries, and Weale (1994). The table depicts the inter-industry flows of commodities, final output, exports, imports, and final consumption for 17 sectors.[5] They also present data on employment and the capital stock in each of these activities.

Because of the careful construction of this table, we have made only one significant modification to it: dividing agriculture into two components, grain and non-grain (pastoral) production, something stressed by Williamson (1990). The repeal affected these two agricultural sectors quite differently: the tariff on imported wheat directly protected British grain producers from foreign competition, whereas non-grain pastoral producers (wool, hay, dairy, etc.) were more insulated from import competition and even exported. Consequently, following Williamson (1990, p. 149), we split agriculture into grain and pastoral sectors, where grain production

[5] These sectors are agriculture, mining, food, metals, soap, textiles, metal goods, bricks, other manufacturing, construction, gas, transport, distribution, domestic services, other services, public administration, and housing.

accounts for 38 percent of total agricultural output. However, whereas he assumes that land is a specific factor in both grain and pastoral agriculture, we assume that land is imperfectly substitutable between the two sectors; an elasticity of transformation parameter represents the degree to which land used in grain production can be converted for use in pastoral agriculture.

Production and Calibration

After separating grain and pastoral agriculture, we have an 18-sector economy with three primary factors of production: land, labor, and capital. To derive the shares of capital, labor and land by sectors, we do the following. First, based on Horrell et al (1994), only one factor (capital or labor) is employed in the production process of three of the eighteen sectors (construction, domestic services and housing services), meaning that no value added split is needed for these activities. Second, pastoral and grain agriculture are the only two sectors that employ land. Based on Clark (2010, Table 13), we apply the national average factor income share for land (10 percent) to derive the share of land in value added in pastoral and grain agriculture. We further assume that the share of land in value added is uniform across these two sectors at 41 percent. Third, based on Clark (2010, Table 13), we use national average factor income shares for labor (65%) and capital (25%) to derive the national aggregate values of capital and labor employment.[6] From these values, we then subtract capital and labor employed in three sectors (with a single factor use) identified on step 1 above. Following Horrell, Humphries, and Weale (1994), we assume that wages (w) and profit rates (r) in each sector "i" are uniformly lower or higher than the economy average rate. With the available data on number of workers (L_i) and

[6] Humphries and Weisdorf (2019) also report a labor share of 65 percent for 1840.

capital stock (K_i), we estimate values of capital and labor employed by each sector based on the equation $VA_i = \alpha_i (wL_i + rK_i)$, where VA_i is value added in sector "i" (with land payments for the case of agricultural sectors) and α_i is and industry-specific level of total factor productivity (TFP). Finally, we ensure that the national average labor and capital shares match the figures (noted above) from Clark (2010, Table 13). This is done through the multiplicatively uniform adjustment to the capital employment and reallocation of the corresponding value to/from the labor employment. As a result, the values of labor and capital employment in each sector are estimated as $\alpha_i\, w(L_i+\beta K_i)$ and $r(1-\beta)K_i$ respectively, where β is a multiplicatively uniform adjustment factor, so that national average labor and capital shares are preserved.

We have also refined the specification of imports to distinguish imported intermediate goods that do not compete with domestic intermediates (cotton in the textile sector) and imported intermediate goods that compete with domestic intermediates (grain as an input to the food sector and pastoral as an input to the textile industry).[7]

Consumption and Distribution

Final consumption is represented by a constant elasticity of substitution utility function defined over all the commodities that enter final consumption. The elasticity of substitution

[7] This requires us to refine the representation of import flows in the input-output table. First, raw cotton comprises £12 million of the £22.2 million in intermediate imports used by the textile sector, but cotton does not compete with domestic production, while the remaining £10.2 million consists of intermediate imports (wool, hides, flax, etc.) that do compete with pastoral production. Second, of the £21.1 million intermediate imports in the food sector, £9 million are grains that compete with the £36 million of domestically produced grain that is also used as an intermediate. Horrell, Humphries, and Weale (1994) record most imports of primary commodities used for further processing under those sectors that use these commodities as an intermediate inputs, rather than under corresponding primary commodity sectors. These include imports of grains (£9 million) used by the food industry and imports of pastoral products (£10.2 million) used as an intermediate inputs by the textile sector. We record these imports under the "grain agriculture" and "pastoral agriculture" sectors, respectively. We are able to do all this because the footnotes to Horrell, Humphries, and Weale (1994), and the appendix to the 1991 working paper version of their article, provide cell-by-cell detail on the construction of the input-output matrix.

across goods is 0.5. The Armington elasticity, representing the elasticity of substitution between domestic and imported goods, differs by sector. We use the value of 2 for service sectors and 3 for other sectors, except "Grain agriculture" and "Soap, candles, dyes", where we assume a slightly higher value of 4.[8]

To address the distributional impact of repeal, we distinguish between sources of income (based on factor ownership) and patterns of expenditures (based on budget shares) for the top 10 percent and the bottom 90 percent of income earners. Figure 2 presents the ownership of the factors of production (panel A), the composition of income (panel B), and the composition of expenditure (panel C) for these two groups. Lindert (1986, Table 6) shows that the top 10 percent of income earners in England and Wales in 1867 derived 13 percent of their income from land rents, 51-87 percent of their income from capital earnings, and 0-36 percent of their income from labor earnings. Meanwhile, the lower 90 percent derived 1 percent of their income from land rents, 26-35 percent of their income from capital earnings, and 64-73 percent of their income from labor earnings. We reconcile these data with the input-output table data to have the top 10 percent capture 89 percent of all land rents, 78 percent of capital income, and 15 percent of labor income. The bottom 90 percent have 11 percent of all land rental income, 22 percent of capital income, and 85 percent of labor earnings. The top 10 percent also earn 38 percent of national income, as shown in Lindert (1986, Table 6).[9]

[8] Bajzik et al. (2020) provide a recent meta-analysis of estimates of the Armington elasticity and find that it ranges between 2.5 and 5.1 with a median value of 3.8.

