1. How well did British Industry perform in the pre-1914 period?
2. To what extent did entrepreneurial failure/ not adopting mass production techniques contribute towards Britain's relative economic decline?

Broadberry (1994) looks at the data from US and UK Census of Manufactures around 1909 and finds that for manufacturing as a whole, the US had a 2:1 productivity lead over Britain.

The relative economic decline of British industry is often attributed to Entrepreneurial failure, but technology choice is a function multiple interrelated factors: social capabilities, institutional arrangements.

McCloskey and Sandberg (1971) argue that competition ensures the correct choice of technology, and that the most recent development was not always appropriate.

British Entrepreneurs were justified in their technology choices in some industries (cotton textiles, ship-building) where Britain's social capabilities conferred Marshallian external economies of scale; however, but entrepreneurial failure was more obvious in industries where competition was absent (chemicals)

Cotton Textiles

The cotton textiles industry expanded output and exports right upto WW1, after which its share of world spinning and weaving capacity rapidly dropped off.

In 1830, *cotton textiles were half of GB exports, whereas in 1913 they were only a quarter* **(Broadberry, 1994).**

Once cotton had collapsed between the wars, economists looked back in hindsight to trace the origins of decline.

One of the principle allegations of entrepreneurial failure was in spinning, where technological conservativism arguably delayed the switching from mule to ring spindle.

Sandberg (1974) examines the technological decision to retain mule spinning by Lancashire producers, and finds they were rational not to switch given the conditions they faced.

Mule spinning was more appropriate for British mill-owners as relied on labour relatively more than capital and was better method for catering to diversified international markets, rather than the homogenised American market.

Leunig (2003) points to the *Rothbarth-Habbukak thesis* which explains that technological choice at any point in time is determined by relative factor prices.

The US was scarce in labour, but rich in raw materials; meaning wages were relatively high compared to raw material prices.

Therefore, US firms had an incentive to develop labour saving, resource using technology which facilitated the 'American system of manufactures' and the adoption of ring spinning.

Britain's relative factor endowments suggest that ring spinning may have been an inappropriate technology choice.

Lazonick (1986) criticises **Sandberg (1974)** for stressing *labour cost differentials* as the key factor in explaining slower diffusion of ring spinning and automatic looms in GB;

arguing instead that Lancashire cotton textiles producers faced a number of 'institutional constraints', such as 'vertical specialisation', 'industrial relations' and the 'Liverpool cotton market's proximity'.

In the sense of being '*Schumpeterian entrepreneurs*', they perhaps failed on account of passively accepting these constraints rather than creatively overcoming them.

Saxonhouse and Wright (1984) disagree with **Lazonick (1986)**, arguing that the Lancashire cotton industry would have suffered an even more catastrophic decline between the wars, had it been like the New England textile industry (Chandlerian).

This view is shared by **Leunig (2003)**, who finds Lancashire textiles had a higher output/ labour productivity than New England textiles due to more intensive competition, manifested through external economies of scale.

In a sense, decline was inevitable: we can look at the demise of cotton through the lens of **Vernon's (1979)** '*product cycle hypothesis*'.

With comparative advantage shifting to low wage producers like Japan/ India, there was little British entrepreneurs could have done to prevent textiles' failure.

Given Lancashire cotton managed to prevail for so long suggests entrepreneurial achievement rather than failure.

Chemicals Industry

Broadberry (1997) looks at data for the chemical industry in 1910, and finds that Britain lags behind both the US and Germany in terms of comparative labour productivity.

In terms of trade, however, Britain was a net exporter of almost every type of chemical product, bar coal-tar dyes.

Proponents of British entrepreneurial failure **(Author, Year)** point to technological conservatism in persisting with the Leblanc process for soda ash production long after the superiority of the Solvay process was established.

The Solvay process could produce soda ash of higher purity at a lower cost by 1870, yet the British Chemical Industry failed to adopt it.

Broadberry (1997) supposes that if *foregone profit opportunity* qualifies as entrepreneurial failure, the lag in the adoption of the Solvay process in soda making is an apt example.

