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Distributional Consequences of Structural Transformation:
Institutions, Industrialization, and the Capture of Growth in Modern Britain

Abstract:

The Industrial Revolution in Britain is commonly understood as a period of steadily increasing growth and structural transformation underpinned by an upward consolidation of income. In this paper I demonstrate how structural economic change contributed to both rising output and inequality, highlighting the role of institutions in moderating and exacerbating distributional outcomes across key industries. Drawing from the fields of comparative law and industrial organization I argue that the specific industries driving British economic growth in this period were structurally predisposed to elite capture, and thus contributed to the increasing concentration of income growth among the uppermost percentiles at the turn of the 19th century. Characteristics like geographical diffusion, factor intensity, and market structure contribute to the propensity for the capture of growth with distributional outcomes further distorted by institutional manipulation in the form of industrial policies, labour organizing restrictions, state-enforced monopolies, and the construction of property rights. This indicates that inequality is broadly structured on the basis of legal claims over ownership and income which vary at the sector level. By studying within sector inequality as the primary channel through which structural change and the sources of growth contribute to inequality, I ultimately seek to lay a foundation for further investigating the role of legal institutions, and the composition of an economy on its stability and capacity to function both efficiently and equitably in the long run.

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Introduction

The relative distribution of the benefits of the Industrial Revolution in Britain has long been a source of debate, with the transition to modern growth characterized as both a period of intense urban poverty, exploitation, and declining living standards (Engels, 2009; Komlos, 1998; Szretzer, 1997) but also a revolutionary shift in the trajectory of real incomes for the average worker (Allen, 2009a; Clark, 2005; Lindert and Williamson, 1983). Both characterizations accurately depict different facets of this period of history, but how do we square the two disparate visions of British industrialization? Did steadily increasing growth underpinned by an upward consolidation of income occur as the result of upper-tail human capital formation, rewarding the increasing productivity of select professions? Or alternatively, was it primarily an institutional phenomenon with developments like the construction of property rights over the course of enclosure and legislation restricting labour organizing favouring the incumbent land and capital-owning classes, distorting the relative income distribution upwards, and producing conditions of immiserizing urban growth? Determining the extent to which these two narratives hold true demands the disaggregation of the sources of income and inequality, accounting for changes in the institutional environment and the countervailing political and economic interests.

To explore the dynamics underlying this dichotomy I will expound on the relationship between income growth and distribution by incorporating two theories of economic and institutional development; first, the process of structural change itself as a market driven phenomenon is the primary explanation of inequality in this period, where the disruption that comes with large shifts in the composition of an economy is responsible for trends in distribution, and second, specific industries are structurally predisposed to upward redistribution through elite capture and are thus likely to contribute to rising inequality as said industries compose a greater share of output. The Industrial Revolution in Britain is a context

that is uniquely suited to engaging with these questions, occurring in several stages over the course of a century and with staggered development of different sectors of the economy. Observing these changes over time, variation in the distribution of income can be seen as a largely sector-specific development, with differences in rent-seeking behaviour and income extraction at the sectoral level contributing to rising inequality. This will be presented in contrast to a human-capital-centred argument for rising income concentration, showing that inequality during this period is not adequately explained by the increasing wage premium for skilled workers in Britain, but instead is largely a result of institutional capture and the construction of legal claims over property and income that promotes first land rents and in later periods inflated capital returns in leading industries, both at the expense of stagnant wages.

To demonstrate this, I will be looking at the distributional consequences of structural changes in the British economy following the Industrial Revolution, focusing on how changes in the sectoral composition of output affect the distribution of income in the short run and contribute to the concentration of wealth in the long run. Holding institutional conditions equal in the short term, and testing for structural breaks in the long run, the variation in output share by sector offers insight into the impact of sector-level structural attributes and in some cases predisposition of certain industries towards rent-seeking and elite capture of growth. Variations in distribution can thus be identified in part as an outcome of interactions between the stages of economic growth and the legal-institutional environment. By studying the channels through which structural change and the sources of growth contribute to inequality, I ultimately seek to determine the significance of rents, institutions, and the composition of an economy on its stability and its capacity to function both efficiently and equitably in the long term. More broadly, I want to study the processes by which growth, distribution, and the institutions that regulate them are jointly determined, observing the interests and mechanisms that shape these outcomes over time.