[9] Note that earnings from capital account for about half the income of the top 10 percent. The diversification of the portfolios of the wealthy who were represented in parliament (away from land-based income) in the early nineteenth century plays a role in explaining the political economy of the Corn Law repeal; see Schonhardt-Bailey (2006).

In terms of consumption, Feinstein (1998, Table 1) presents budget shares for working class households. In 1828/32, 65 percent of expenditures were devoted to food (16.25 percent on bread and 13.65 percent to wheat flour) and 11 percent were devoted to drink. The 1841 input-output table reports that consumption of pastoral and food commodities accounts for 42 percent of total expenditures at the national level. To reconcile these data with the input-output table accounts, we assume that bottom 90 percent spent 70 percent of their income on food, pastoral and related distribution services. We also assume that the bottom 90 percent account for 65 percent of consumption expenditures, while the top 10 percent account for the rest of demand.

External Sector

We do not model the British economy as a small open economy in which world prices are given, but as a large open economy in which it can affect those prices. World export demand and import supply functions for each traded commodity are assumed to be less-than-perfectly elastic.[10] A key issue is the degree to which Britain possessed market power in international trade, particularly in exports of cotton textiles and imports of raw cotton and wheat.

In 1840, Britain accounted for 37 percent of world production of textile products and 29 percent of world production of all manufactured goods, dominating world trade in those goods (Mulhall 1903, 365, 367). While large market shares do not necessarily imply a high degree of market power, such large shares of world production suggest that changes in Britain's exports would affect the world prices of such goods, something that estimates of trade elasticities for the

[10] To do so, we introduce a specific factor that is used as an input in the Cobb-Douglas export and import transformation functions. This factor is owned by foreign consumer, who demands foreign exchange. By choosing the share parameters of export and import transformation functions, we are able to calibrate the export supply and import demand elasticities.

nineteenth century support.[11] As an initial reference point, we assume that the elasticity of export demand facing Britain is 5 for textiles and all other commodities.

In terms of imports, the foreign export supply of wheat and cotton was unlikely to have been perfectly elastic. Noting that principal foreign sources of wheat prior to 1838 were coastal Poland, Germany, and Denmark, Fairlie (1965) contends that these regions could only supply a much larger quantity of exports to Britain at higher prices. Ward (2004) finds that Britain faced relatively large long-run elasticities of export supply of grain, ranging from 2 from Prussia, 5 from the United States, and 8 from France, estimated during the period 1828-46. We assume a reference elasticity of 5.

In the 1830s and 1840s, Britain accounted for about 55-57 percent of the world's cotton consumption, most of which came from the United States (Irwin 2003). Most studies suggest that U.S. export supply of raw cotton was relatively inelastic. Wright (1971) estimates the elasticity of pre-Civil War land sales with respect to the price of cotton is between 0.6 and 1.5; even present-day estimates that the response of cotton acreage with respect to the price are somewhat below 1. As a result, we assume that Britain faces an upward sloping import supply schedule for cotton (as an intermediate input to the production of textiles) with a reference elasticity of 1. All other sectors have an import supply elasticity of 5.

3. The Repeal of the Corn Laws: Simulation Results

[11] Irwin (1988) estimated the export demand elasticity facing Britain to be -1.1 for the period around 1840. For the period 1870 to 1913, Hatton (1990) finds that the long-run elasticity of export demand facing Britain was -1.8. These parameters may be underestimated. If the world demand for textiles had a price elasticity of -1, and Britain's share of world trade in textiles was 0.35, then the implied export demand elasticity would be nearly -3. This assumes the simple relationship that $\eta_{UK} = \eta / s_{UK}$, where η_{UK} is the elasticity of export demand facing Britain, η is the elasticity of world demand for the good in question, and s_{UK} is Britain's market share.

Before presenting the simulation results, we examine some simple time series data on wheat imports, the average tariff on wheat imports, and domestic wheat production to see if the Corn Law repeal had any visible impact.

Figure 3 shows Britain's production of wheat and imports of wheat and wheat flour from 1830 to 1860. In the 1830s, imports were about 15 percent of domestic consumption. Imports rise markedly after the repeal in 1846, while production never recovers its 1845 peak and falls fairly steadily until the mid-1850s.[12] After 1849, wheat imports as a share of domestic consumption hold fairly steady at about 40 percent (Fairlie 1969, p. 103). While imports increase, domestic production declines but does not collapse.

How much were these imports affected by the Corn Law duties? Figure 4 presents the volume of imports along with the average import duty over time, as calculated by Sharp (2010). The inverse relationship between the two series is clearly evident. As the tariff rises to 40 percent and higher in the mid-1830s, imports nearly disappear; tariffs at those rates are essentially prohibitive. Between 1838 and 1842, the tariff fell to about 10 percent and imports surged in. The tariff rose again between 1842 and 1846, squeezing imports, but repeal allowed foreign grain to enter the British market again.

There are various estimates of the restrictiveness of the Corn Laws just prior to repeal. We adopt a figure of 28 percent as a consensus estimate based on Sharp (2010), Ward (2004), and O'Rourke (1994).[13] Of course, the repeal of a 28 percent tariff does not reveal the magnitude

[12] For a short period, British producers were aided by the outbreak of the Crimean War in 1853, which led to sharply higher prices.

[13] There was no unique ad valorem tariff on wheat imports and the degree of protection given to domestic producers depended upon the particular time period considered. In 1828, a sliding set of duties was adopted in which

of the price shock facing British producers and consumers. A rise of the world price of wheat as a result of increased British demand would mute the negative price shock for domestic grain producers and diminish the gains reaped by domestic consumers.

Figure 5 presents the main results for a simulated repeal of the Corn Laws (the removal of the 28 percent tariff on imported grain) under a low elasticities and a high elasticities scenario.[14] Panel A reports the changes in goods prices (relative to a consumer price index). The price of grain is critical because it is directly affected by repeal. We find that the domestic price of grain declines by about 4-5 percent. This 4-5 percent decline is an Armington composite of the change in the price of domestic grain (which falls just 1 percent) and the tariff-inclusive price of imported grain (which falls 20 percent). This decline in the domestic grain price allows the relative price of food to fall by about 1 percent.

