

Price Dynamics in England from 1820-1864: Corn, Trade Liberalization, and Railway Mania

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Using price and sales data from 309 markets in England from 1820-1864, I study the 1846 Corn Law trade liberalization in England. I show that the trade liberalization substantially reduced costs of consuming staple grains for the average consumer. Most importantly, I show that the liberalization had distributional effects where some markets experienced substantial price decline, whereas other markets experienced stagnant or even rising prices. The variation in price changes can be attributed to the varying degree to which the transportation network improved in the years leading up to the liberalization. Post-liberalization, access to infrastructure such as roads, waterways or railways turns out to be a good predictor of whether the prices declined or not in a particular market.

Keywords: Corn Laws, Trade Liberalization. England 19th Century, international trade. JEL Codes: F14, N7.

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1. Introduction

In 1846, a seminal event happened in the economic history of England and more importantly, the world trade system. This was when the British parliament voted to repeal the protectionist Corn Laws and allowed tariff-free international grain to enter English ports to be sold in local markets (James and Lake, 1989). In the debates surrounding trade liberalization, the repeal is taken as the most important trade liberalization in history due to the preeminence of England as the leading trading nation of the era, and the knock-on effect this liberalization had on other European countries (Baldwin and Martin, 1999). Using price and sales data from 308 markets in England during the period 1820-1864, this paper will show that the Corn Law repeal resulted in lower prices of staple goods being faced by the consumers. However, the repeal also resulted in the creation of a two-speed economy where better connected areas fared better, and the relatively remote markets failed to fully realize the gains from liberalization.

The liberalization was not without its detractors. Standard economic theory stipulates that the effect of trade liberalization is beneficial to consumers on account of not only an increase in available consumption choices, but also of lower prices in consuming the good (Kinsey, 1998). More choices, coupled with lower prices effects an increase in welfare as more (both in terms of quantity and quality) can be now consumed given one's original endowment. However, trade liberalizations such as the Corn Law repeal still remain contentious due to various reasons in the political economy of countries, the lobbying power of unions and other interest groups being foremost among them (Simmons and Elkins, 2004). Further, price reductions brought about by liberalization also tend to hurt producers at home who are faced with lower incomes as a result (McKay et al., 2004).

I have two major aims in this paper. First, I show that average transportation costs fell substantially, spurred by lower barriers to trade and an increased investment in the railroad infrastructure in the 1840s. Second, I show that the trade liberalization was beneficial to the consumers on account of cheaper foreign grain being made available for sale in the local markets. However, not all areas of the country experienced a drop in prices, with several markets experiencing higher prices post-liberalization. I will try to explain this apparent failure of liberalization in certain markets by positing that the growth of transportation networks had a great role to play in the creation of such an economy. Lack of access to transportation networks resulted in higher prices, as grain could not be moved to off-grid local markets in a timely fashion.

Methodologically, this paper will study price differentials among the local markets as well as between England and foreign markets. According to Chilosi et al. (2013), "when traders share information and trade costs are small, price differences are quickly arbitrated away and prices converge." Hence, paper will make use of price convergence (or lack thereof) to argue about the distributional impacts of trade liberalization. Further, in order to ascertain trade costs, this paper will make use of a locally produced grain (beans) and the price differentials between producing and consuming regions to chart how distance ceased to matter much in the price faced by consumers.

2. Literature Review

2.1 History of the Corn Laws

Throughout the 19th century, nations around the world held tariff rates at extremely high levels to allow flourishing of local industry. For example, in the United States, tariff rates were generally above 10%, and hovered consistently around 20-30% of the value of goods imported (Bils, 1984). Infant industry protection proliferated during this period, and beggar-thy-neighbor policies were *norm de jure*. However, the rising capitalist class of the era was acutely aware of the fruits of liberalization, having made its fortune in the textile behemoths of Manchester and Liverpool. Cheaper grain would allow the industrialists to pay lower wages to their workers, thus increasing their profits and stimulating industrial

exports (James and Lake, 1989). It was only the agrarian rural elites, and their greater power in government that enabled Corn Law to remain in place for so long. Further, cheap grain was readily available in the United States and other places around Europe, and hence it was making increasing sense for the British government to push for a repeal.