Ultimately, I argue that the capture of growth through legal and institutional structures is a significant source of inequality during this period that is often overlooked. Elite capture of institutions and the manipulation of the law to create a more favourable market environment is a significant mechanism by which an individual or firm may seek returns greater than their contributions to productivity and is often concentrated in specific sectors and industries. In cases where this occurs a disproportionate share of the benefits are able to be extracted by landowners, with intellectual property holders, monopolists, traders, brokers, and state actors coordinating to reap artificially inflated returns on wealth without generating additional contributions to growth. Elite capture of institutions is thus a means by which actors can make a legal claim over future incomes without additional contributions to development, skewing the distribution of the benefits of growth. Comparative legal scholars have written about how regulation and asset classifications can be leveraged by elites to shape the economic environment, resulting in a feedback loop between economic and political power (Pistor 2019; Deakin et al., 2017). Incumbents are able to erect barriers to market entrance, enriching themselves, suppressing competition, establishing monopolies, stifling innovation, and protecting their interests and wealth, as well as establish legal regimes that ensure the security of their assets and continued capital returns. Theories presenting capital accumulation as a political process, structured by the power wielded by different interests further illustrate the institutional framework of inequality, even going so far as to claim that capital valuation acts as an instrument for the quantification of the distribution of power (Nitzan and Bichler, 2009). This institutional foundation has substantial implications for distributional outcomes and ought to be more prominent in explanations of inequality during this period due to the semi-contemporaneous upheavals in the economic and political environment.

In terms of identification strategies, inherent characteristics across sectors necessitate differences in institutional arrangements and methods of elite capture, resulting in variation in

the propensity for extraction and an imbalanced distribution of benefits across industries. Institutional factors contribute both to long-term stagnation and generate inequality simultaneously, but necessarily differ in construction depending on sectoral variables like geographical limitations, factor intensity, and market structure. From this premise, it follows that these processes can be observed as output and productivity changes at the sector level, with variation in the composition of the economy resulting in shifting trends in overall income distribution. Thus, sectoral predisposition can be leveraged to identify structural sources of inequality and additionally reveal the impact of different institutional developments over time.

Finally, if the institutional mechanisms that are used to extract rents are inversely related to growth, there must be a tipping point where the surplus income extraction exceeds the additional productivity that is being generated, resulting in disproportionate gains for relatively few and real losses for the wider economy. This brings me to my primary hypothesis; from the proto-industrial to modern periods of economic development, some growth sources are subject to unique sectoral structural attributes, causing them to be predisposed to capture via specific legal institutional arrangements, thus generating greater levels of inequality. Following from this premise, I intend to demonstrate fundamentally that within each sectoral development when the rate of income extraction exceeds the contribution to growth, inequality will inevitably increase. Variation in the capture of surplus output at the sector level over the course of development can therefore provide a cogent explanation for the relationship between structural change and inequality.

Background

Disaggregating the sources of inequality through the industrial revolution demands an understanding of the coevolution of the economic and institutional environment during this period. There are several pertinent areas of research related to this topic in terms of historical context and further-ranging theoretical work. Industry-level growth driving the Industrial Revolution, the distributional consequences of specific legal reforms, broader historical trends in development and inequality in comparative perspective each contribute to an interpretation of how institutional arrangements mediate the concentration of income over the course of structural transformation. Drawing from a diverse body of literature I will explain and expand upon several of the prevailing theories regarding institutional development, economic growth, and income distribution, evaluating their salience in the context of the Industrial Revolution in Britain.

Industries Driving British Economic Growth

The question of which sectors drove British industrial development is a point of contention, based largely on the debate over the sources of increasing productivity; whether it was the result of innovation in a few key sectors or a broad-based expansion of productivity-enhancing technologies across the entire economy that resulted in consistently increasing per capita national income. Crafts (1985) and Harley (1992) argue that the innovation driving British industrialization was concentrated in textiles, metals, and transportation, separating themselves from the traditional views of Landes (1969) and Mokyr (1990) who posit that technological change was far more pervasive. These views emerge from variations in growth estimates across sectors, with Crafts and Harley adjusting the manufacturing growth rate down from earlier estimates, emphasizing the role of the aforementioned sectors. While this is still a

contested framing of productivity gains during the Industrial Revolution, it is reflected in the trends in the relative share of total output across industries during this time.

