



Wheat, globalization and history

Guest lecture for *Europe in the World Economy*
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What I will talk about

- Why wheat?
- Why the nineteenth century?
- Why wheat in the nineteenth century?!
- What I have been working on...
- ... and how research can sometimes progress in unexpected ways!



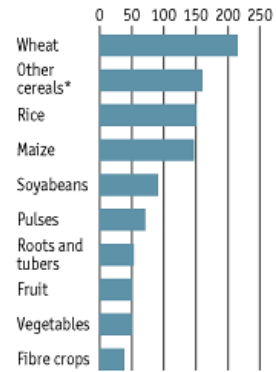


Why wheat?

- Some interesting snippets from the *Economist's* article on "The Story of Wheat", December 24, 2005:
- In the last 10,000 years, the world's population has doubled ten times.
- Most of the calories used to support this come from three plants: maize, rice and especially wheat.
- "To a first approximation wheat is the staple food of mankind, and its history is that of humanity."
- But wheat is now declining in importance...

Wheat leads the field

World crops, 2004, m hectares



* Barley, rye, millet, etc

Source: Food and Agriculture Organisation



Why the 19th century?

- Extraordinary parallels with the 20th century:
 - Almost constant wars from 1760-1820 (compare to 1914-1980s)
 - Decline in barriers to trade, capital thereafter.
- "History doesn't repeat itself, but it rhymes." – Mark Twain
- We can better understand the present by understanding history. Applies equally well to economics!



The First Era of Globalization

- Globalization is considered by most to be a modern phenomenon.
- In fact, the world was as globalized before WW1 as it is today:
 - Commodity markets: Low tariff barriers to trade, high trade / GDP ratios.
 - Capital markets: The gold standard *required* perfectly free capital mobility.
 - Labour markets: Age of mass migration.
 - Currency unions fashionable.

“If we do nothing, what then? Why, we shall be left out in the cold. Before long, all Europe, save England, will have one money, and England be left standing with another money.”

– Walter Bagehot, editor of *The Economist*, ca. 1860.

“We have established free trade with every other country. We have admitted their goods, and we have admitted their ships, and we have done everything to promote intercourse; and this scheme of an international money is the next great step – as it seems to me – to further communication.”
– Stanley Jevons (inventor of marginal utility theory)



After World War 1

- Great depression.
- Rise of fascism.
- Belief in autarky, barriers to trade etc.
- World War Two.
- Cold War.
- Only now have we reached comparable levels of “globalization”.





Why wheat in the 19th century?

- Around 1850 between a half and two thirds of the income of British workers was spent on food and drink, most of which was grain based.
- Wheat was the first commodity to be “globalized”, i.e. experience market integration on a global scale.
- “On the market place in Nikolaiev (one of the most important southern ports) I had an opportunity to observe a fact which a short time ago would have been altogether incredible. The peasants on arrival at the market with their grain were asking “What is the price in America according to the latest telegram?” And what is still more surprising, they know how to convert cents per bushel into kopecks per pood.” – Russian Counsellor of the State Miller (1903)



Background to this lecture

- Three papers I have written for my PhD thesis
 - 1846 and All That
 - Pushing Wheat
 - The Long Grain Invasion of Britain
- Note the progression of research!



1846 and All That: The rise and fall of British wheat protection in the nineteenth century



A Short History of the Corn Laws

- These were the laws governing the duties payable on the import of grain. (Corn = grain in British English)
- They were designed to stabilize prices and protect land owners.
- As the landed aristocracy lost power, pressure for repeal grew. Seen as a "tax on bread".
- Led to establishment of the most famous (and successful) political lobby organization (ever?), the Anti-Corn Law League.
- The League helped found

The Economist

OR
THE POLITICAL, COMMERCIAL, AGRICULTURAL, AND FREE-TRADE JOURNAL

- in 1843 to campaign for free trade.



A Short History (cont.)

- Pressure for repeal built up especially after the onset of the Irish Potato Famine
- The debate caused political turmoil.
- The Conservative Prime Minister, Sir Robert Peel, became convinced that repeal was necessary.
- But the Conservatives traditionally supported the landed interest! The Conservative Party split in two.
- The Corn Laws were famously “repealed” in 1846.



The Corn Laws prior to 1828

- First regulated imports from 1660.
- Became irrelevant during the Napoleonic Wars.
- With peace in 1815 prohibitive tariffs were operational in most years until 1828.
- In the following I discuss the duties on foreign wheat: other grains and colonial wheat were subject to different duties.



How did they work (until 1849)?

- Two main issues of importance here:
- There was no duty payable on import: Imports could be stored in "bonded warehouses". The duty was payable on release from bond.
- The duty payable depended on the *Gazette* price: an average of the last six weeks' average prices of wheat sold recorded in the *Gazette* newspaper.



The Duke of Wellington's Sliding Scale of 1828

When the price of wheat was...	... the duty payable was...
73 and above	1
72-73	2.67
71-72	6.67
70-71	10.67
69-70	13.67
68-69	16.67
67-68	18.67
66-67	20.67
	+ 1 for every shilling decrease in price

All prices in shillings per imperial quarter.