According to Moore (1965), the rationale behind the Corn Laws was the belief that high agricultural prices led to rural prosperity. The countryside population, especially the big landowners, believed that prosperity could not be shared by urban and rural populations, and that the sacrifice had to come from the urban consumers owing to the inherent importance of agriculture to society.

During this time, a constituency counter to the agriculturalists was developing rapidly in the urban centers of England – the big manufacturers and industrialists setting up factories in cities such as London and Manchester (Cottrell 1980). In the years leading up to the 1830s, the export sector saw a massive increase in its profits, and in the corresponding social and political power. However, an economic slump in the 1830s, coupled with near-famine conditions due to failed crops, led to an increasing sense of disquiet among the industrialists who protested the seemingly unfair protections enjoyed by the agricultural sector (Ibid). The resulting high food prices gave impetus to action from the wage earning poor as well as the urban industrialists, uniting them under the auspices of the well-funded Anti-Corn Law League which undertook lobbying efforts for the law's repeal.

The repeal came in various stages. In the first stage of repeal in 1815, imports were only allowed if the average weighted corn price exceeded 80 shillings per quarter (Williamson, 1990). However, the price very rarely exceeded 74 shillings and thus the change in law bore minimal effect on imports. In 1822, the threshold was reduced to 70 shillings per quarter, but it was again devoid of substance as imports failed to nudge higher and prices continued to hover below the threshold. Another milestone for liberalization came in 1828 when tariffs on imports were linked to domestic grain prices on a sliding scale – the lower the prices at home, the higher the tariff at the ports. In an important development, tariffs on manufacturing were removed in 1842 but the proposal to remove tariffs on agricultural products was defeated in the parliament. All of this, however, was superseded in 1846 when Prime Minister Robert Peel removed all tariff and non-tariff barriers to importing grain from markets such as Prussia, Russia and the United States (James and Lake, 1989).

2.2 Theoretical Motivation

The Corn Laws presented an opportunity for one of the earliest debates on free trade and protectionism to take place. On one hand, there were Thomas Malthus and Herbert Spencer with their ideas of protectionism, while opposing them were Robert Torrens and David Ricardo who had recently discovered the principle of comparative advantage in 1815 (Schonhardt-Bailey, 2006).

According to Spencer and Malthus, free trade would lower food prices and depress agricultural wages, leading the agricultural labor to seek employment in industry where unemployment would surge as a result. Malthus' conclusions were attacked by Buchanan, who asserted that low prices would lead to lower wages, and that worker welfare would only improve with higher wages (Ibid). This assertion came from the fact that labor wages were traditionally paid in corn; thus a rise in price of corn automatically increased wages. However, the relationship was a theoretical one and not fully explored by Malthus himself (Ibid).

On the other end of the spectrum, Ricardo and his associates represented a more modern outlook on the debate. They argued that protection resulted in lower wages (or higher corn prices), since lowered profits for manufacturers and farmers meant a cut in production costs. In the 1830s, Robert Torrens further argued that opening up the English economy to trade would actually raise wages (or lower corn prices) as the comparatively high productivity of English workers would trump their foreign counterparts, and they would be paid accordingly as a result (Ibid). George Porter, another theorist, agreed with Torrens

and asserted that high food prices do not necessarily lead to higher wages (Ibid). The intensity of the debate showed how important the issue was to political theorists of the era, and interest in Corn Laws continues to this day.

Bliss (2003) speculates that cheaper corn might not have had the welfare effects that it is simplistically assumed to have on the basis of increasing purchasing power for a given wage. The wage level is affected by the alteration in terms of trade which is reflected in lower food prices. Further, wages might fall by a greater proportion than the proportion by which corn prices fell. However, the data shows that wages did rise, and this is attributed more to the rapid technological change rather than the change in trade tariffs. Bliss proposes further examination of the link between lower food prices and real wages, but for simplicity a fall in food prices will be taken as a rise in real income.

