Globalization and Divergence: Geography Matters

Nicholas Crafts

The Solow Model in a Globalized World

- $Y/L = A(K/L)^a$

- Diminishing returns to capital accumulation

- Technology universal

- Factors mobile, K/L equalized across countries

- Beta and sigma **convergence**

20th vs. 21st Century

- "*The restoration of inter-society income equality will be one of the major economic events of the century to come*" (Lucas, 2000)

- So divergence will be superseded by convergence and normal (neoclassical) service will be resumed

Lucas's Underlying Argument

- **Obstacles to growth removed** through imitation of good policies, institutions

- In a globalized world, capital mobility and financial liberalization relax the savings constraint

- **Speed of catch-up growth will increase** markedly and K/L and TFP gaps will be rapidly reduced

Why Might the Solow Model Be Wrong?

- **TFP is not the same** across all countries because either efficiency or technology is not universal

- Obstacles to factor mobility prevent equalization of K/L

- **Geography, institutions or economic policies** differ

Divergence Big Time

- Persistent and widening income gaps characterize modern economic growth era

- Institutional/policy failures matter much more when growth opportunities increase BUT there is a **strong spatial correlation of development outcomes**

- Does this mean that geography undermines the mainstream assumption of a 'level playing field' for development ?

Geography and Income

- Geography may preclude full convergence

- Natural resources and market access; **1st and 2nd nature** aspects

- Direct and indirect effects

- Indirect effects may work through institutions, e.g. 'natural resource curse'

Changes in 19th-Century Economic Geography

- **Industrialization and de-industrialization** in globalizing world

- Concentration of world manufacturing production and, even more so, exports

- Changes in location influenced by transport costs in the **First Unbundling** (Baldwin, 2012)
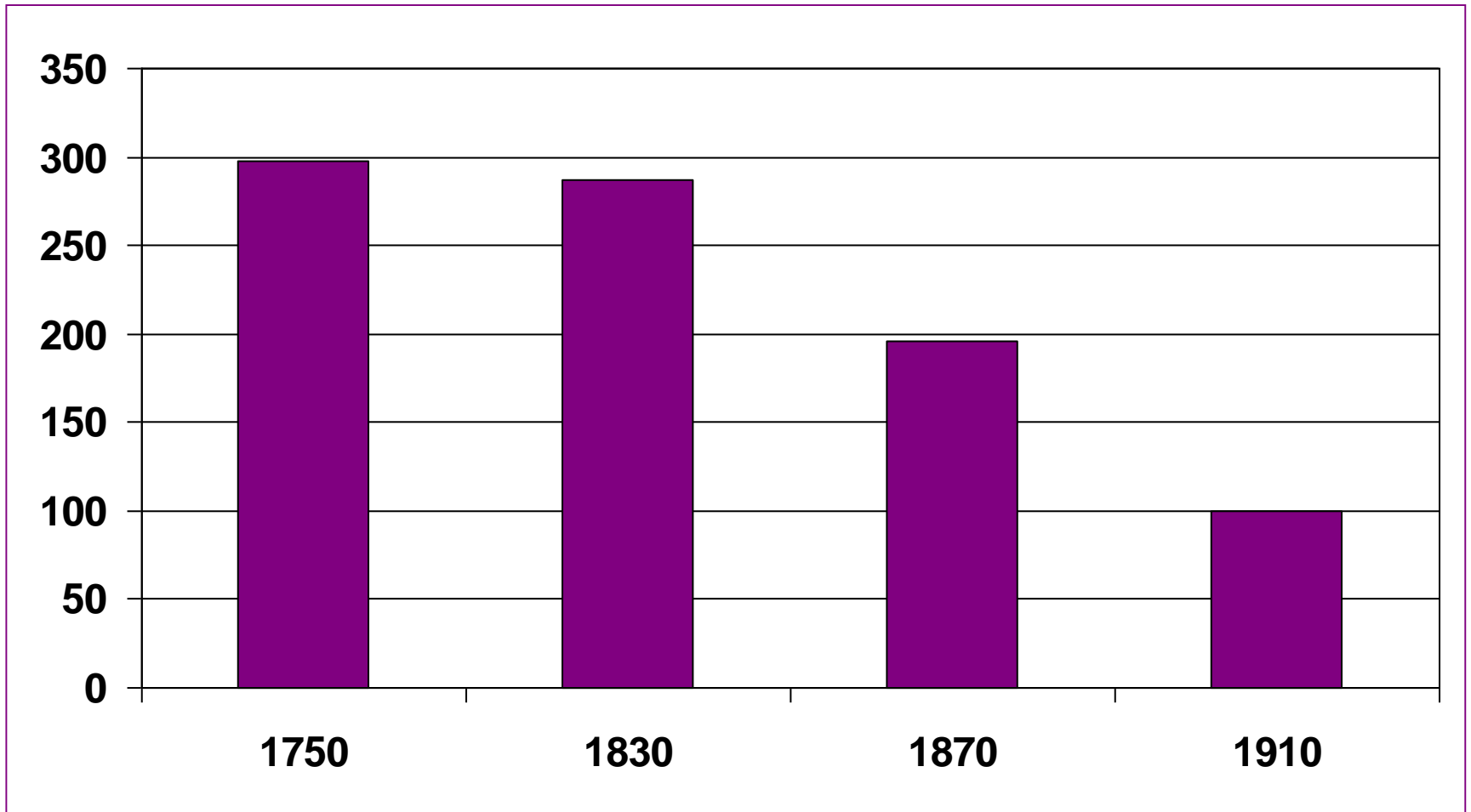
2 Unbundlings