Note the non-linearity of the sliding scale!



The Corn Laws after 1842

- A reformed sliding scale was in effect from 1842-6 (with lower duties).
- After “repeal”:
 - A new sliding scale from 1846-9.
 - A fixed “nominal registration duty” of 1s. per quarter from 1849.
 - Registration duty abolished in 1869 (briefly reintroduced from 1902-3 to pay for the Boer War).
 - Free trade until 1932.



Estimating *ad valorem* equivalents (AVEs)

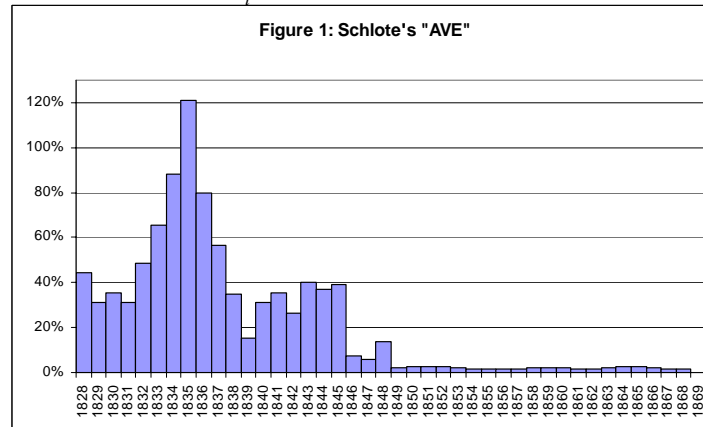
- Information requirement of specific duties far less than for *ad valorem* duties.
- How to convert specific duties to AVEs? (WTO negotiations broke down over this!)
- Two methods:
 - Unit price: Specific duty compared to reference price.
 - Revenue method: Tariff revenue / Value of imports.



Previous attempts: Schlote

Intuitive method for creating annual AVEs: (Unit Price Method)

$$AVE_t = \frac{D_t(P_t)}{P_t}$$



Schlote (cont.)

- Problems with his method:
- The duties payable varied weekly.
- Traders released grain from bond at times of lowest duties payable. (Vamplew)
- By withholding grain, traders could force the price higher to release it at e.g. 1s./qr.
- Schlote's estimates are too high!
- Use average of weekly AVEs? Gives no weight to weeks with highest duties!



Other estimates

Fairlee, Williamson: Based on law of one price:

$$P = (1+t)(P^* + \tau)$$

Two main problems:

- These estimates are for whole periods of a tariff regime, so hide the true yearly (weekly!) variation.
- O'Rourke has shown that the law of one price did not apply for periods of highest duties payable.



McCloskey: Estimates based on the Revenue Method

Revenue Method: Tariff revenue / Value of imports

Pros:

- Does not rely on assumption of law of one price.
- Easy way to get annual estimates.

Cons:

- How to value the imports?
- How to take account of prohibitive tariffs?
- Imports only (meaningfully) valued from 1854.



My estimates

- Revenue collected on wheat: I found records of this in old Parliamentary papers.
- Prior to 1849: Imports = foreign wheat released from bond.
- After 1849: Imports = all imported wheat.
- Value of imports: the method used from 1854 seems to be approx. quantity of imports * *Gazette* price. Is this appropriate?



How to value the imports

- Three alternatives:
 - Use (high) price at which wheat released from bond (gives smaller AVEs).
 - Use (smaller) foreign price (gives larger AVEs).
 - Use *Gazette* price!
- WTO draft guidelines: "Calculation of AVEs is not an exact science"!



Summary

1828-1849:

$$AVE_t = \frac{(Duties\ collected)_t}{(Quantity\ released\ from\ bond)_t * P_t}$$

where all values are for *foreign wheat only*.

1850- :

$$AVE_t = \frac{(Duties\ collected)_t}{(Quantity\ imported)_t * P_t}$$

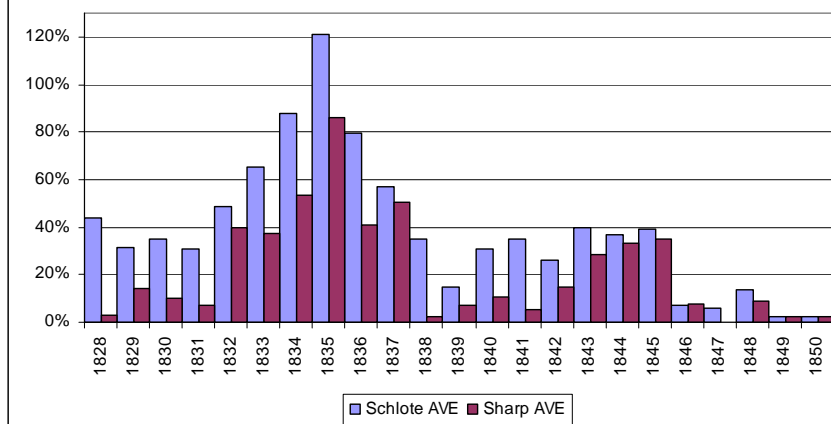
where all values are for *both foreign and colonial wheat*.