Not all economists, however, were convinced that the tariff reduction would lead to an increase in welfare. Irwin (1988) shows that British welfare only increased when English tariff reductions were matched with tariff reductions abroad as well. *Ceteris paribus*, unilateral tariff reductions were found to have reduced British welfare since British exports were still subject to tariffs abroad. However, we do see evidence from the 1840s that as trade barriers fell, British consumers did benefit in the end.

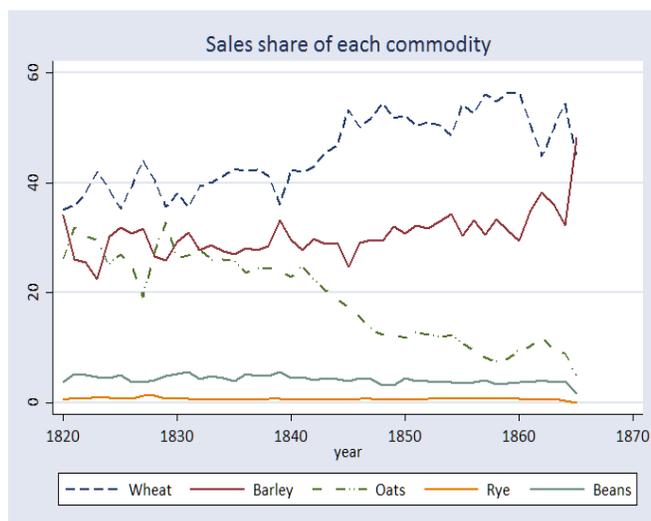
2.3 Transportation Networks

But how was this gain in welfare distributed inside Britain? Schonhardt-Bailey (2006) argues that “economic interests in free trade both intensified and spread geographically,” alluding to the power of Lancashire industrialists who fervently supported the anti-Corn League. These industrialists were extremely active in one other arena as well – railway and infrastructure building. In the 19th century, there was no systematic government investment in infrastructure as we see today. Private entrepreneurs, such as the ones in Lancashire, engaged in the construction of railways and waterways throughout the country on important commercial routes. For example, the opening of Liverpool-Manchester railroad line in 1830 was followed by the so-called railway mania of the 1840s, at the end of which almost the entire country was covered by the rail network. This had great implications for the way grain was transported. For one, spatial price variation was greatly reduced as local price changes would immediately result in “flow from, or to the center so that all markets would rise and fall in line” (Schonhardt-Bailey, 2006). Hence, the railway network allowed the benefits from Corn Law repeal and other such liberalizations to diffuse throughout the country.

3. Data

I use five data sources, the primary source providing price and sales data from 309 English markets during the period 1820 - 1864. Additional data sources complement my analysis by explaining the micro and macro trends during the time of the Corn Law repeal.

3.1 Primary Source



The principal data source for this study comes from *Corn Returns Online*, an online repository containing scanned data from the *London Gazette*, an official publication of the British government containing information about price and quantity of major ‘corns’. The ‘corns’ refer to wheat, barley, rye, oats and beans, which were produced in varying quantities all over England. The data were collected at the local market level, with several local markets from a county represented in the sample. Quantities are measured in bushels, whereas prices are

measured in shillings. Further, the observations were on a weekly basis, starting from October 1820 to December 1864. The figure here shows the market share by sales of each commodity in the sample over time.

Table 1: Summary of Prices by Period

Unweighted Mean Prices				Weighted Mean Prices			
	(1)	(2)	(3)		(1)	(2)	(3)
Period	1820-27	1828-42	1847-55	Period	1820-27	1828-42	1847-55
Wheat	7.09	7.36	6.79	Wheat	7.02	7.34	6.72
Barley	3.98	4.03	3.95	Barley	3.90	4.05	3.95
Oats	2.81	2.89	2.86	Oats	2.86	2.89	2.83
Rye	4.27	4.51	4.43	Rye	4.03	4.45	4.33
Beans	4.80	4.81	4.88	Beans	4.55	4.73	4.78