Three factors account for the modest decline in the price of grain. First, the price of imported grain rises by 6-9 percent due to the finite elasticity of supply from Poland and other

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the specific duty applied depended on the state of domestic prices, something akin to a variable import levy (Sharp 2010). Sharp (2010) calculated the average tariff by dividing the revenue raised by the Corn Law duties by the value of grain imports. He finds an average tariff of 28 percent in the decades prior to repeal, but this figure is highly variable over time. Ward's (2004) figure is almost identical (27 percent) and O'Rourke (1994) calculates a counterfactual "no-repeal" wheat price for Britain and finds that it would have been 25 to 30 percent higher in the early 1850s than it actually was after repeal. Williamson (1990) examines the price differentials between British and foreign markets and finds strong evidence that British and European wheat markets were well integrated, aside from the wedge between domestic and foreign prices due to the Corn Laws and transportation costs. In the 1830s, Williamson (1990, p. 127) reports that the Corn Laws were equivalent to a 54 percent tariff on imported grain. This tariff wedge was reduced in two stages, a reduction of 32 percentage points in 1842 and then a repeal of the remaining 22 percentage points in 1846.

[14] The low elasticity assumption sets the elasticity of land transformation = 10, the elasticity of import supply of cotton = 1, the elasticity of import supply of wheat = 5, the elasticity of import supply for other goods = 5, the elasticity of export demand = 5, and the elasticity of export demand (textiles) = 5. The high elasticity assumption sets the elasticity of land transformation = 20, the elasticity of import supply of cotton = 3, the elasticity of import supply of wheat = 10, the elasticity of import supply for other goods = 10, the elasticity of export demand = 10, and the elasticity of export demand (textiles) = 10.

exporting areas, so only part of the tariff reduction is passed through to British prices. Second, the Armington elasticity of substitution, which is set at 4, implies that imported grain is an imperfect substitute for domestic grain. If the substitutability of domestic and imported grains is higher, and the Armington elasticity is set at 10 or 50, the price of domestic grain falls 3-5 percent and the composite price falls 5-6 percent. The composite price effect is muted even with the higher elasticity because then the import price rises more (as consumers substitute to a greater extent toward imports) and a smaller fraction of the tariff reduction is passed through to domestic prices. Third, the initial share of imports in domestic consumption is only around 10-15 percent, which also mutes the impact of imported grain prices on the domestic market.

Panel B presents results for sectoral output (production). Despite the modest change in the relative price of grain, domestic production of grain falls about 10-12 percent. Pastoral agricultural production expands slightly (3 percent) because it can now employ land that is no longer used in grain production. Food output expands slightly (2 percent) and cotton textile output expands a modest less than 1 percent. One of the main contentions of Richard Cobden's Anti-Corn Law League was that import tariffs prevented the expansion of British manufacturing; this appears to be the case but only to a very small degree.

Panel C focuses on international trade. The abolition of the Corn Laws allows imports of wheat to increase anywhere from 58-76 percent. This magnitude is plausible given the relationship between the tariff and imports depicted in Figure 4. As a result, exports of other goods expand in exchange for these additional imports; exports of pastoral agricultural goods become more cost competitive and expand considerably, while textile exports increase by up to 3 percent. Overall exports increase by about 4-6 percent. The terms of trade deteriorate by about 2

percent.

Panel D presents the change in factor prices (relative to the consumer price index). The model confirms the suspicions of the classical economists, such as David Ricardo, that the Corn Laws benefitted landowners at the expense of workers and capital owners. The return to land falls by around 3-4 percent as a result of repeal, while both real wages and return to capital increase a modest 1 percent. It is unsurprising that the repeal helped labor and capital at the expense of land, but the magnitudes of the impacts might seem modest given the intense political and social controversy that surrounded the repeal. To its opponents, the Corn Laws symbolized class legislation and its repeal was considered a major political victory, even if the economic consequences were perhaps exaggerated by those objected to it. That said, a 3-4 percent reduction in land incomes is not trivial. Of courses, because land's share of GDP was just 10 percent, there was a limit to how much income could be redistributed to other groups in society.

Finally, panel E turns to welfare. In keeping with McCloskey (1980) and Irwin (1988), who explored how British welfare might decline if a tariff reduction led to a deterioration in the terms of trade, we find that overall welfare does decline, but a trivial amount, about 0.1-0.3 percent of Hicksian equivalent variation. This result arises because the expansion of trade lowers export prices of textiles and increases import prices of wheat and cotton enough to offset the static efficiency gains from trade.[15]

The results also suggest that the benefits of repeal accrued disproportionately to the

[15] The only existing estimate of overall welfare impact of the Corn Law repeal is that under Williamson's (1990) small country assumption in which real per capita GNP rises 1.5 percent; his model was unable to calculate the outcome in the large country case. When we approach the small country assumption in the high elasticities case, we find welfare increases 0.6 percent.

bottom 90 percent, both because their income was positively affected (higher wages, as opposed to the declining land rents for the top 10 percent) and because the price of their consumption goods fell. In the low elasticities case, the welfare of the top 10 percent falls 1.4 percent while the welfare of the bottom 90 percent rises 0.3 percent. In the high elasticities case, the welfare of the top 10 percent declines by the same amount (1.4 percent) while the welfare of the bottom 90 percent rises 0.6 percent. Both the redistribution of income and the pattern of expenditures (more heavily weighted on the imported good) work to the advantage of lower income households in this case, making the repeal of the Corn Laws a "progressive" pro-poor policy.

4. An Ex-Post Evaluation of the Corn Law Repeal

It is difficult to evaluate the results of the any model without looking at what actually happened in the aftermath of the event studied or what other models predict. Of course, assessing the results of any simulation by comparing them with ex-post outcomes is always complicated by the fact that the economy is subjected to new shocks and ongoing trends, but it still seems worthwhile to check if the results come anywhere close to matching up with the magnitudes of the actual historical outcome in the years immediately after the repeal. We also compare our results to those in other papers.