P is the *Gazette price*.



Results

Figure 3: Comparison of Schlote's and Sharp's AVEs



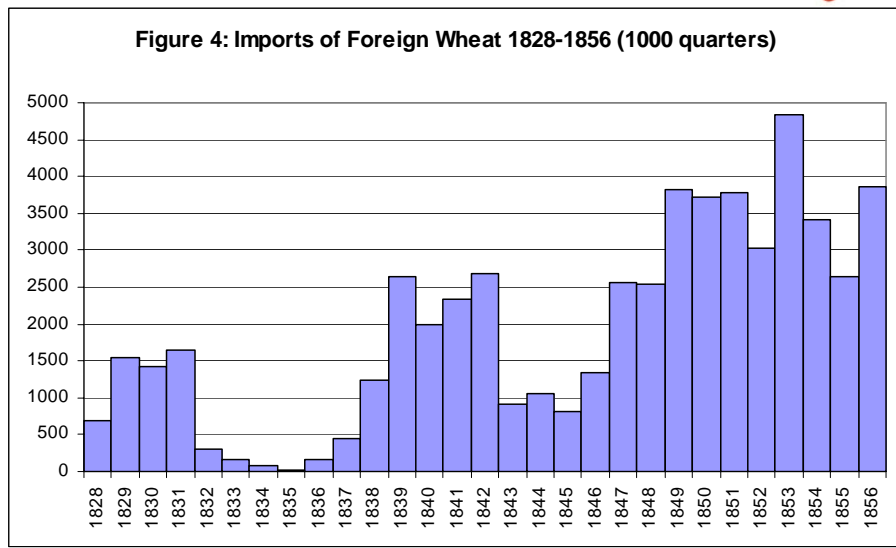


Why these estimates are nice!

- Contemporary sources: Years of least protection 1828, 1838 and 1841.
- Fits in nicely with data on imports of foreign wheat.
- Refutes prevalent claim amongst world historians that the Corn Laws debate was “much ado about nothing”. (As economists we perhaps don't want to hear that!)



Foreign imports





Comparison of average estimates

	Fairlee	Williamson	Schlote	Sharp
1828/9-41	20%	54%	51%	28%
1842-45	10%	22%	36%	28%
1846-48	4%	N/A	9%	6%

- Williamson's (famous) 54% estimate is too high (compare to Schlote!).
- Protection did *not* fall in 1842: why the debate was so urgent?
- Quantifies Vamplew's contention that the protection afforded by the Corn Laws was not as high as is usually supposed.



Pushing Wheat: Why supply mattered for the American grain invasion of Britain in the nineteenth century



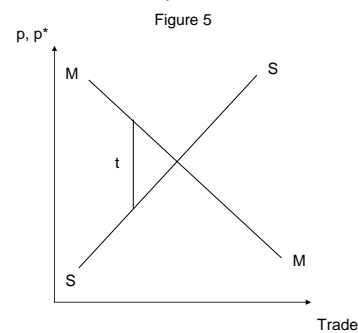
The American grain invasion

- An important part of the story of the “first era of globalization”
 - The development of an “Atlantic economy” in wheat in the nineteenth century
 - Protectionism declines at beginning of nineteenth century
 - Large amounts of cheap American wheat flood into Europe
 - Some markets remain open (UK, Denmark)
 - Others return to protection (Germany, France)
- What caused this invasion?



Idea of this paper

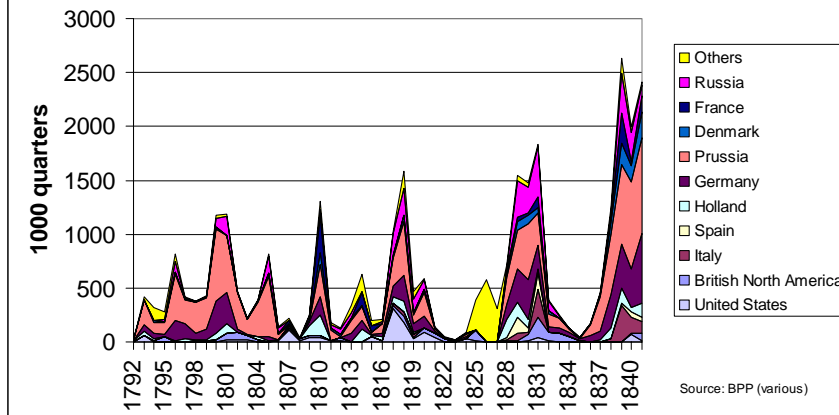
- The increase in trade is usually attributed to declines in the price gap (= globalization)
- This is contrasted with earlier periods of trade expansion, fuelled by supply shifts
- Transport costs?
- Tariffs?
- Recent work has suggested not!
- So what caused the invasion?
- Using a new database of relevant variables, I look at what the data can tell us