Unweighted Median Prices				Weighted Median Prices			
	(1)	(2)	(3)		(1)	(2)	(3)
Period	1820-27	1828-42	1847-55	Period	1820-27	1828-42	1847-55
Wheat	7.09	7.50	6.30	Wheat	7.08	7.54	6.23
Barley	4.08	3.96	3.94	Barley	4.08	3.99	3.92
Oats	2.83	2.89	2.66	Oats	2.88	2.90	2.64
Rye	4.25	4.48	4.25	Rye	4.05	4.35	4.13
Beans	4.86	4.79	4.75	Beans	4.68	4.70	4.63

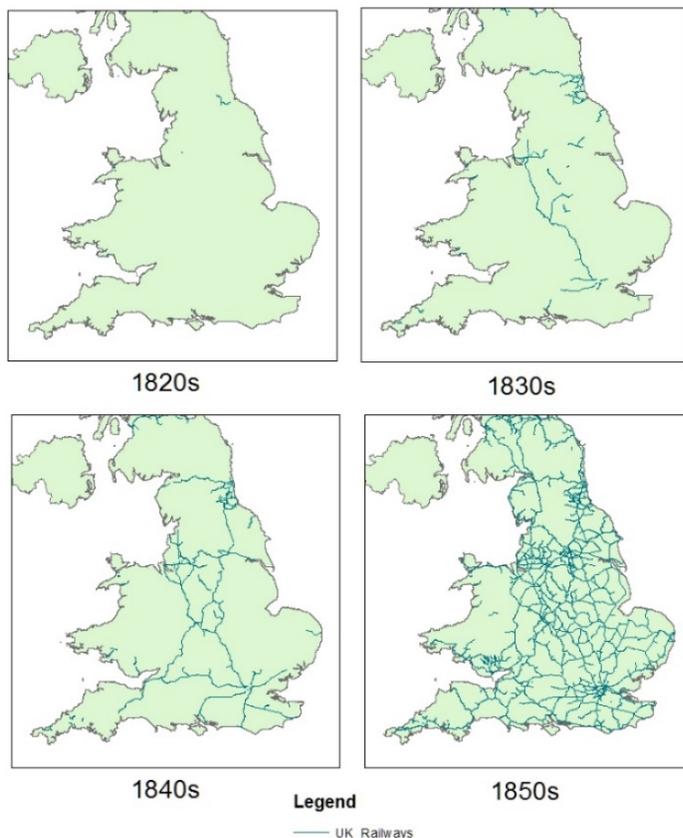
International Unweighted Mean Prices				International Unweighted Median Prices			
	(1)	(2)	(3)		(1)	(2)	(3)
Period	1820-27	1828-42	1847-55	Period	1820-27	1828-42	1847-55
Wheat	5.83	5.34	6.24	Wheat	5.25	5.61	5.60
Rye	3.77	3.45	4.26	Rye	3.24	3.57	3.98
Oats	2.38	2.27	2.27	Oats	2.32	2.28	2.07
Barley	3.32	2.97	3.75	Barley	2.87	2.98	3.58

Note: All prices are in shillings

The geographical extent of the primary source data is as follows: from 1820 the Gazette published the Returns from 139 markets from mainly coastal counties. The markets included changed somewhat in 1822 and 1823, followed by a more substantial change in 1828 when some larger inland towns were added to the list. Smaller Welsh towns were removed from the list at the same time. In 1842, the list expanded to include 290 markets, and continued with the same markets until 1864.

3.2 Secondary Sources

Secondary data sources for this study include data from *British Historical Statistics* by B.R. Mitchell published in 1988. The book contains detailed statistics about sources of British corn imports and exports,



often broken up by origin or destination countries. Additionally, Geographic Information System (GIS) software was used to map out the locations of all the markets on the list. Using market names in the primary data source, I plotted the latitude and longitude coordinates of the markets in ArcGIS software. The coordinate information was used to get information about (1) distances among markets, and (2) distances between markets and production regions of the crops represented in the primary data. Further, I used data from *Historical GIS of Europe* to ascertain distances of markets from railway lines, major roads and waterways. The figure here provides an example of the data, showing how the railway lines evolved from 1820 onwards.