For the argument of this paper, the sources of innovation play a marginal role and what matters is simply the total output of a given industry in absolute terms, as well as per worker, and relative growth compared with other industries. Growth in output (and income) at a per-worker level is the measure that best illustrates the developments of interest and can be used to identify a significant structural shift in the composition of the economy, but aggregate measures of the changing composition of output and employment provide a similar illustration of the significant changes occurring at this time. Assuming for the moment that labour is relatively interchangeable and supply elastic during this period, we would expect that the industries seeing the greatest gains in marginal labour productivity would also be those with the greatest aggregate increases in output. From this approach, it is evident that particular industries produced far more than others and were responsible for a greater share of total income growth in this period, as shown in the following figures. The observed variation in the composition of output is the primary focus of this paper, with the period of transition being used to identify key structural dispositions of the existing institutional environment.

At the sector level, it is obvious that the industrial revolution represented a significant increase in the share of industry relative to agriculture, as illustrated in Figure 1. Historically agriculture was the predominant source of income in England and the rest of the United Kingdom, with some of the population also working in service professions. Beginning around the 16th century, industry began to increase its share of output, until the end of the 19th century when it made up over a third of the total output produced in Great Britain. This is mirrored by a slow decline in the relative share of agricultural output, which sees additional pressure from a less drastic but nonetheless consistent increase in the share of services.

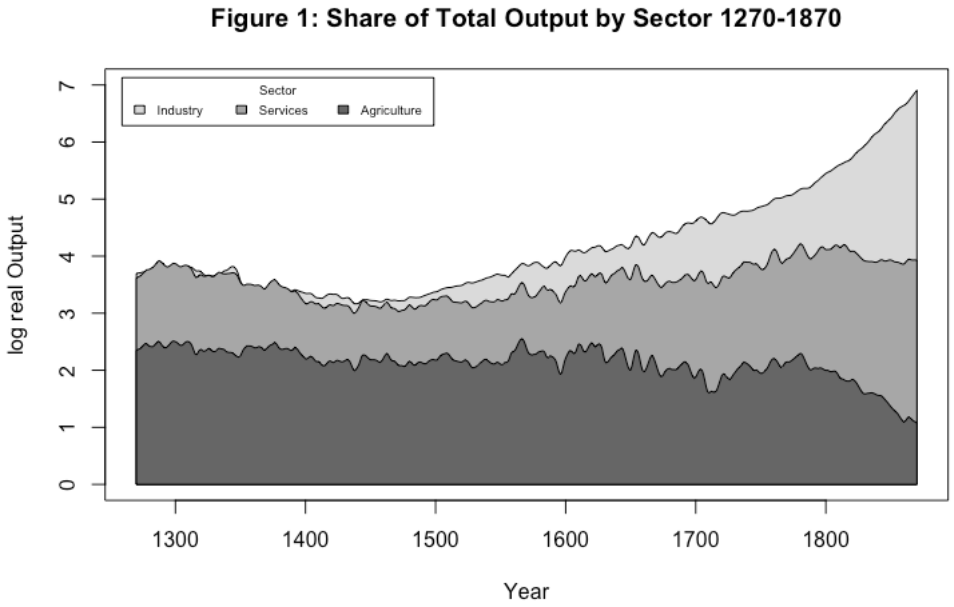


Figure 1. demonstrates the trends in log real output across the three primary sectors between 1270 and 1870, displaying the share of total output in terms of area under the curve. Industry represents a significant share of the increase in output during this period alongside growth in services relative to agriculture. (Broadberry, et al. 2012)

Breaking down this change further, we can look at the within-sector trends to identify the specific industries driving the growth of output. There are not many meaningful differences in the categories within the agricultural and service sectors during this period. For industrial output, there is relatively little change in the composition over time, especially when compared with the sweeping transformation that occurred at the sector level. Through the six centuries of data leather and textiles make up a substantial proportion of industrial output, with metals and mining representing the most significant growth in share of output during this period, alongside some marginal growth in construction. While it is less clear than the relative sectoral growth rates, the industry-level data does point to metals and mining in the later periods of the Industrial Revolution as key areas of economic growth, while textiles remain a constant but substantial share of total output throughout the six centuries observed. This mirrors the developments suggested by Crafts and Hartley regarding key industries for industrial development in Britain.