(Baldwin 2012)

- **1st Unbundling:** production and consumption of manufactures in very different locations

- Classic example: Lancashire cotton in the **steam age**

- **2nd Unbundling:** stages of production of manufactures in very different places; more complex value chains

- Classic example: 'German car' in the **ICT era**

Real Cost of Ocean Shipping
(1910=100)

Source: Harley (1988)

Trade Costs, 1870-1913

(Jacks et al., 2011)

- Trade costs estimated using gravity-model approach

- **Trade costs fell by 33% on average** during this period; for Asia-Europe by 50%

- Average trade volumes rose by 486%; for Asia-Europe by 647%

- 60% of average trade increase and 77% of Asia-Europe attributable to lower trade costs

Shares of World Industrial Production (%)

	China	India	Western Europe	USA
1750	33	24	23	0.1
1830	30	18	34	2
1880	12	3	61	15
1913	4	1	57	32
1953	2	2	26	45
2010	15	2	24	25

Sources: Bairoch (1982) and UNIDO (2012)

Per Capita Levels of Industrialization

(UK in 1900 = 100)

	1750	*1830*	*1880*	*1913*
Europe	8	11	23	45
UK	10	25	87	115
USA	4	14	38	126
China	8	6	4	3
India	7	6	2	2

Source: Bairoch (1982)

Shares of World GDP (%)

	China	India	Western Europe	USA
1820	33	16	23	2
1870	17	12	33	9
1913	9	8	33	19
1950	5	4	26	27
1973	5	3	26	22
2010	16	6	19	23
2030	28	11	13	18
2050	29	16	10	17

Sources: Maddison (2010) and OECD (2012)

Historiography (Rodrik, 2013)

- The explanations for **19th century continental divergence are** as follows:

  Imperialist exploitation (Mandel, 1975)
  Institutions (Acemoglu et al., 2002)
  Dutch Disease (Williamson, 2011)
  Directed technical change (Allen, 2012)

- But **could NEG core-periphery have anything to do with it?**

New Economic Geography: Key Ideas

- 2nd Nature Geography matters

- Agglomeration Benefits

- Market Potential

- Trade Costs

- **Globalization** may imply **divergence**

Globalization and the Inequality of Nations (Krugman & Venables, 1995)