Finally, census data are drawn from Great Britain Historical database (GBH). The data set includes county level observation on population from the year 1801 onwards, collected at 10-year intervals until 1911. Also I have made use of *Three Centuries of Data* made publicly available by the Bank

of England for exploration of concurrent trends in the English economy. Data used includes GDP estimates and other aggregate measures of the labor market, financial system and the money market.

4. Estimation Methodology

The determination of price, in equilibrium, takes place according to the following structural equations.

Since in equilibrium $Q_s = Q_d$, the equations may be rearranged to obtain

However, the supply and demand are subject to shocks, such as a decline in transportation costs or an increase in supply, modelled in the case of Q_s and Q_d as x and z respectively.

Thus, the equations characterizing supply and demand now become

Solving for the equilibrium condition of , we obtain

This allows us to estimate the following reduced form equations for P and Q in equilibrium, where the s can be solved for the s and s .

Since our variable of interest is price, I will estimate the following,

$$(1)$$

where: vector X includes dummies representing the three Corn Law regimes

vector Z includes the transportation variables

vector XxZ includes interactions of interest between X and Z

and other controls such as foreign price, market and year fixed effects are included but not shown. For robustness check, I include both nominal and real wheat prices as my dependent variable.

Secondly, I estimate transportation costs by decomposing the price of beans into production cost (at origin) and transportation costs required to ship the good from origin to destination. It is assumed that price at destination market is made up of two components, that is, the production cost and the transportation cost. For the following equation, I estimate coefficients and for all years available in the data.

$$(2)$$

where: p_{it} is the price at destination market i at time t

is the average price at origin markets at time t , and

is the crow-fly distance from origin market to destination market at time t .

5. Results

The estimation results for equation (1) in Table 2 portray a consistent story for the key variables of interest, that is, the regime dummies and the interactions between market distance to rail infrastructure and the regime dummies. Firstly, the prices faced by consumers do decrease with each successive wave of liberalization, and secondly, the distance to railroad infrastructure becomes increasingly important in significance in determining the final price paid in each market.

Table 2: Main regression - Variables of interest

(1)

(2)

VARIABLES	Wheat Price	Real Wheat Price
Foreign Price	0.915*** (0.00581)	0.715*** (0.00683)
period = 2, 1828-1842	-0.715*** (0.0450)	-0.00948 (0.0529)
period = 3, 1842-1846	-1.735*** (0.0299)	-1.367*** (0.0351)
Dist. to rail	-0.0342 (0.0226)	-0.0489* (0.0265)
period = 1 x raildist	Omitted	Omitted
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period = 2 x raildist	0.0726** (0.0287)	0.0954*** (0.0338)
period = 3 x raildist	0.211*** (0.0802)	0.239** (0.0942)
period = 4 x raildist	0.405*** (0.115)	0.441*** (0.135)
Year	-0.0642***	-0.000263
	(0.00150)	(0.00177)
Constant	120.1*** (2.764)	4.607 (3.249)
Observations	6,970	6,970
R-squared	0.951	0.890
Number of mkt	282	282
Market FE	YES	YES
Year FE	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