Figure 6 presents these comparisons. Panel A considers imports of wheat. Our prediction that the repeal would increase imports by about 70 percent (averaging the low and high elasticity scenarios) is very close to Ward (2004). Determining how much wheat imports actually increased after repeal is difficult; depending on the base year, data source, and time range, the observed growth is anywhere from 91-168 percent. (The choice of base year is important

because imports were close to zero in 1845.)

In panel B, our model indicates that domestic grain production would fall by about 11 percent, very close to the 13 percent fall observed between 1845 and 1849 (Fairlie 1969, 114). By contrast, the Williamson and Ward models predict a 7 percent decline in production.[16] The observed decline in wheat production implies that the repeal of the Corn Laws forced the agricultural sector into some significant adjustments. Vamplew (1980, p. 395) summarizes the effects on British agriculture:

> "Although repeal did not lead to a dramatic undermining of domestic prices by a flood of cheap imports, the increased importation of foreign grain prevented rising home consumption from raising prices by the pressure of demand. Many British cereal producers became caught in the price-cost squeeze as wages and rents moved upwards but prices did not. This encouraged many of them to adopt mixed farming or move out of cereals altogether into pastoral agriculture where the prospect of profits was relatively more attractive, partly because there was less competition from imports."

In terms of labor employed, census data indicate that employment in agriculture was higher in 1851 than in 1841, but van Vugt (1988) reports that "unprecedented numbers" of small, undercapitalized grain farmers emigrated to the United States in the early 1850s. O'Rourke (1994) links the repeal to significantly lower Irish employment in agriculture (and greater emigration) over the subsequent decades. Heblich, Redding, and Zylberberg (2020) document significant outmigration of population from regions specialized in grain agriculture in the decades after repeal.

Panels C and D of Figure 6 consider the prices of domestic wheat and imported wheat, respectively. The simulations of Williamson and Ward indicated a slightly larger decline in the

[16] O'Rourke's (1997) model produces a 75-85 percent reduction in grain output from an exogenous 29 percent decline in the price of cereals.

domestic price of wheat (7-10%) than suggested in the model here (5%). We find import prices rise 7% whereas Ward (2004) suggests it would have increased 17%. Thus, we would expect that the decline in the domestic price of wheat would be only some fraction of the 28 percent average tariff.

Unfortunately, it is difficult to judge these model results with the actual changes in domestic and import prices. Between 1845 and 1847, the domestic price of wheat rose by 37 percent while the import price of wheat rose by 70 percent, consistent in relative terms with our expectation, but not very informative about the contribution of the tariff change alone. The greater demand for wheat in light of the potato famine is probably responsible for this outcome, but both prices promptly collapsed after the Commercial Crisis of 1847. This pattern makes it virtually impossible to determine the impact of the repeal on domestic and import prices from simple observation.

Although not presented in Figure 6, we can also compare our results on real wages and land rents to others. We find real wages would increase about 1 percent. Williamson (1990) has unskilled wages rising 12 percent and skilled wages rising 2 percent; O'Rourke (1997) has real wages rising 3-6 percent. Feinstein (1998) and Allen (2007) report that real wages grew between 1.6-2.1 percent in the years after repeal, but this is not a significant deviation from trend.

Regarding land rents, we find a decline of 4 percent, whereas Williamson (1990) reports a decline 12 percent and O'Rourke (1997) a decline of 9 percent. However, they specify land as a specific factor in grain and pastoral agriculture, whereas we assume it is a partially mobile factor, an assumption for which there is evidence (Vamplew 1980). Williamson finds a 41 percent decline for grain land and a slight increase for pastoral land and O'Rourke a 38 percent

decline for grain land and a 14 percent increase for pastoral land. When we make the assumption that land is a specific factor, we find the rent on grain land falls 12-13 percent and that on pastoral land rises about 4 percent. Clark (2010) reports that nominal land prices rose about 6 percent between 1840 and 1850, but Heblich, Redding, and Zylberberg (2020) finds that property values declined in regions producing grain.

5. Conclusions

The repeal of the Corn Laws in 1846 stands as perhaps the defining trade policy changes of the nineteenth century. This paper uses a carefully constructed input-output table of the British economy in 1841 created by Horrell, Humphries, and Weale (1994) in a standard applied general equilibrium model to evaluate the welfare consequences of the dramatic policy move. Consistent with recent work on the impact of trade policy on household welfare, we find that the distributional consequences of the repeal were more pronounced than the static efficiency effects. In this case, the efficiency gains were more than offset by the terms of trade losses as a result of Britain being a large country in world trade. The distributional effects arise because the repeal had a sharply different impact on the earnings of high- and low-income groups due to highly unequal factor ownership, as well as the different pattern of expenditure between those groups. By favoring the bottom 90 percent of income earners, the repeal of the tariff on imported wheat was a progressive, “pro-poor” policy.

At the same time, with land rents accounting for just 10 percent of British GDP by the mid-nineteenth century, there was a limit to how much redistribution could take place. The repeal of the Corn Laws was probably a larger event in the political life of Britain, as free trade

in grain symbolized a major defeat for the privileged landed aristocracy, than its underlying economic importance might have suggested.

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Figure 1: Production Nesting Structure for All Sectors