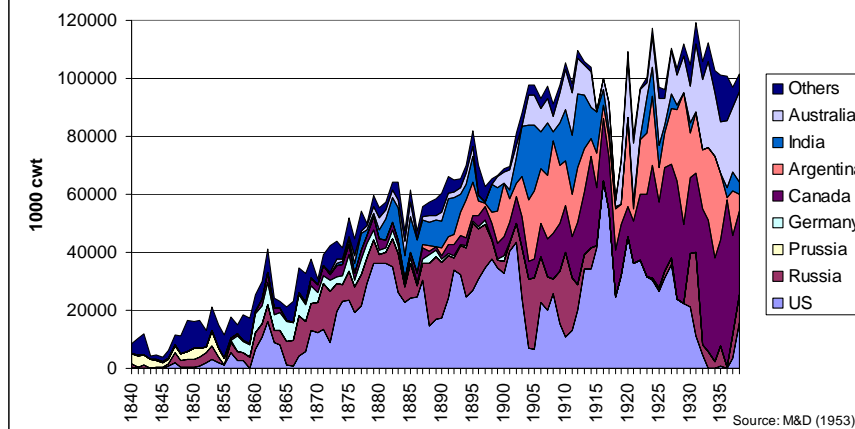
A relevant question: Was there an invasion?

**Figure 1: Imports of wheat to UK
1792-1841**



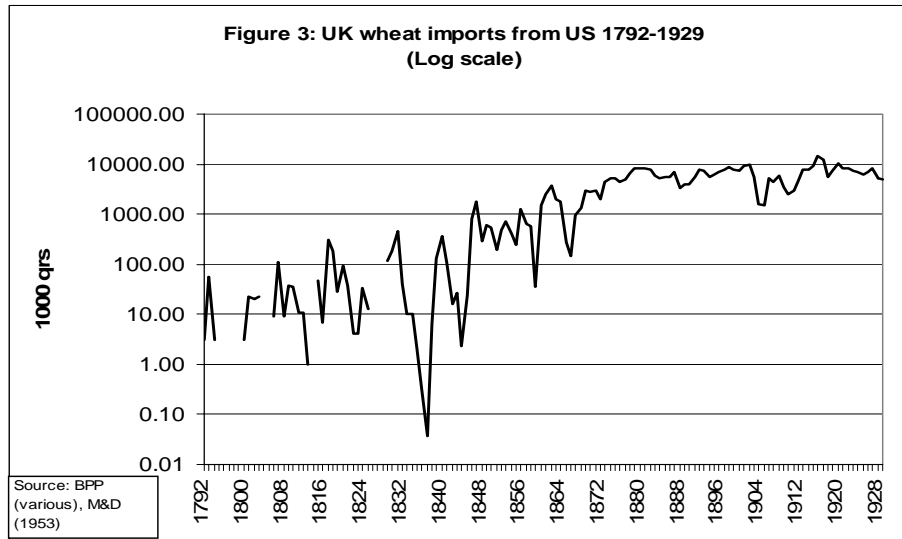
A New World Invasion?

**Figure 2: Imports of wheat to UK
1840-1938**





Not a sudden break



Data selection

- Impossible to test model directly
- To test theory, necessary to assess importance of
 - Demand factors
 - Supply factors
 - Price gap
- All relevant variables expressed per *UK* capita, thus abstracting from the demand effects
- Looking for a simple demand relationship for a representative consumer for US wheat:

$$m = f(x_{UK}, x_{US}, z)$$

- Logarithms taken for the empirical analysis

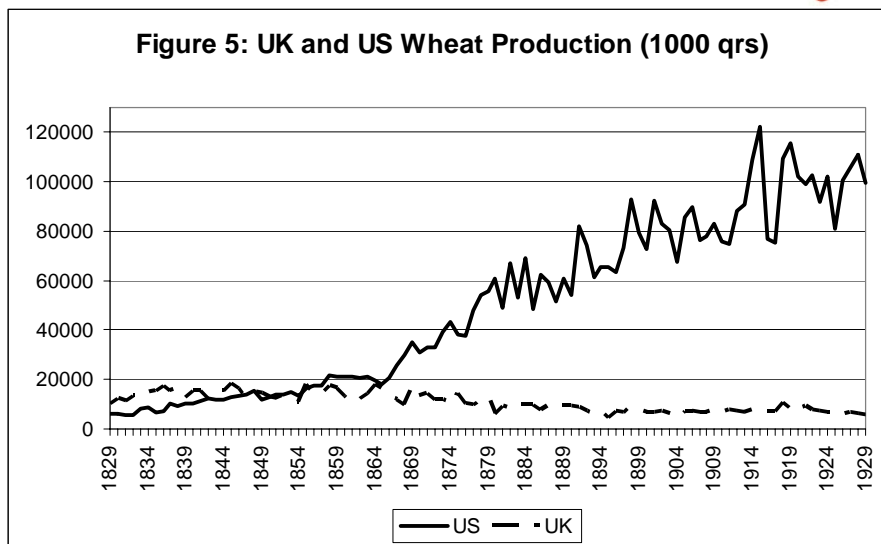


The supply side

- UK data:
 - Official estimates from 1884
 - Unofficial estimates from 1853 (Rothamsted)
 - From 1829 from Fairlee, based on statistics for wheat sold
- US data:
 - Before 1866 from decennial census
 - Gaps filled in with other official estimates and in very early years from descriptions of the harvest
- The graph shows it is clear that the supply side must be taken seriously