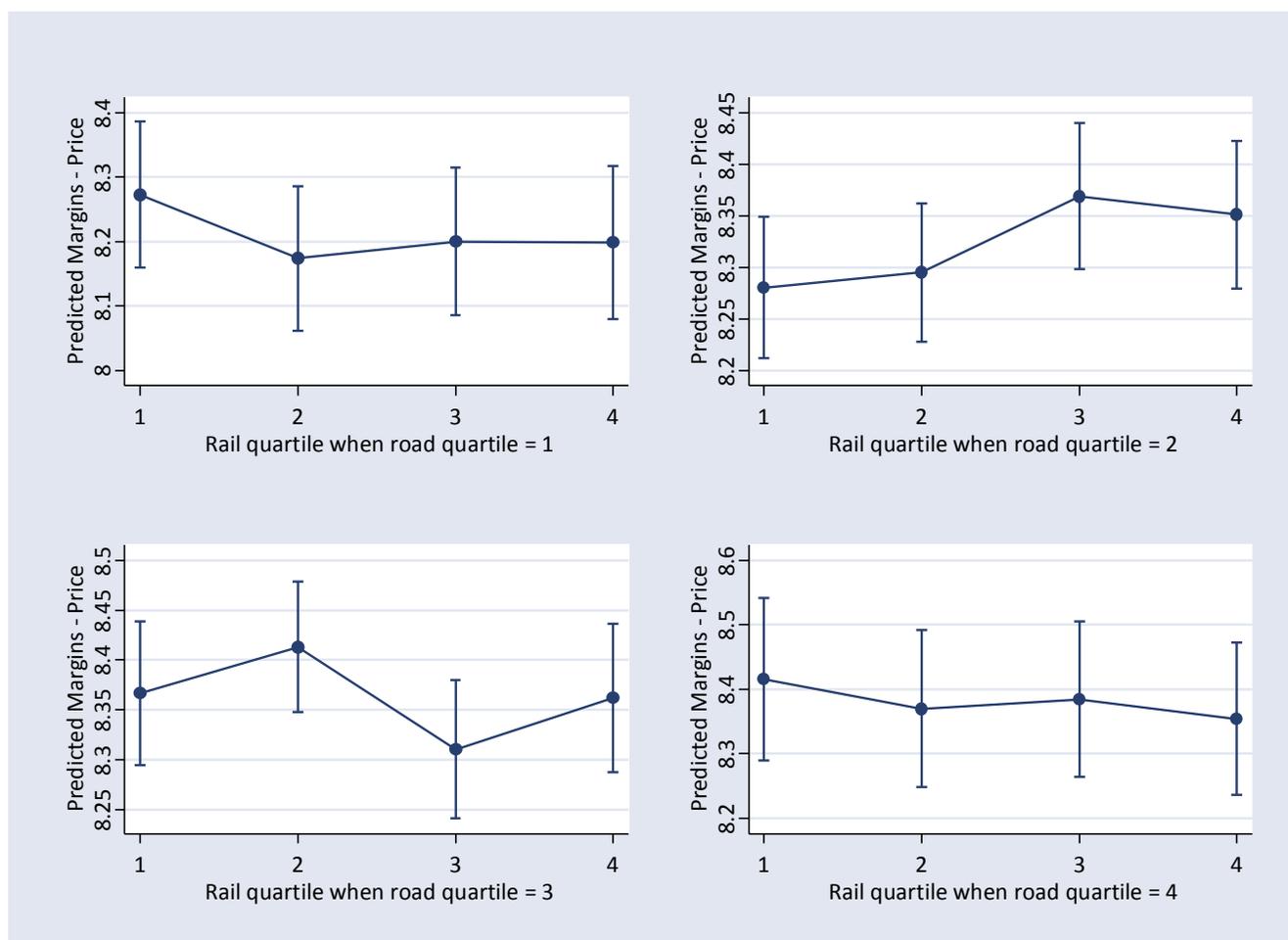
Period 1 = 1820-1827, period 2 = 1828-1842, period 3 = 1843-1846, Period 4 = 1847-1854

The periods correspond to different Corn Laws regimes, where 1 refers to total import ban, 2 refers to 80s. price ceiling, 3 refers to 66s. price ceiling & 4 refers to liberalization.

The coefficients in regression (1) and (2), having nominal wheat price and real wheat price respectively, differ to some extent with regards to the independent variables of interest and the control variables. Both models use market and time fixed effects, and have the same sign on all variables of interest, differing only in the magnitude and the significance level of the coefficients.