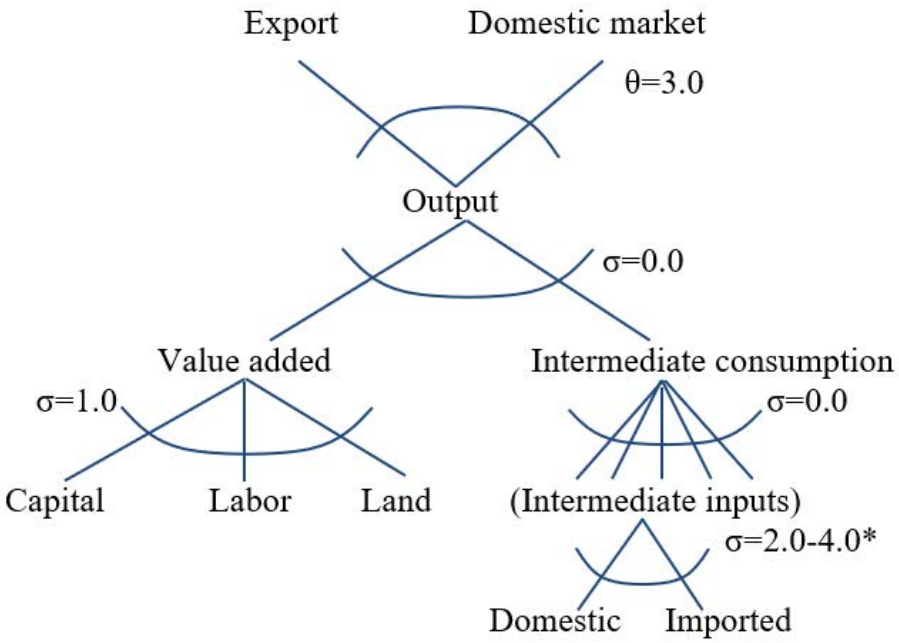
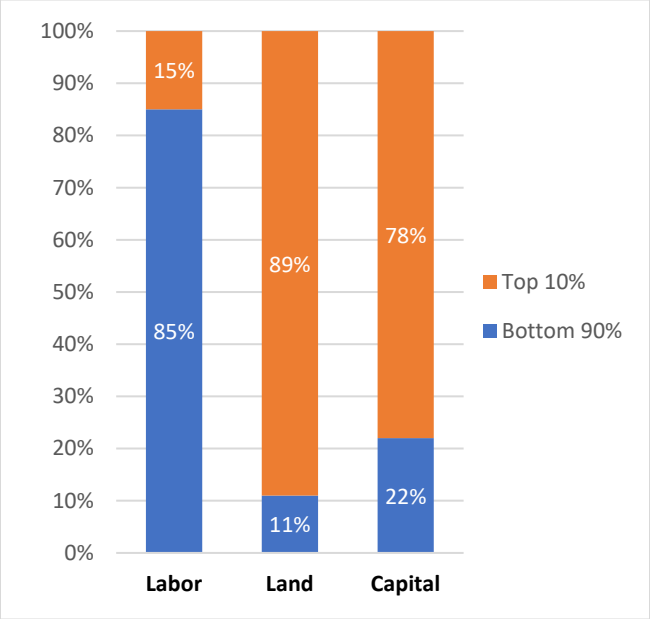


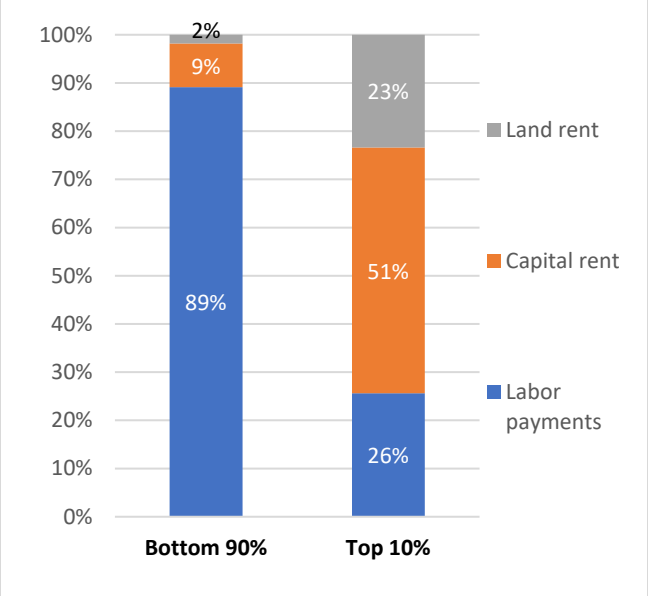
Figure 2: Factor Ownership, Income and Expenditures, by class

A. Factor Ownership, by class



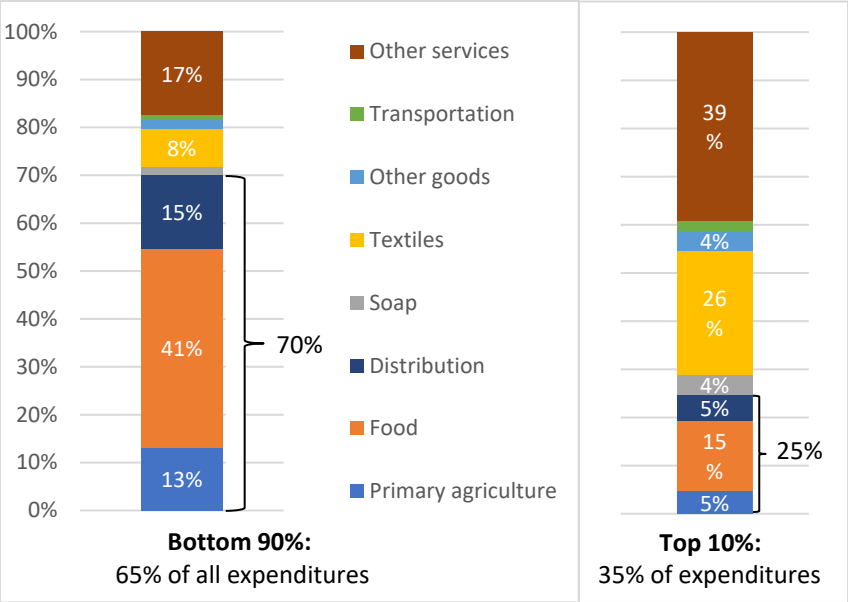
Source: Based on Clark (2010, Table 13) and Lindert (1986, Table 6).