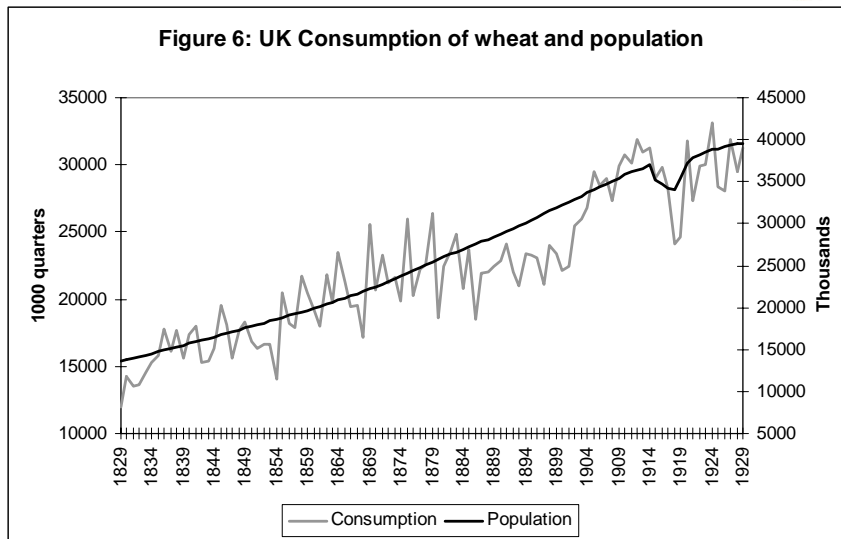
The supply side





The demand side

Figure 6: UK Consumption of wheat and population



The price gap

- Should ideally be the relative price of wheat in the two countries, but
 - Which variety to use?
 - Is the data available?
 - Would this be representative?
- Use a simpler measure, the “explainable” price gap:

$$z = \log(ave + ff)$$

- Expresses tariff and transport costs in *ad valorem* terms
- Values wheat using UK average price:
 - Cif price not available before 1854
 - Consistent, standardized quality of wheat
 - Uses post-1854 method
 - Has interpretation as %age of UK price paid in freight and duty



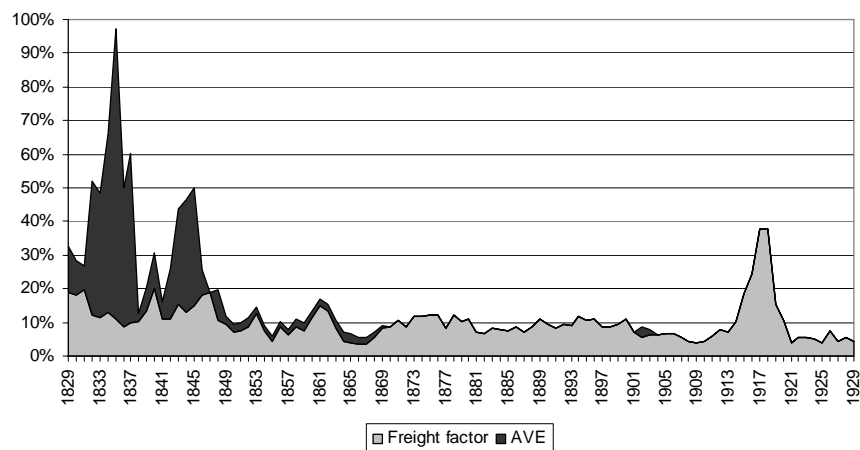
Why not include domestic US transport costs?

- Recent work has shown US domestic transport costs to be declining far more than Transatlantic
- The data is, however, only available from the 1950s
- It is not clear that there was a great decline in the cost of getting wheat to the East Coast, because the centre of gravity of wheat production was moving westwards



The price gap

Figure 7: Transport costs and tariff protection





What explains the increase in trade if not falling transport costs?

- Persson's (2004) conjecture
- *...the growth in world grain trade [could have been] driven by a downward shift in the New World supply schedule and/or a change in the supply schedule – its becoming more price-elastic as nations with practically unlimited supplies of land were populated by immigrants.*
- Evidence for this would be that imports are strongly influenced by supply
- US supply not impacted on by price gap



The econometric method: Juselius (2006)

- Period 1838-1929
- Find a model that fits the data, starting with a very general model:
$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma\Delta X_{t-1} + \mu + \Phi D_t + \alpha\beta_0' t + \varepsilon_t$$
$$X_t = (M_t, Z_t, XUK_t, XUS_t)'$$
- "Extreme events" are modelled using dummies
 - High tariffs, harvest failures, measurement error
- Look for combinations of variables which cointegrate
 - Stationary linear combinations
 - Can be interpreted as long-run equilibrium relationships
- Set insignificant coefficients to zero



The long-run relations

- Can be described as “sophisticated” stylized facts
- Coefficients in the beta matrix can be interpreted as elasticities

Two long run relations:

1. Between UK imports and US wheat supply with an elasticity of 3.1 and a t-value of 13.5 (very robust result!) – only a minor role for the price gap
2. Between US and UK wheat supply with an elasticity of -0.6



A sophisticated stylized fact!