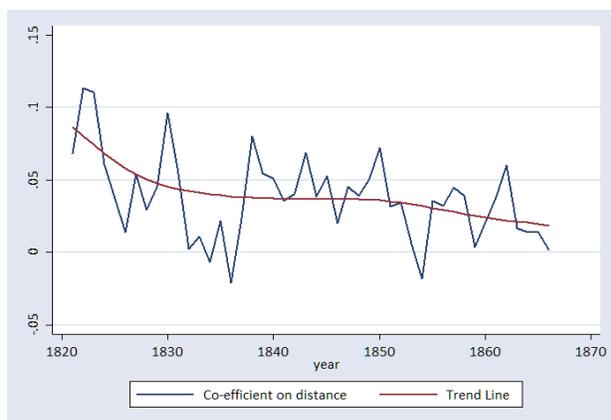
As expected, the coefficients on the period dummies are negative and successively increase in their magnitude, showing that the prices consistently decreased relative to the base period of pre-liberalization. The results are largely significant at the 1% level. Further, the coefficients on the transportation variables also bear the expected signs. On the variable distance to railway infrastructure, the coefficient is negative and significant at the 10% level. Although it might appear counter-intuitive at first, it must be noted that the variable mainly captures years before the proliferation of the railway structure. The main railway lines that were initially built connected only the big urban centers, and hence prices were higher (due to increased demand) the closer a market was to the railway infrastructure. In contrast, markets that lay away from the initial infrastructure were either producer markets or ports, and hence the prices observed in those markets were lower due to home-production or imports.

The increasing importance of the rail network in each period is demonstrated by the coefficients on the interaction between rail distance and period dummies. The coefficients are positive, significant at 5% level, and increase in magnitude with each successive period. This shows that the price premium paid for being at a unit distance away from the railway infrastructure increased with each period, demonstrating the increasing importance of the railway network in determining market prices.

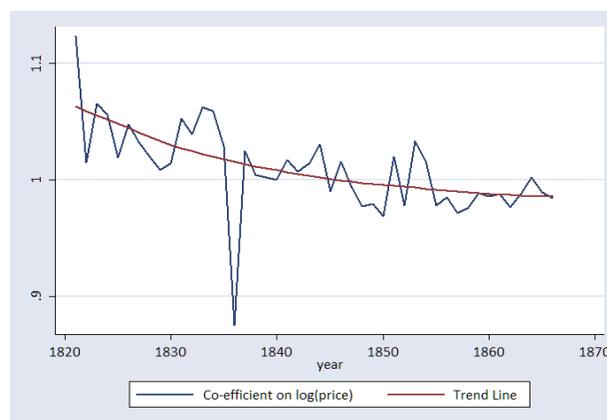


Marginal analysis on the interaction between road quartile, a variable that represents market access *before* liberalization, and rail quartile, a variable that represents market access *after* liberalization, delivers interesting results. Those markets with initially good market access (road quartile = 1) seem to consistently display lower prices even when they ended up in the fourth quartile of rail network after liberalization. In comparison, those in road quartile 2 initially show an increasing trend as the market ends up in higher quartiles of distance to rail infrastructure. Overall, the figure shows heterogeneous effects in markets depending on their initial and final positions in relation to infrastructure after successive waves of development peaking in the 1840s.

5.1 Transportation costs



(a) Distance co-efficient for beans



(b) Log(price) coefficient for beans

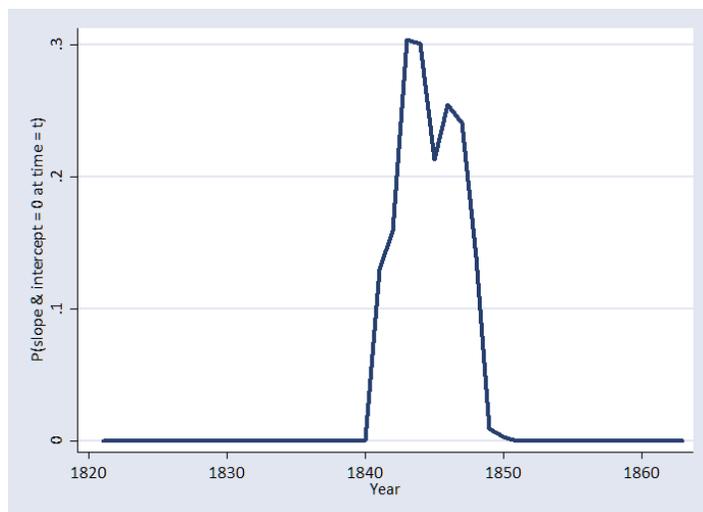
The regressions estimating transportation costs show a trend consistent with the coefficient on reaching unity with time as the prices at the origin and the destination converge.