B. Sources of Income, by class



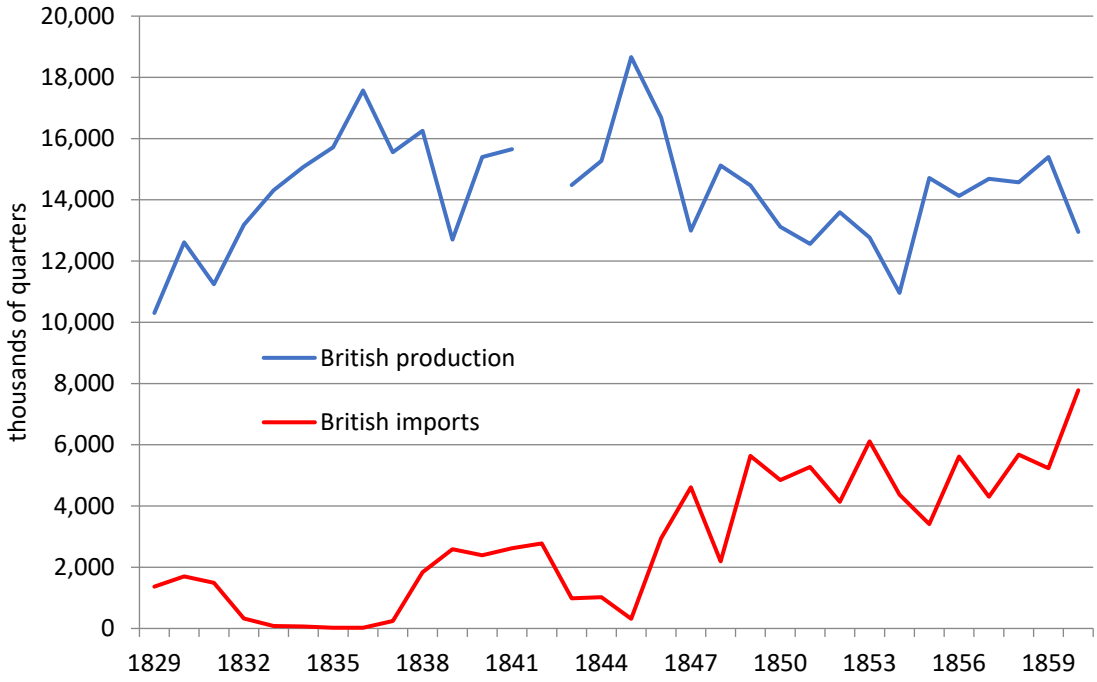
Source: Based on Lindert (1986, Table 6).

C. Share of Expenditures, by class



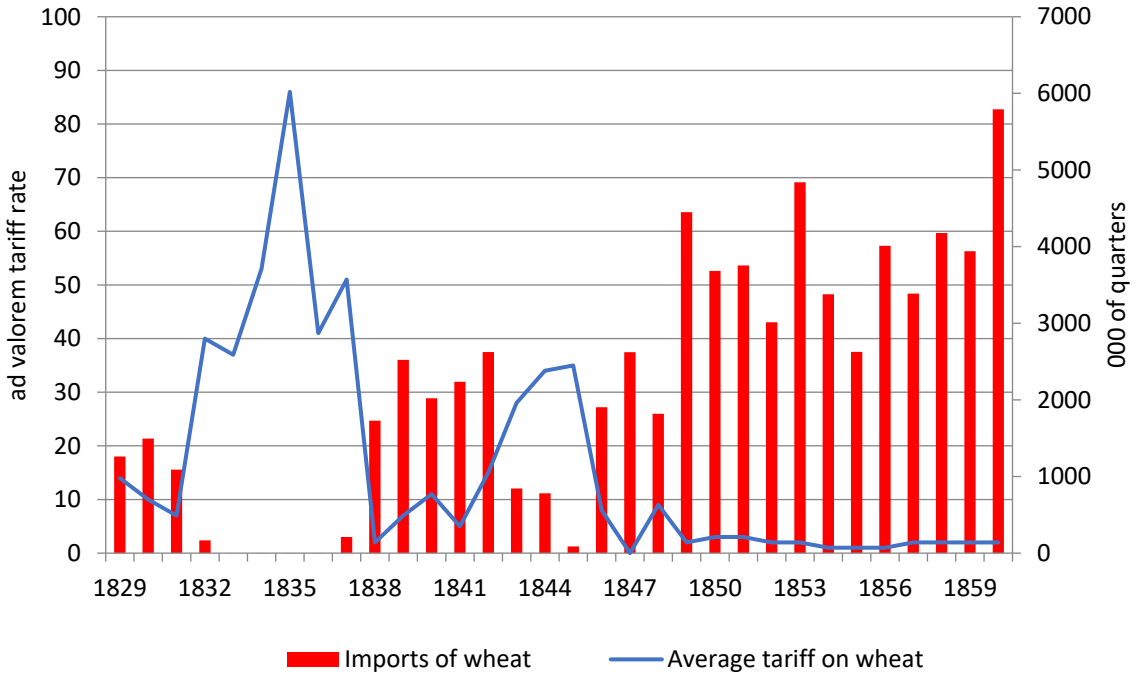
Sources: Based on Feinstein (1998, Table 1).

Figure 3: Britain's Imports and Production of Wheat, 1829-1860



Source: Fairlie (1969), pp. 114-15. Imports: retained imports of wheat and wheat flour by United Kingdom. Production: wheat output in England and Wales "inspected" markets. No production data exists for 1842.

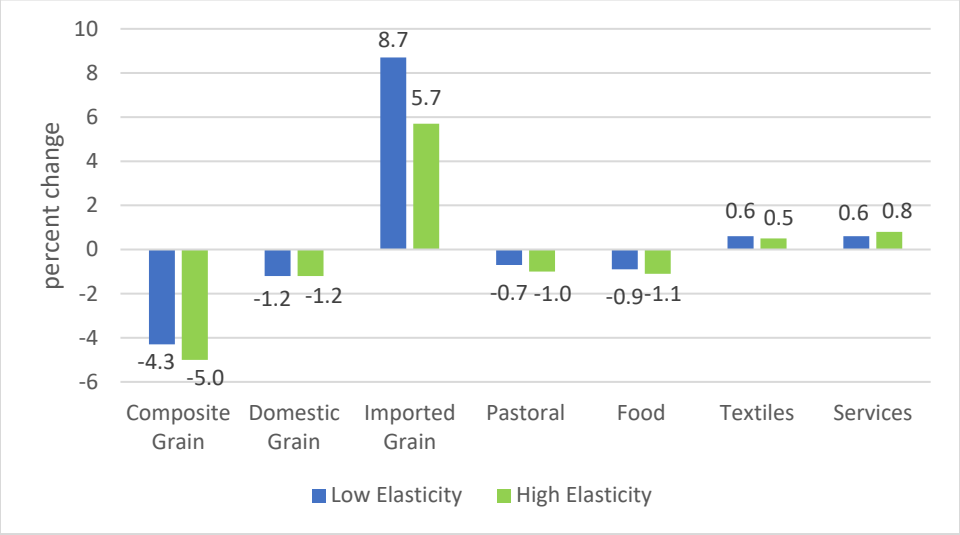
Figure 4: Average Import Tariff on Wheat and Britain's Wheat Imports, 1829-1860