Lindert and Trace (1971) quantify the costs of prolonged retention of the Leblanc process *and see substantial foregone profits* - up to £740,000 p.a after 1900.

Sandberg (1974) disagrees with **Lindert and Trace's (1971)** figure - suggesting that Leblanc producers had already paid the fixed cost of existing capital, and the comparison should be against the variable cost of Leblanc

The **McCloskey-Sandberg (1971)** view is that the failure occurred in an industry that operated under a cartel, protected from competition by barriers to entry.

If *Bruner Mond* had operated in a more competitive fashion, it may have forced *United Alkali Company (UAC)* to adjust or exit.

Crafts (2012) agrees that when industries operate under competitive conditions, technology choices are generally consistent with profit-maximising behaviour.

Shipbuilding Industry

Data on shipbuilding output and employment from **Broadberry (1997)** suggests rapid growth, with employment more than doubling between 1861 and 1911.

Britain *accounted* for more than 80% of world output by 1890s and despite the build-up of German, American, French and Dutch capacity behind protective barriers, Britain's share remained over 60 per cent before WW1 (**Broadberry, 1997).** Britannia rules the waves.

The absence of a trans-Atlantic productivity gap reflects the fact that mass production methods had not yet been successfully applied to shipbuilding; meaning flexible production methods continued to be used on both sides of Atlantic.

British tramp shipping benefited from **Marshall's (1920)** idea of external economies of scale; with large numbers of specialised producers localised in the NE of England, around the Tyne.

Pollard and Robertson (1979) argue that *Britain's craft-based flexible production system* was pivotal in explaining the success of British shipbuilders; pointing to the high-skilled 'amphibians' working in shipyards, which was only possible due to craft-based production organisation around separate trades.

Shipbuilding thus provides a counter example to **Elbaum and Lazonick (1986)**, who wrote on the inadequacies of GB craft based production in late 19th century.

In shipbuilding, British entrepreneurs were correct not to adopt Chandlerian methods, with their success predicated on craft based production methods.

The **McCloskey and Sandberg (1971)** argument applies here: the latest technology is not always the most efficient.

Chandlerian forms of organisation were adopted more quickly in less successful German and US shipyards to counter problem of lack of skilled labour.

Conclusion

Entrepreneurial Failure.

Chandler discusses the different structure of US and UK industrial management – US has more professional managers, fewer owner-managers, M-form management and specialisation. (Williamson and transaction cost economics). But this has been criticised by Payne (1967).

This argument was rebutted by micro-studies of many industries which demonstrated underlying rationality. (Sandburg on cotton (1974); Harley on steam ships (1971)). The only exception was Lindert and Trace on chemicals (1971).

Poor GB productivity performance (US Y/L lead more than 2:1 average) in industries where high throughput techniques developed successfully in US, but where demand conditions or resource & factor endowments prevented adoption of such techniques in GB. In summary, productivity performance in this period was similar to Germany, and the productivity gap with US was accounted for by different technological choices arising from different conditions and factor endowments.

Not necessarily EF: use of different technologies due to different conditions.
Demand side: US consumers prepared to accept a higher degree of standardisation - more homogeneous market meant producers..
Supply side: In US there was a shortage of skilled labour which led to substitution of machinery for skilled labour & their abundance of resources allowed for development of resource using technology.

Variety of experience across industries, but central theme was lead of high- throughput production methods

Motor vehicles: mass production in US → mass market in UK → large Y/L gap

Shipbuilding: mass production still not feasible → no Y/L gap

Cotton: mass production in US but UK competitive on basis of flexible production with external economies of scale → small Y/L gap

Chemicals: cartel → inappropriate technological choice in soda ash.

Classic example is motor vehicles, where no mass market existed in GB.

3rd type of industry where GB attained high Y/L levels was where demand factors allowed early adoption of high-throughput techniques in GB. Examples here include seedcrushing, coke, sugar refining and tobacco.

Abramovitz (2001) by the 1920s, American technological progress was underpinned by much larger investments in intangible and human capital formation and by 1929 the United States had established a clear TFP lead. American TFP performance was not matched by Britain and to some extent this may reflect failings in education and technology policy.