Figure 2: Share of Industrial Output by Industry 1270-1870

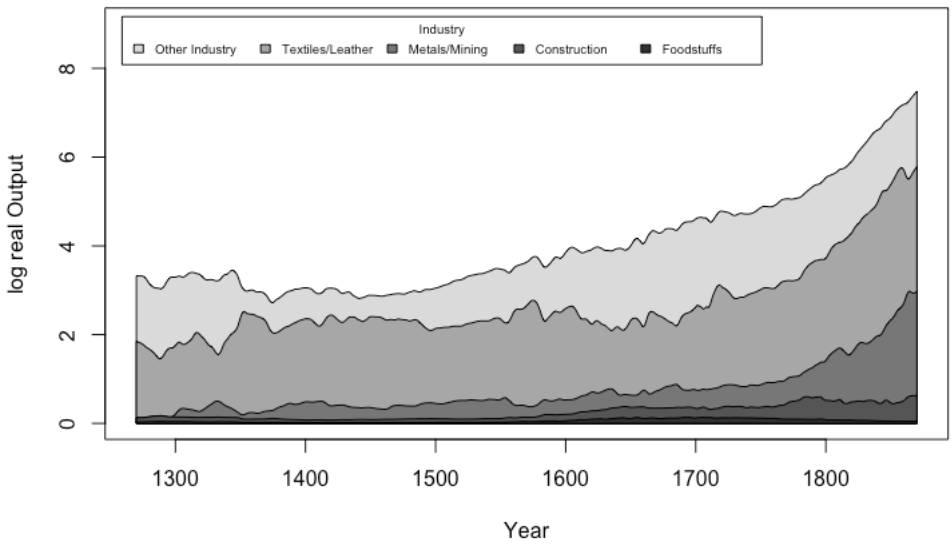


Figure 2. breaks down the trends in the composition of log real industrial output across the five key industries between 1270 and 1870, displaying the share of total output in terms of area under the curve. Textiles and Leather remain at a similar share of total industrial output over time, with metals and mining, and to a lesser extent construction growing as a share of the total. (Broadberry, et al. 2012)

While this does not tell us much about the changing rates of productivity or the introduction of new innovations, it does illustrate in a broad sense, the changes that characterized this period of history. The effects of industrialization are clear in the increasing share of the economy that is dedicated to specific industries, marking a shift from prior modes of economic organization, and allowing us to identify the primary sources of output and income growth during the relevant period. Variations in the spatial organization, factor intensity and other structural attributes of these growing industries as well as the institutional arrangements that structured property and income claims, will play a key role in understanding how the shifting composition of an economy contributes to trends in income distribution over time.

Development and Distribution in Comparative Perspective

The relationship between income and inequality over the course of development is a significant source of debate, with economists positing both general laws of inequality and development as well as descriptive accounts of the forces that shape specific cases. As the first

economy to industrialize, Britain sits in a unique place in this literature. Early accounts of the inequalities produced by the nascent capitalist mode of economic organization, most notably Marx (2004) and Engels (2009), focus primarily on the British experience as an example of the archetypical tendencies of industrial development. The systematic analysis of income growth and distribution was expanded upon by later generations of economists, as other emerging economies underwent similar structural transformations and a consistent set of patterns began to emerge across Western Europe and America.

The Kuznets hypothesis and its variations is a central theory of structural economic change and its impact on distribution over time. Kuznets' (1955) theory describes the rate of inequality in an economy as a function of per capita income, postulating that there will be a rise and then a decline in the rate of inequality as an economy develops and income increases, forming an "inverted U" shape. This relationship occurs over the structural transformation of the economy, where the incumbents who are the initial beneficiaries of growth are eventually displaced through innovation and declining returns on capital, by a new upwardly mobile class. This "inverted U" relationship is evident in the plot of income ratio in Britain between 1290 and 1990 depicted in Figure 3. The income ratio of the top 10% to the bottom 90% is a crude measure of inequality but adequately demonstrates the basic corollary relationship outlined by Kuznets, with inequality spiking in 1870 at the height of the Industrial Revolution and declining soon thereafter as per capita income continued to rise. While this does little to substantively demonstrate Kuznets's causal claim regarding the origins of this relationship, the general shape of inequality trends suggests that there is something significant about the period of industrialization that led to an increase in the relative income distribution from its natural level, be it through structural or institutional channels.