- **Manufacturing** goods are subject to increasing returns and are used both as final and as intermediate goods

- As trade costs fall, self-reinforcing advantage of larger market leads to country-specific external economies of scale and lower costs for manufacturing in **core** relative to **periphery**

- Eventually, if trade costs fall enough and/or wages in the core rise enough, manufacturing returns to (parts of) the periphery

Transport Costs and the Location of Economic Activity

- **Very High** or **Very Low**: everything dispersed

- **Intermediate**: centralization of industry based on location in larger market with increasing returns and external economies of scale

- So New Economic Geography says that even with perfect institutions everywhere integration of markets may lead to divergence

Path Dependence

- Economic historians like the idea – 'history matters' – so less optimistic than neoclassical economists about future convergence

- Technological historians think of **QWERTY**

- The NIEH tradition sees **institutions** as the 'carriers of history'

- The NEG approach highlights **2nd-nature geography** as a source of potential lock-in

Late 20th Century Empirics
(Redding & Venables, 2004)

- There is a high **correlation between location and income**; most cross-country income variation accounted for simply by location (market access)

- Market potential elasticity around 0.3

- Location effects largely robust to including institutional quality in regression

- Later research confirms RV results are robust

Figure 4 : GDP per capita and MA = DMA(3) + FMA
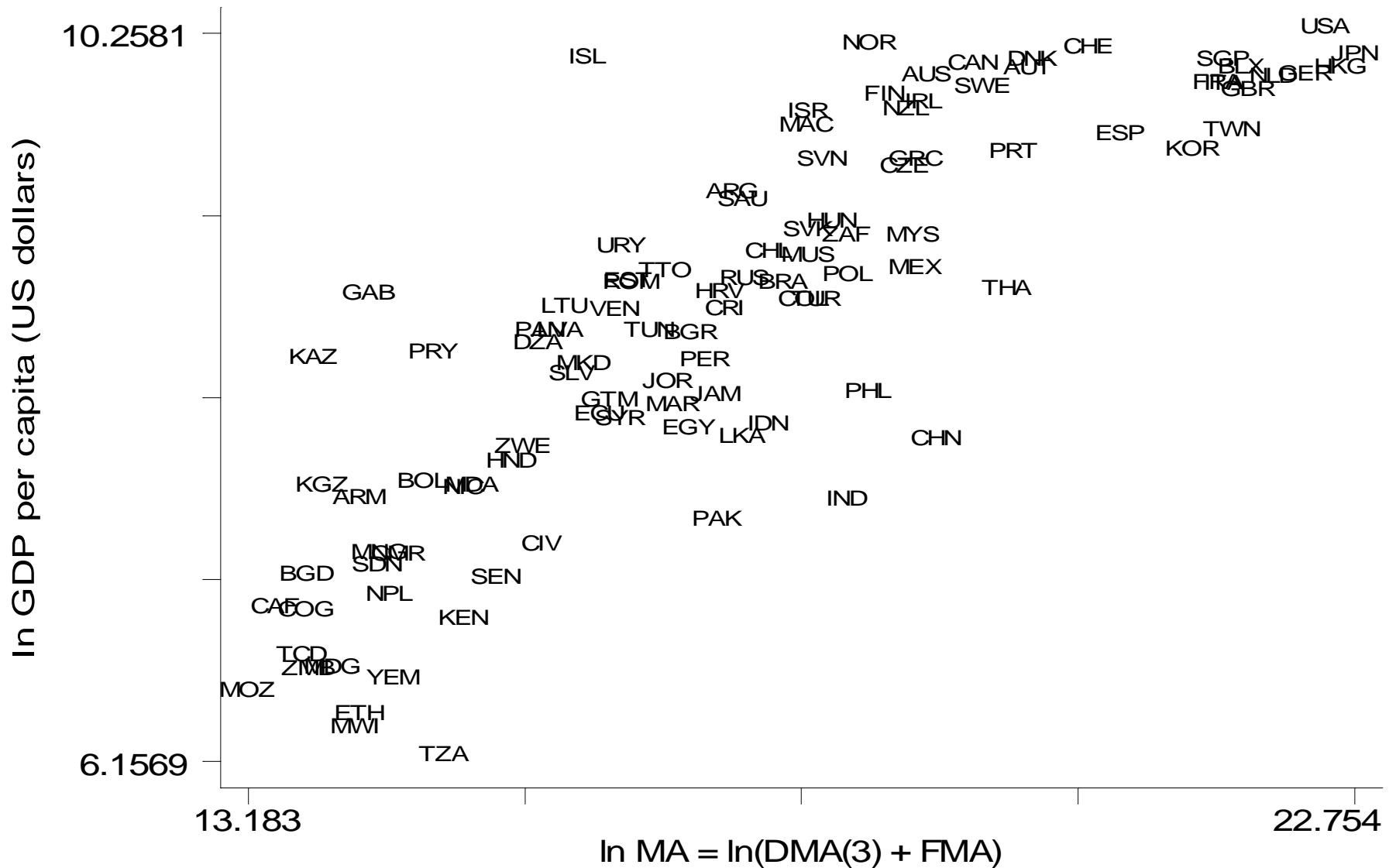
A Prediction