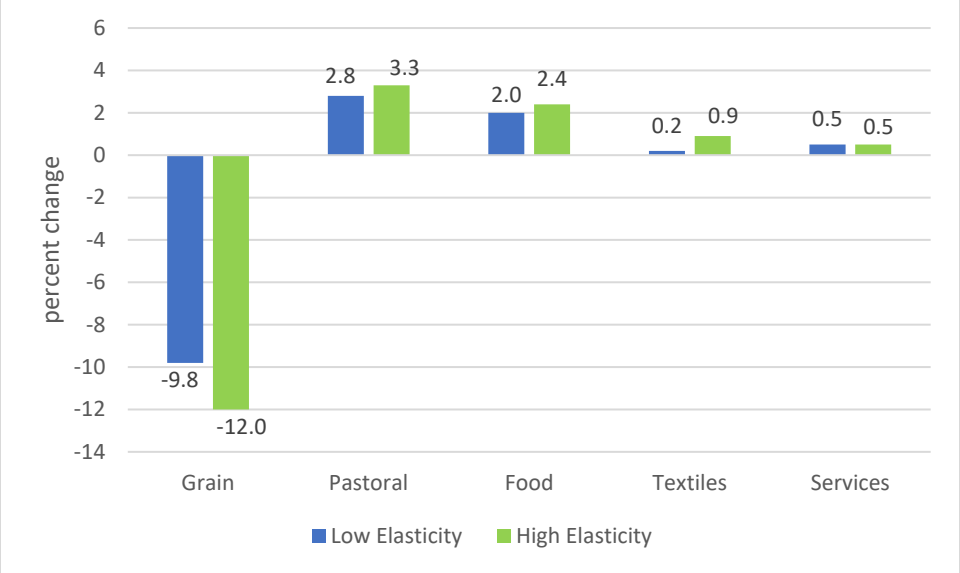
Source: Sharp (2010).