Figure 3: Ratio of Top 10% Income to Bottom 90% 1290-1990

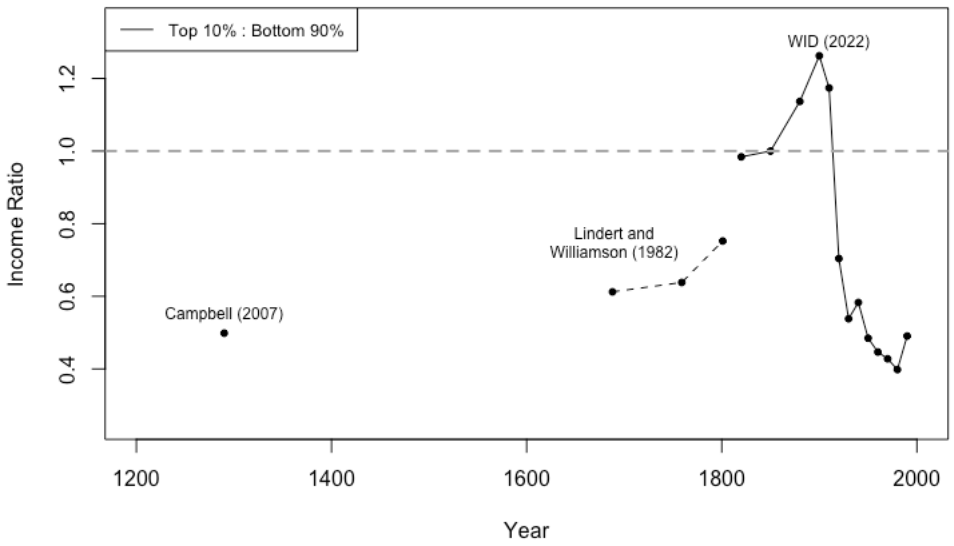


Figure 3: displays the rise and decline in inequality in the United Kingdom from 1290 to 1990, highlighting the spike in the income ratio during the late 19th century at the height of the Industrial Revolution. This curve pattern matches the relationship outlined by Kuznets (1955), with a rise and decline in the share of income accruing to the uppermost income percentiles.

While this is a visible trend in the process of structural transformation, it is ultimately limited application to long-term trends as inequality has increased in the later years, deviating from this solitary curve. This change has led other economists like Piketty (2014) to attribute the rise, decline, and subsequent rise again, to other political and social developments rather than an inherent product of the process of industrialization. Though this is the apparent pattern for the Industrial Revolution, long-run trends and comparative case studies mean it is necessary to address factors outside an isolated developmental process and structural economic transformation, as changes in the political, economic, and social environment put pressure on the level of inequality and transform the hypothesized curve relationship.

Building on the concept of the Kuznets curve, Milanovic (2016a:2016b) puts forth a wave theory of inequality. Wave theory presents this trend as not a solitary curve but a continuous wave of fluctuating inequality over time as per capita income continues to increase and various external pressures transform the intensity of distribution. Changes in the structural composition are reflected in the wave pattern with these shifts being represented in the

relationship described by Kuznets but occurring repeatedly rather than as a single period of economic transition. This provides a more flexible framework for understanding income growth and distribution over time, adapting Kuznets's proposed relationship into a much more expansive model of inequality over the course of development.

Within this model, there are numerous mechanisms that account for distributional changes over time outside of endogenous economic development, including exogenous shocks and changing institutions. These external forces consist of both benign and malign mechanisms, placing pressure on the rate of inequality, in a manner similar to the Malthusian model's pressure on population growth (Malthus, 2015). The benign mechanisms include the influence of social, political, and other institutional forces that can impact the concentration of income through redistributive policies and other checks on the balance of economic power. On the other hand, the malign forces consist of war, conflict, state collapse, disease, and other external forces, akin to Malthusian population checks, can additionally place pressure on the wealth and income distribution (Schiedel, 2018). In these cases, increased taxation for military mobilization, decline in labouring population, and the destruction of assets that result have a disproportionate impact on the wealth uppermost income percentiles and tend to increase the income and wealth share of the lower percentiles, albeit out of an altogether reduced pool of total wealth and income. While exogenous shocks like the malign forces offer insight into the fundamental dynamics of inequality, I am most interested in the concept of positive checks, accounting for institutional variations the pressure they exert on the shape of the Kuznets curve and long-run patterns of distribution.

Inequality in Britain During the Industrial Revolution

The "general law" approach has been critiqued by Acemoglu and Johnson (2015), questioning the universality of these formulations of inequality, emphasizing a contextual understanding of the dynamics of markets and institutions. Endogeneity between technology,

institutions, and distributional outcomes makes it difficult to claim a general tendency of development and inequality, especially comparing economies that underwent the process of industrialization in the early 19th versus the late 20th century and the resulting structural differences. Accounting for context is essential, and the conditions of the Industrial Revolution in Britain mean it is uniquely situated as a case study for early development but is not necessarily generalizable to modern cases.