The coefficient in (a) can be interpreted as follows: for a unit percentage change in price at origin, the price at the destination changes by a unit percentage as well with the improvements in infrastructure and greater domestic market integration. Further, the expansion in transport infrastructure is meant to make the distances less of a factor in determining the final prices of products. Hence, it is not surprising to observe that the coefficient approaches the value zero just as the coefficient approaches unity as shown below.

The changes in over time can be interpreted as evidence of the fact that improvements in infrastructure resulted in lower prices for the consumers. For a unit percentage rise in distance between origin and destination markets, the price at destination increased by almost nothing. Hence, this is further evidence that improved transportation networks reduced the contribution of distance-based costs from the final price paid by the consumers.

5.2 Robustness checks

In order to test for the robustness of my results, I have performed the regressions on both real and nominal wheat prices, and the results seem to hold for both the dependent variables. Further, I conduct a Chow test with a dummy variable testing for a structural break in the sample. The dummy variable is described as follows:



I conduct this test to ascertain the point at which transportation costs began to matter in the determination of prices with the expansion of railway infrastructure. The results of the Chow test on the dummy variable are summarized in the graph here.

The figure shows that the break in the sample can be considered to have occurred around the year 1840, the point where the dummy ceases to be statistically significant at the 10% level as much of the variation in railway infrastructure takes place post-1840. Alternatively, the sample can be

considered to have structurally changed around the year 1850 when the dummy variable becomes statistically significant at the 10% level again. This is the point when all the variation in railway infrastructure more or less comes to an end, and hence the sample exhibits a clear break before and after 1850.

6. Conclusion and further work

The paper has shown that removal of protectionist barriers was successful in lowering the cost of consumption for major staple goods in England. However, not all sections of the English public were able to benefit from the liberalization. Indeed, certain sections of the population actually ended up being worse-off compared to the pre-liberalization state. I show that improvements in transportation networks, most importantly railways, is an important predictor of such deviation in national prices.

Methodologically, price deviation from national and international markets has been used to study the distributional implications of the repeal. I also show that the transportation costs declined in England due to a proliferation of railroads and waterways in the decade following initial tariff reduction. The private entrepreneurs detected an opportunity to profit from potentially increased flows of good flowing into England, and thus made investments that reduced transportation costs further in the country. This also had an impact on grain prices as they experienced a further reduction due to lower international and intra-national transportation costs.

The main contribution of this paper lies in the combined use of very different data sources in order to further understand the Corn Law repeal of 1846. Although it was a well-known fact that the liberalization worked by allowing imports and consequently reducing the price of major staple goods, my paper shows that the distributional impacts can be potentially attributed to markets access. Several extensions are also possible to the paper's findings which are detailed below.

Firstly, the distance based measures included in my analysis are only based on what is called the 'crow-fly' distance, i.e. the straight line distances from the markets to the production areas. This does not take into account the terrain and any other features of the counties that might make access difficult e.g. non-availability of mean, road and canal infrastructure. Secondly, the region and market-specific factors can be studied further. What else, apart from infrastructure, could have led to a higher decline in prices compared to other markets? Enriching the data with further sources might help in disentangling the causal relationship further. Econometrically, this the data used for this study has a panel spanning many time periods (large t) and a large number of units studied (large n). Further analysis should take into account issues such as stationarity of the data, meaning that the mean, variance and autocorrelation structure of the data do not change over time. Lastly, taking advantage of the large span of this dataset, tariff pass-through from producer to consumer areas can be studied to understand the price transmission mechanisms better.

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