If Zimbabwe were re-located to Hungary, real GDP per person would rise by 80 per cent

Redding & Venables (2004)

Location of Manufacturing

- The **'manufacturing belt'** in the United States is locked into place by market potential which interacts with scale and linkage effects (Klein & Crafts, 2012)

- **Catalonia** industrializes to a much greater extent than the rest of Spain as a result of favourable market size (Roses, 2003)

- **Lancashire** dominated the world cotton textile industry based on second nature geography (Crafts and Wolf, 2014)

2 Theories

- **Heckscher-Ohlin**
  Industries that use a factor intensively locate in regions abundantly endowed with that factor

- **New Economic Geography**
  Market potential exerts a pull of centrality on industries with big linkages or large plant size… when transport costs **intermediate**

- Both theories rely on the **interaction** of regional with industrial characteristics

MK et al. Model: Intuition

- Dependent variable is log of share of total employment in each industry in each state; this depends on input prices and the spatial distribution of demand

- Inputs include primary factors and a composite intermediate good; the prices of these inputs are related to factor endowments and proximity to suppliers of intermediates

- Proximity to demand depends on geographic distribution of GDP and transport costs (market potential)

- NB: this subsumes both HO and NEG considerations

MK et al. Regressions

$$\text{Log}(S_{ik}) = c + \Sigma_j \beta^j (y_{it} - \gamma^j)(x^j_{kt} - \chi^j) + \varepsilon$$

$$= c + \Sigma_j (\beta^j y^j_{it} x^j_{it} - \beta^j \gamma^j_{it} x^j_{kt} - \beta^j \chi^j_{it} y^j_{it}) + \varepsilon$$

- The estimated coefficients of the interactions between regional and industry characteristics are what matter – they are expected to be positive

Klein and Crafts (2012) Results

- Seek to explain persistence of the manufacturing belt in the USA using MK et al. model

- **Market potential is more important than factor endowments** as determinant of industrial location; forward linkages matter most but backward linkages and scale effects also apparent

- Agricultural land and coal endowments play a role but not HK

2SLS Results: Significant Positive Interactions

	1880	1890	1900	1910	1920
Agriculture		**	*		
Human Capital					
Coal	**				
Forward Linkage	*	*	*	**	***
Backward Linkage	***		***		**
Scale	***	***	***	***	**

Market Potential and GDP 100 Years Ago

- Similar impact on real GDP/person to late 20th century with elasticity of about 0.3 (Liu & Meissner, 2015)