The previous theoretical contributions paint a broad picture of the forces that shape inequality, but focusing on case studies in the British context reveals the idiosyncrasies of early industrialization and the British institutional environment, necessitating a more tailored approach than the catch-all general theories of development and inequality. As the first economy to reach modern growth, Britain's developmental process was gradual and occurred in stages over the course of several centuries. This means that rather than a single transitional period of industrialization, the process can be divided into distinct segments, each of which is subject to unique dynamics in terms of the distribution of income, potentially contributing to the stark trend in distribution.

Accounting for the distinct rise in inequality Allen (2009) elaborates on the disparity between productivity and income growth between 1790 and 1840, resulting in elevated income share accruing to the uppermost percentiles. Directly referencing the observations of Engels (2009) and the immiserizing conditions of the working class in England at the time, Allen confirms that this first stage of the Industrial Revolution saw increases in output per worker but stagnating wages, resulting in elevated profits and an upward consolidation of income. As with Kuznets, this upward slope in the inequality curve is attributed to increasing income for incumbent economic elites. The consolidation of income is attributed to the need for capital investment, where the upward trend in the inequality curve is a result of increased profits to finance the increasing demand for physical capital. Thus, inequality during this segment was a

product of relatively high rates of capital accumulation spurred by technical progress, with wages once again following productivity once the capital owners achieved the requisite level of investment.

This trend is evident in Figure 4 which clearly demonstrates the distributional consequences of 'Engels pause,' with an elevated share of income going to the uppermost 1% during this stage of British development. Though Allen demonstrates that wages caught up with productivity in 1840 following this period stagnation, the distribution of income remained at its peak before declining in the early 20th century, returning to its pre-pause distribution in 1950.

Figure 4: Distribution of Income in the United Kingdom 1688-1990

Figure 4. presents the distribution of real income across the top 1%, following 9%, following 40% and bottom 50% from 1688 to 1990. The period between the 19th and 20th centuries concurrent with the height of industrialization marks a substantial increase in the income share going to the uppermost income percentile. (World Inequality Database, 2022)

There are numerous explanations for this trend and the conditions that enabled wages to catch up with productivity. These range from poor harvests to the Napoleonic wars occurring on the continent, but the institutional explanation that I will be elaborating on is the role of the Corn Laws between 1815 and 1846 in supporting high food costs, preventing real wages from increasing during this period (Williamson,1990; O'Rourke 1997). Protection from cheap

imported grain allowed the British agricultural sector to continue producing in spite of high relative costs and declining quality of marginal farmland, ultimately at the expense of consumers who were limited to purchasing expensive domestic grain (Ricardo, 1911). This produced a favourable economic environment for the landholding elites, capable of retaining rents despite being slowly displaced economically and politically by a growing capitalist class, contributing to an upward consolidation of incomes. Thus the repeal increased consumer purchasing power and additionally struck a blow to upper-tail incomes, producing a more equal distribution (Irwin and Chepeliev, 2021).

This adds to the theory that the Kuznets curve in Britain is a story of capital formation induced by savings and extra-normal profits at the expense of labour incomes. Labour returns were effectively squeezed between a vise of rising capital and retrenched landowner interests bolstered by favourable institutional environment, allowing for a greater rate of extraction in spite of rising productivity. This naturally resulted in an expanding share of income to the uppermost percentile of earners. However, the conditions that enable capital and landed interests to exert their economic will and expand profits raises questions regarding the political and institutional dimensions of growth and inequality and the source of this capacity for some classes to enact their will over others through extra-market forces. How do sources of income shape political interests, and through what channels can said interests shape the institutional environment?

Income Sources and Distribution

John Bates Clark, writing in 1899 on the distribution of wealth identified the marginal returns to labour in addition to capital, positing that much of the inequality during the previous period of industrialization was a product of fair compensation in terms of capital and labour returns. Arguing from a purely market perspective, this would mean that the sources of income do not distort the rate of inequality but rather reflect marginal productivity and result in a

natural distribution of income. Despite Clark's significant contribution to economic theory, the institutional arrangements that compose the economic environment are such that the returns on labour and capital are not entirely reflective of marginal productivity as demonstrated by Engel's pause but can additionally be attributed to relative institutional influence and the legal interventions disparate impact across different claims on ownership and income which vary by class and industries.