- The expansion of trade in wheat was *not* mainly attributable to “globalization” of commodity markets!
- Might therefore have more to do with “overseas trade boom” of 1500-1800 than previously suggested



Conclusion: Is it surprising that the US production expansion was important?!

- The answer must be no!
- By 1900 the UK was importing just under 10 million quarters of US wheat
- This was roughly equivalent to the US's entire production at the beginning of the 1840s!
- By the First World War the US was producing over 100 million quarters
- But what caused the expansion of supply?



The Long American Grain Invasion of Britain:
Market integration and the wheat trade between
North America and Britain from the Eighteenth
Century



Idea of this paper

- Provide a long term perspective to the development of the Atlantic Economy in wheat
- Nearly all focus has been on the 1800s
- I extend this back to the 1700s
- I argue for the importance of grain imports from America to Britain based primarily on
 - “New” data on wheat imports since 1697
 - A considerable amount of non-statistical primary evidence
- I follow the idea put forward by O’Rourke (2006) that market integration (globalization) might have started prior to the late 19th century, but was interrupted by a series of events



The Grain Invasion

- Much scholarly focus has been on the American “grain invasion” of the late 19th century
 - Unprecedented volumes of US wheat poured into Europe and in particular the UK
 - The development of an “Atlantic economy”
 - The beginnings of “globalization”
 - *Transport costs* considered all important!
- It seems that contemporaries considered the importance of American wheat to be a new phenomenon
- Economic historians seem until recently to have been content to accept this!
- Recent work has only gone back to the early nineteenth century

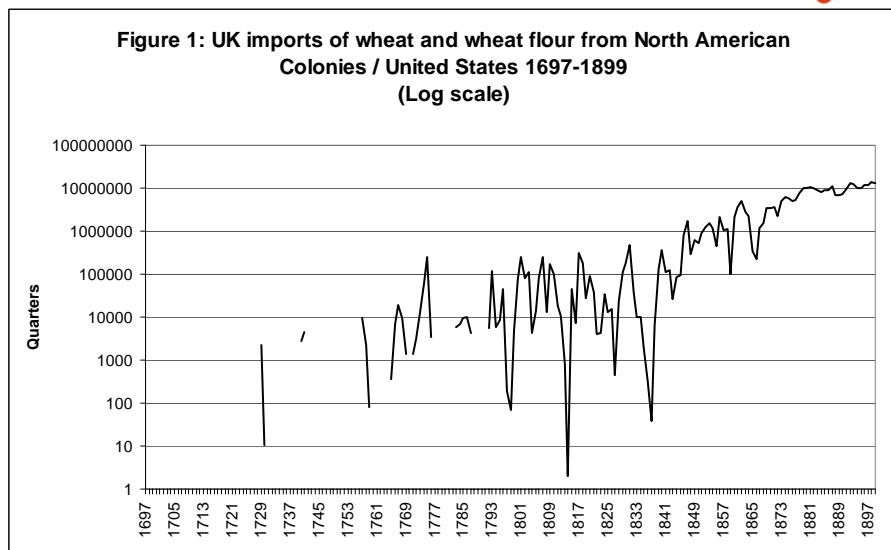


One exception

- Galpin (1922, 1925) investigates the grain supply of the UK during the Napoleonic wars
- Remarks that the "importance... of American grain in English history presented itself for the first time during the Napoleonic era"
- But it seems he only has data going back to 1792



What do the data show?





What do the data show?

- Extending the data backwards might suggest that the "invasion" started in the 1770s
- During the grain invasion era, the series levels off!
- But there are large swings before the 1870s due to (exogenous) events
- This should have impacted on market integration – the O'Rourke hypothesis



What did contemporaries experience?

- In the first half of the 18th century, concern was focused on the problems of competing with American wheat exports
- Parliamentary select committees in 1713 and 1737 heard about the problems of competing with American wheat for European markets
- Petitions were presented on this in 1742 (by farmers) and 1749 (by merchants)



Letter from William Ellis (a farmer) in 1742

- Expresses concern that Americans
 - “by their great Increase of Land... have been tempted... to carry on the Cultivation of Corn, and have made such Progress in its Improvements, that they are become Masters of prodigious Crops of Grain, especially the finest of Wheat, by enjoying, perhaps, one of the best Opportunities the World affords”
 - “they have the richest of Land both dry and wet, a very potent Influence from the Sun’s Heat, their Acknowledgement or Rent, little or nothing, their Slaves labour for a Trifle Charge, and withal *the great Cheapness and Conveniency of Water Carriage for transporting their Corn into Europe, to the infinite prejudice of Great-Britain.*”