Figure 5: Results of Model Simulation

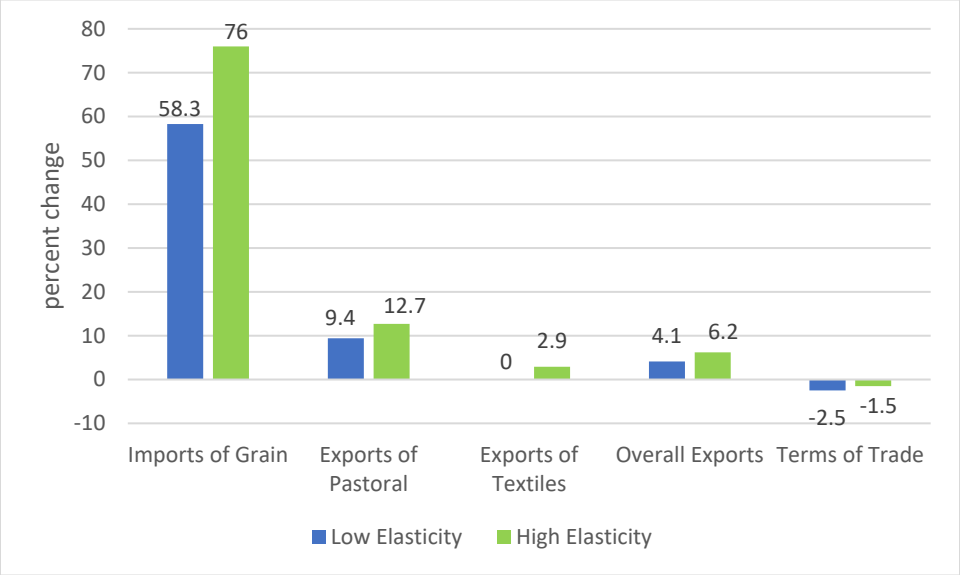
A. Goods Prices



B. Production

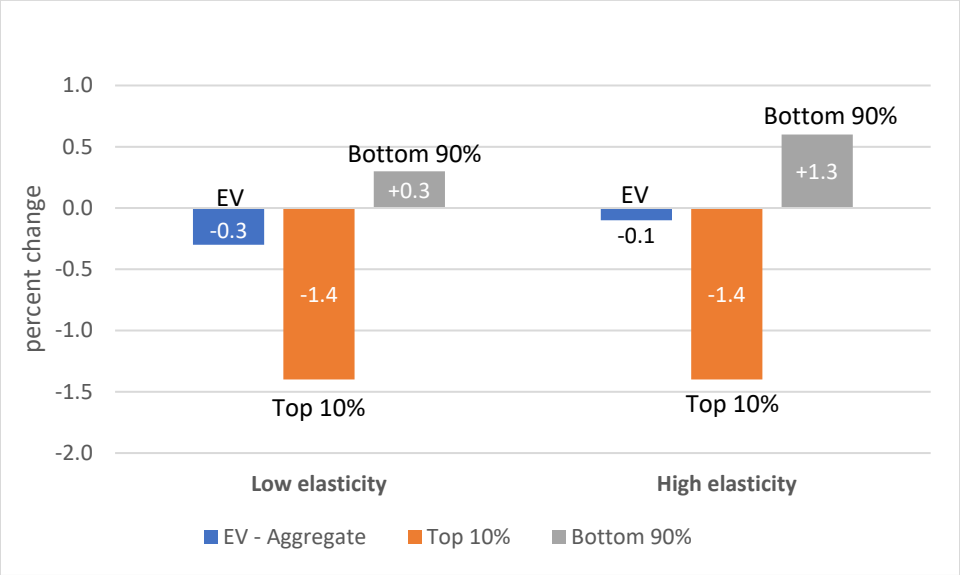


C. Trade



D. Factor Prices

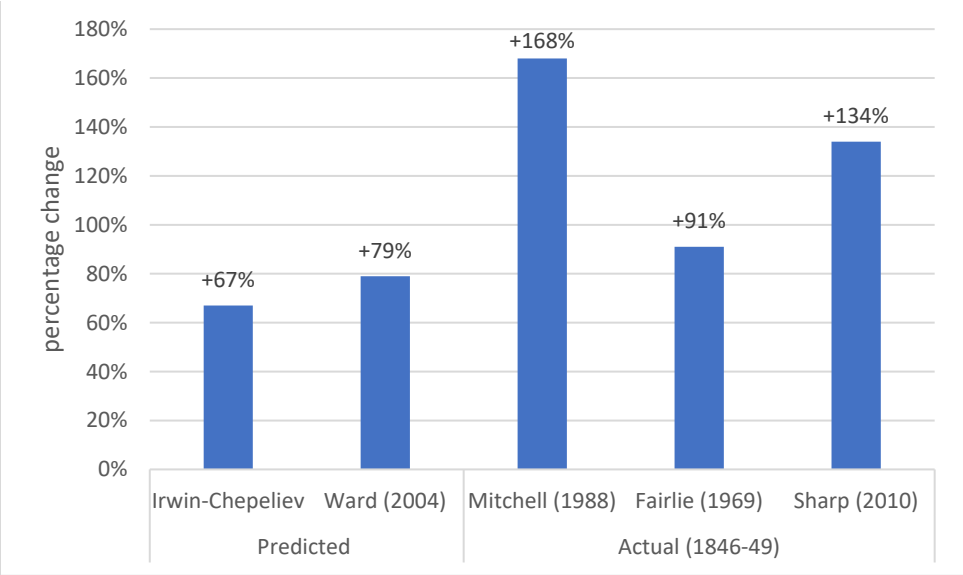
E. Welfare



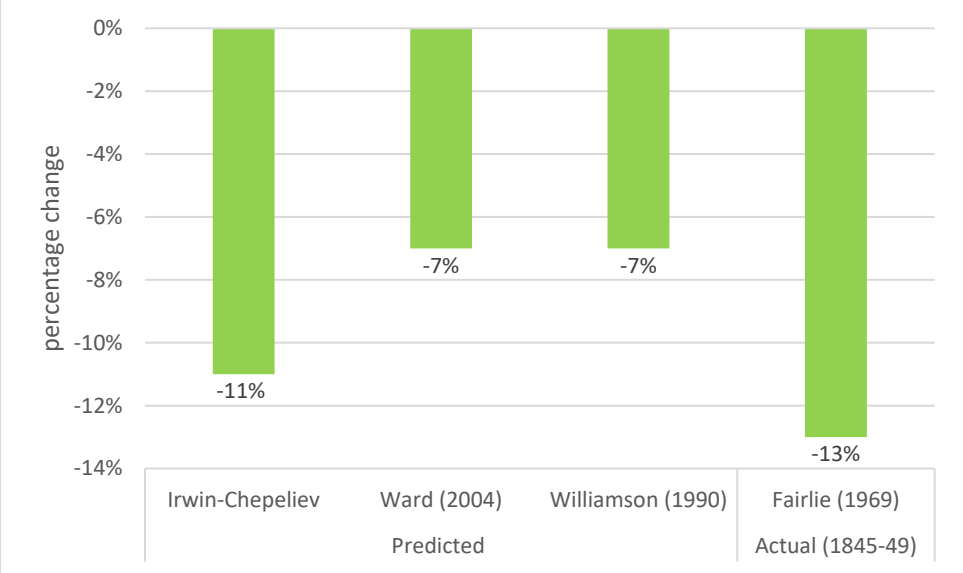
Note: percentage change in equivalent variation measure of welfare.

Figure 6: Ex-Post Assessment of Corn Law Repeal

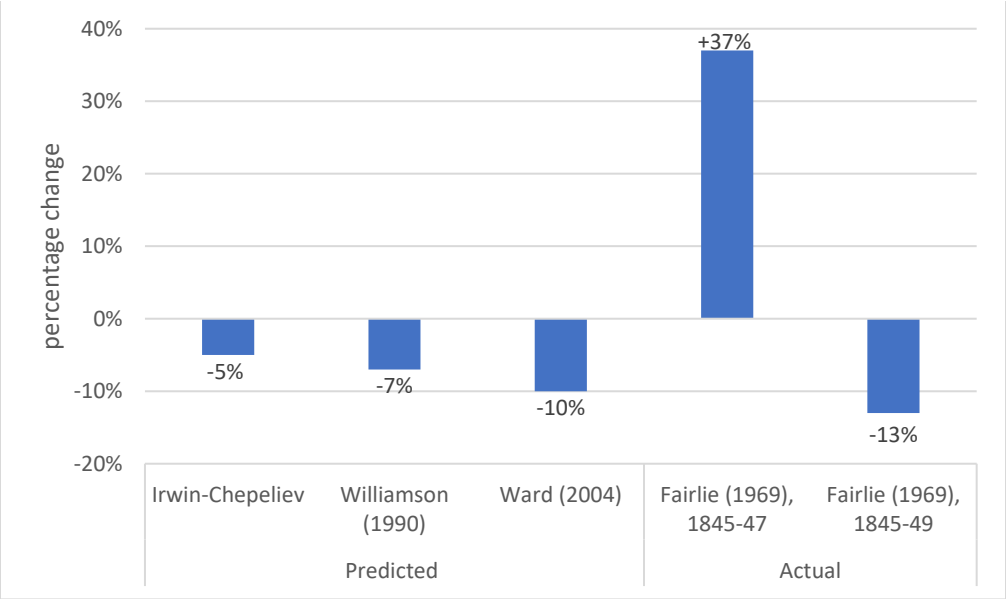
A. Imports of Wheat



B. Domestic Production of Wheat



C. Domestic Price of Wheat



D. Import Price of Wheat