Sources of income are vital to understanding the contribution of structural change to inequality because they differ structurally across class and industry. In the broadest sense, the process of industrialization and transition from agriculture to manufacturing can produce variation in the rates of capital versus labour income due in part to the relative factor intensity and organization of ownership and production, but these two classes of income are not homogenous. On a more granular level, these factors vary by industry meaning that the shape of inequality produced by development is additionally a function of which industries are leading the developmental process within this sectoral transition. Owners of land, productive capital, and intellectual property each receive different kinds and rates of return, and varying levels protections for their respective ownership claims, primarily determined by the law and the institutional inclination to be enforce it. In contrast, labour at various skill levels and across trades are subject to different wages, structured in part by the labor market but additionally by the limitations of the law and its enforcement. Legal differentiation in the classes of asset and income thus produces political and economic incentive structures placing these groups in contention with one another in shaping the features institutional environment.

The property rights held by capital owners are fundamentally different from the property rights of landowners, and labourers and are subject to different legal jurisdictions and guarantees. Asset returns and labour returns are fundamentally different under the law and as such the resulting distribution of income is in part structured around these legal claims on

ownership and income. Even within the land and capital asset classes, legal distinctions differentiate the protections received, producing an inherently uneven field in terms of expected risk and return (Pistor, 2019). This is in part a result of the structural characteristics of different classes of assets and claims on income, but additionally reflects the existing power structure and countervailing incumbent-emerging institutional interests.

The Industrial Revolution in Britain marked a shift in class relations and the distributional outcomes of growth because of the transition from pre-capitalist towards a capitalist organization of the economy defined by the capital and labour classes. Accounts of industrial inequalities such as those presented by Marx (2004), and Engels (2009) place this consolidated class structure at the centre of their analysis of the capitalist mode of production and its political consequences. However, within this new economic modality and shift in class relations, there is the additional detail of within-class heterogeneity, as we see distinctions arise between different locations, high-skilled labourers and their low-skilled peers as well as land and capital owners. The income received from these different professions creates a more complicated structure of relative class position and interests, particularly as those at the upper tail of professionals began receiving income greater than some in the lower landowner classes.

Aside from land and physical capital returns, one factor that is sometimes attributed with driving the income distribution during this period is increasing human capital among a subset of the population across select few professions. The human capital argument for inequality follows the reasoning that the spike in inequality during the Industrial Revolution was a direct product of the increasingly skilled upper tail of the labour force. The increasing productivity of this narrow subset of workers was rewarded with increasing wages relative to their unskilled peers, resulting in an upward consolidation of the benefits of growth. This line of reasoning attributes in part the rise in inequality to within class heterogeneity and expansion of skilled professionals, however, this may be true in the later stages of development, it is not

an adequate explanation for the massive expansion in the uppermost incomes during the early stages of the Industrialization.

Galor and Moav's (2004; 2006) description of the role of human capital in economic growth is relevant to the phenomena of inequality during early industrialization. The characterization of high demand for physical rather than human capital in the early stages is fully in line with Allen's description of this period, so while demand for skilled workers may be increasing it was nowhere near the rate of demand for physical capital and machinery. Additionally, there were no significant increases in educational attainment or labour skill levels during this period, indicating that elevated inequality was unlikely to be a direct product of human capital variations, but is instead another piece of this multifaceted development arc (Mitch, 2004). This is also reflected in the adjusted wages for workers at the time, with evidence that that the relatively high wages of craftsmen and construction workers in London that have been touted as illustrative of the high rates of human capital are skewed upwards, being contested and adjusted downward to account for errors in the interpretation of the contractor records (Stephenson, 2017).

Finally, this theory accounts for the internal development of Britain but does not include the gains from trade and Empire. The income and costs associated with the British Empire likely impacted distributional outcomes. The wealth brought in from colonial subjects at the height of the empire and Britain's position at the centre of global trade certainly contributed to the processes of industrial development and accrual of wealth across different classes of British society (Hobsbawm, 1962;1969;1975). However, this paper will be focused primarily on internal developments, employing trade flows as controls to identify the effects of transformation within Britain.

A contemporary phenomenon worth investigating to elaborate on this relationship is the increasing of mixed sources of income or homoploutia. The data used in this paper cuts off

prior to the modern rise in management and financial services as a dominant source of economic inequality. However, the earlier relationship characterized by this sort of split in the sources of income and rent extraction begins to break down as many of the ultrawealthy of the late 20th and early 21st century earn an income from both capital and waged positions.