- **Core Europe has much greater market potential** than peripheral Asia (and Southern Europe) by the late 19th century

- Changes in transport networks and shifting spatial distribution of GDP since 1820 'lock in' Europe's industrial-location advantage

Market Potential (London, 1800 = 100)

	1800	1870	1910
SE England	77	757	3411
NW England	61	499	1862
Kwantung	126	319	1075
Madras	80	256	1296

Source: Caruana-Galizia et al. (2015)

Location of British Cotton Textiles in 1838 (Crafts & Wolf, 2014)

- In 1850, UK had 69% world spindles (58% in 1900)

- **In 1850 Lancashire had** 66% of UK spindles (79% in 1903) and **about 46% of world spindles** (same in 1903)

- Lancashire is 1.3% of UK land mass and 0.002% of world land mass

- Cotton is classic example of core-periphery in the '1st Unbundling'

Lancashire Textiles and Globalization (Leunig, 2005)

- Lancashire a **high wage** industry: 6 x India and Japan in 1910

- But continued to dominate world trade (60% world market share in cottons in 1910)

- **Unit costs lower** than India or Japan even before adjusting for output quality

- Lancashire flourished because of **agglomeration benefits** ..... its productivity exceeded other British locations by 33%

The Wind of Change, 1850-1900
(Pascali, 2017)

- Use shipping times in gravity model to explain trade; these times change as steamships supersede sailing ships; **steamships account for about ½ trade increase, 1870-1910**

- Average shipping time fell by more than 50%; coal consumption/horsepower fell by over 50% between 1855 and 1870 after which steam rapidly replaced sail

- This implies a notable addition to conventional growth accounting estimates of steam contribution

Growth Accounting for GPT

- **3 aspects**

  GPT capital deepening

  TFP growth in GPT production

  TFP spillovers

GPT Growth Accounting

- Augment standard formula to allow 2 types of capital, own TFP growth in 2 sectors, and TFP spillovers

$\Delta(Y/L)/(Y/L) = \alpha_1\Delta(K_O/L)/(K_O/L) + \alpha_2\Delta(K_{GPT}/L)/(K_{GPT}/L) +$

$\beta\Delta(HK/L)/(HK/L) + \eta\Delta A_O/A_O + \phi\Delta A_{GPT}/A_{GPT} +$

$\gamma\Delta(K_{GPT}/L)/(K_{GPT}/L)$

The final 3 terms are each part of TFP growth and the last one is TFP spillovers from GPT capital deepening

Growth Accounting Does Not Capture Adequately

- Welfare gains from new goods

- TFP spillovers within sectors

- Wider economic benefits

- Impacts through globalization

Steam Contribution to Labour Productivity Growth in UK Excluding TFP Spillovers (% per year)

	Capital-Deepening	*TFP*	*Total*
1760-1830	0.011	0.003	0.014
1830-1870	0.18	0.12	0.30
1870-1910	0.15	0.16	0.31

Real Price Falls of Steam Horsepower (%)

1760-1830	39.1
1830-1870	60.8
1870-1910	50.0

Source: Crafts (2004)

Does Trade Cause Growth ?
Frankel & Romer (1999)

- Estimate impact of trade on income (successfully?) taking explicit account of simultaneity bias

- If ratio of trade to GDP goes up by 1 percentage point, income per person increases by 0.5% to 2%

- Substantial part of the effect comes from higher TFP

- **Feyrer (2009)** offers improved version through use of time-varying geographic instruments; elasticity of income to trade exposure is 0.5

Globalization in the Steam Age: a Very Crude Calculation

- World trade/world GDP rose from 18% in 1870 to 30% in 1913 (Klasing & Milionis, 2014)

- Steamship accounted for about ½ of this increase (Pascali, 2017)

- Assuming 1pp increase in trade exposure raises income by 0.5%, then **steam-driven globalization raised world incomes by 3%**

- An estimate not to be taken too seriously … but does suggest growth accounting is missing something

Implications of the 'Wind of Change'

- Predicted trade raises real GDP/P in rich countries with good institutions and manufacturing but reduces it in other countries

- **Globalization is a major reason for economic divergence between core and periphery**; it accounts for more than 50% of growth rate differential in second half of 19th century

- But **is it an NIEH or an NEG story?** And what is the policy implication?