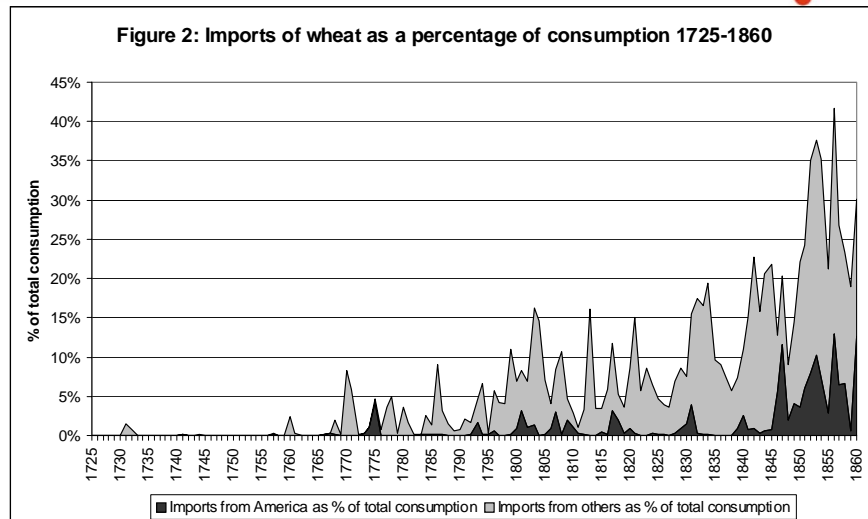


The Industrial Revolution: Britain becomes net importer

- Commentators from the 1770s start to look to America for supplies of grain
- A report of the British Privy Council in 1790 concluded that “whenever the crops fail, in any degree, the deficiency can only be supplied from the harvests of America”
- British Board of Agriculture (1800): “America be, or is hereafter to be the granary of Europe”
- So what happened?
 - Trade policy becomes prohibitive after Napoleonic Wars
 - Discussion of US wheat becomes confined to smuggling of (small) quantities
 - By 1827 William Jacob’s famous report on the “Agriculture and Corn of some of the Continental States of Europe” was just that!



Imported wheat as a percentage of consumption



Importance of US imports

- Consumption is assumed to be 0.9 quarters per annum per head of population
- This is probably an overestimate for many years – in particular during times of scarcity
- But whatever the case, for many years around 1-4% of the population were being supplied by US wheat: Not at all insignificant
- But there are large fluctuations – what explains those?



Harvest failure in Britain?

- This seems to explain well the early fluctuations
- Evidence from Jones (1964)
- "Great dearth" in 1728, 1729 – first imports from US in 1729
- 1730 to 1739 "good harvests" – no imports
- 1739, "late, wet harvest", 1740 "extraordinary scarcity" – imports again in 1740
- Harvests then excellent until 1755 – no imports
- 1756 "year of scarcity" – imports in 1756, 1757
- Success of US imports results in embargo on "all American vessels laden with corn, flour, &c" in 1757
- Harvests then good until food riots of 1766-68 – embargo on exports from England and "Act for allowing the importation of wheat and wheat-flour from His Majesty's Colonies in America... free of duty" in 1766, continued in following year
- This is nothing new: it has long been noted that times of import were associated with harvest failure
- But it is interesting that the American colonies were also looked to for this supply



From 1770: Britain becomes net importer of wheat

- Imports seem to react in the usual way to bad harvests in 1771 and 1772
- But in 1773 harvests are "fine", unremarkable but not bad in 1774 and "plentiful" in 1775 – but these years see the beginning of large-scale imports from the US
- From this time there is no clear correspondence between imports and scarcity at home



The importance of trade policy

- Corn Law of 1774 marks beginning of period of practically free trade in grain
- There was a reversal in 1791, but the onset of the French and Napoleonic Wars made the Corn Laws irrelevant
- It is surely no coincidence that the first large scale imports of US grain occur in this period
- Imports decline dramatically with extreme protectionism after the Napoleonic Wars
- Trade policy becomes more liberal in 1828, but the levels of protection fluctuate. Imports from the US are clearly correlated with these fluctuations (Sharp 2006)
- The (almost) permanent importance of US wheat is from the repeal of the sliding scale in 1849



What explains the long periods without imports from America after 1775?

- The American War of Independence 1775-83
 - British invade Philadelphia region (main area of flour production) in 1777
 - Target merchant mills
 - Washington orders removal of millstones to prevent British acquiring flour
 - 1776 British blockade
 - 1778 American embargo
- Invasion of the Hessian fly from 1776
 - Decimates crops
 - Results in ban on American imports from 1788
 - Reversed in 1790, but Hessian fly arrived in Delaware and Maryland in 1792
 - US exports almost cease, but UK keeps looking to the US for supplies



The recovery

- Large imports from the US arrive in the first decade of the 19th century
- Helped by Napoleon's Continental System from 1806
- Despite US embargo from 1807, illegal imports continue to arrive, and Napoleon soon gives up starving Britain, and allows French exports of grain!
- War of 1812-15 resulted in British blockade of American coastline
- Some scholars have suggested that a combination of the Hessian fly and the wars helped ensure America's later success by stimulating innovation in production