Openness and Growth

- Impacts on incentive to invest and to innovate

- Effects through changes in relative prices and composition of economic activity

- Structure of protection matters

- Trade costs influence location of manufacturing

- So was protectionism the right response to 19th-century globalization forces?

Impact of the 'Great Liberalization'

Estevadeordal & Taylor (2013)

- **Liberalizers accelerated** while non-liberalizers stagnated, 1975-89 vs. 1990-2004; growth differential 1% per year

- The 2 groups are distinguished by changes in their tariff policies on capital and intermediate goods

- Changes in tariffs not correlated with changes in institutional quality

- Fall in price of capital goods raises steady-state income level and boosts investment

- It's the **structure of protection** that matters

Average Tariff Rates on Manufactured Imports (%)

	1875	**1913**		**1875**	**1913**
France	12-15	20	**Argentina**		28
Germany	4-6	13	**China**		4-5
Italy	8-10	18	**India**		4
Netherlands	3-5	4	**Japan**		25-30
Sweden	3-5	20	**Spain**	15-20	41
UK	0	0	**USA**		44

Source: Findlay and O'Rourke (2007)

The Pre-1914 Tariff-Growth Paradox

- O'Rourke (2000) found that higher tariffs promoted growth in this period

- This result was confirmed as robust by Jacks (2006)

- These results different from anything obtained for the recent past (Clemens & Williamson, 2004)

- **NB:** Jacks (2006) also found that the Frankel & Romer result for income levels holds for the late 19th century

Is the Paradox Really There?
Schularick & Solomou (2011)

- **Probably not!**

- Can specify the growth model more fully to control properly for investment and the real exchange rate, measure the tariff rate more carefully, and improve the econometrics

- Results suggest that there is no robust evidence for tariffs raising the growth rate; if anything, the opposite seems to have been true

- Taken together with the evidence on trade exposure and income levels, this suggested that pre-1914 more similar to the recent past than has recently been believed

Probing Pre-1914 Deeper

- Lehmann & O'Rourke (2008) found that it is only **manufacturing tariffs** that promote growth

- Tena-Junquito (2010) found that the positive correlation only holds for **rich countries** (the O'Rourke sample); for a wider sample the correlation is negative for 1870-1913 as a whole

- **NB:** in rich countries protection may have lowered relative capital goods prices (Collins & Williamson, 2001) and these countries may have been better able to protect sectors with positive externalities (Tena-Junquito, 2010)

Would It Have Been Better for UK to Abandon Free Trade?

- Shift-share analysis says difference between UK and US was overwhelmingly intra-sectoral productivity growth not industrial structure

- Does not address slow productivity growth in services or incentives to innovative effort

- **Chamberlain tariff** would have shifted employment towards agriculture and textiles (Thomas, 1984); interwar protection favoured old, labour-intensive industries and probably did not improve productivity performance (Crafts, 2012)

To Protect or Not to Protect?

- Balance of evidence is less favourable to the idea that protection is good for growth than early papers supposed

- Paradoxically, the likelihood of positive effects seems higher in rich countries

- 'Smart protection' is hard to achieve

- D-in-D analyses may be the way to stronger empirical results

Concluding Questions

- Is the now-dominant institutional explanation for "divergence big time" over-sold ?

- Does market potential also play a key role – perhaps after a threshold level of institutional quality is reached?

- Can we construct an NEG-based narrative to (partly) explain industrialization and de-industrialization since 'globalization began'?