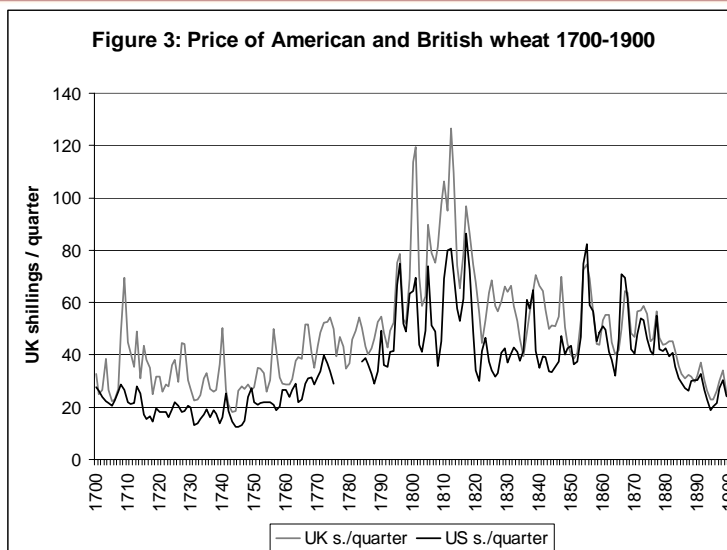


What role for transport costs?

- North's data (available from 1790) shows transport costs highest in 1799-1801 and again in 1807-13, then 1829-31 and 1845-7
- These years saw the greatest imports!
- Probably large imports increased demand for shipping and pushed up costs
- Sketchy evidence exists before these dates:
 - 1773: 8s./quarter: freight factor of around 15%
 - 1791: 8s. 8d./quarter: freight factor of around 17%
 - For comparison freight factors were around 18% from the 1820s to 1840s and around 12% for much of the "grain invasion" period
- At no time do transport costs appear to be an important barrier to trade
- The point: ocean transport has never been expensive (see Ellis quote)



UK and US prices 1700-1900

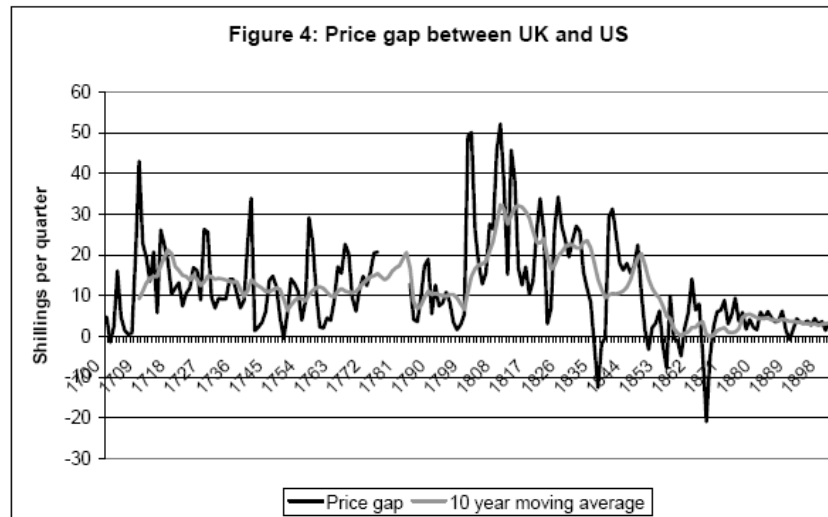


Impact on market integration

- If we want to test the O'Rourke hypothesis, it is necessary to look at prices
- Cointegration is tested for using *dynamic OLS*

$$p_{uk,t} = \beta_0 + \beta_1 p_{uk,t-1} + \beta_2 p_{uk,t-2} + \beta_3 p_{us,t} + \beta_4 p_{us,t-1} + \beta_5 p_{us,t-2} + \beta_6 t + \varepsilon_t$$

- Find an elasticity between prices of 0.93 for 1700-1900
- 0.78 for the 1700s alone
- Markets are clearly integrated already in the 1700s
- Price gaps are also important
- But seem to correspond well with trading costs



The clincher!



- If US supply was so important, why wasn't the Anti-Corn Law League founded in 1791, with the return to prohibitive tariffs?
- Answer: perhaps it almost was, but the wars intervened
- Many petitions were presented to Parliament in 1791, making clear the importance of US supply
- For example, a petition from "the Mayor, Merchants, and principal Inhabitants of the City of Bristol" states explicitly that "the Western Part of the Kingdom does not grow Corn sufficient for the Consumption of its Inhabitants" and relied on imports "chiefly from America" through the port of Bristol



Conclusion

- Several important points:
 - Supply from America had been important long before the famous grain invasion
 - Transport costs are not an important explanatory variable!
 - Fluctuations are easily explainable, and this might add weight to the O'Rourke hypothesis
 - There is indeed evidence for periods of greater market integration prior to the late nineteenth century