Economic Interests and Intra-Class Heterogeneity

Classes hold distinct political interests, and their capacity to act upon these interests is reflected in the institutional formations of a given period. Representation of economic interests appears in the formal institutions of the law as well as the actions of the state in the application and enforcement of said laws. Assessing the relevant institutional arrangements that distort income distribution, it is important to recognize the interests and capacity of the groups that create and maintain these laws and regulations. Returning to the basic model of class structure where we consider capital owners and labourers as the primary classes in contention, there are distinct political interests between the two groups that inform institutional outcomes. Without delving into the origins of political power and relative capacity to influence institutions, we are still able to observe legal-institutional outcomes and the respective beneficiaries through the relative gains between classes. Each of the two basic groups has distinctive economic interests in the context of negotiating wages, hours, and conditions, and laws that structure the process of negotiation can be leveraged to favour the respective interests of one group over another. The introduction of basic measures like a minimum wage or alternatively regulations on labour organizing each has clear implications for the respective classes and their expected returns.

However, this narrative is complicated when we introduce intra-class heterogeneity of economic interests as indicated by the sources of income. Jha (2015) presents evidence that the political position of various asset holders during the English Civil War was in part informed by their economic interests. Despite both being nominally financial asset holders, the legal-structural characteristics of said assets resulted in a disparity in political and institutional

interests. Overseas share investment drove merchants to support reform and more intense enforcement of property contracts to a greater extent than their peers. The conflict of interest between those invested in different ventures presented a fundamental, and economically consequential political transformation. This recurring theme where ownership claims inform political interests is the basis of the claim that variation in sources of income is in most cases a more cogent indicator of political interest than class affiliation in the broader labour versus capital sense.

This is a more complicated picture than the characterization of capital versus labour political conflict, with intra-class variation in interests occurring across sectors and specific industries. Jha demonstrates politics as an outgrowth of the legal implications of different ownership claims, which have distributional consequences as interest groups are able to project their will on the institutional environment. This asset and income distinction model of political conflict becomes even more prescient with the rise of industrial capitalism, whereby new legal assets are created and protected with the advent of models like the joint stock company in the 17th century, and modern intellectual property rights in the 18th century, emerging in addition to lonstanding models of ownership like hereditary land tenure.

It is evident that different industries are subject to different structural characteristics, and different corresponding political considerations. Thus, a thorough decomposition of the interests contributing to institutional formation and change over this period cannot be on a basic class level, but demands the evaluation of intra-class interests, focusing on the legal interests of specific sources of income. The impact of a given policy ought to be understood at the intersection of class and industry, with these two dimensions playing a significant role in the relative impact on the distribution of income through their structural characteristics.

Legal-Institutional Capture and Inequality

As previously discussed, the political economy of property rights and the formation of the so-called "rules" of the economy are underlying factors structuring distributional outcomes. Beyond the granting of monopolies by the crown and banning of labour organizing, something as simple as the configuration of property rights to protect specific asset classifications is indicative of the interests shaping the legal environment. Through these channels, the law is effectively able to create wealth and secure capital incomes and subdue the gains of other competing groups. There are four primary sets of legal regimes that have been implemented at the behest of various economic interests that are the focus of this paper, each of which can be leveraged to shape distributional outcomes through their disparate effects on different classes and sectors.

The creation and classification of private property serves as one of the fundamental sets of legal regimes in terms of the concentration and retention of wealth insofar as it creates classes of assets and can be used as a means to secure future incomes. A key example from English history is the series of Enclosure Acts formalizing private property. The division and privatization of common lands were a means by which landowners were able to cement their claims on future income and secure land rents. The protection of private property and enforcement by the state was a transformation of property relations in Great Britain, which altered the existing tenant-landowner relationship. This legal organization of property rights reflected the prevailing interests in the landowning classes, formalizing their legal claim and instituting a system of recourse for infringement. While the extent to which this contributed to aggregate growth or was simply a means of expanding rents is contested, it still represents the legal construction of an asset that would translate to future incomes. Through the introduction of these measures, and the prevailing social institution of primogeniture over partible

inheritance, relatively scarce productive land in Britain was subject to a persistent unequal distribution.

Returning to Jha (2015) this is also demonstrated in the assets held domestically and abroad, with the legal protections offered against expropriation by the crown only extending to assets located in Britain. This construction of rights prior to the reforms projected greater risk on those holding foreign assets. The way in which property protections were legally structured held a direct bearing on the security of future income from specific sources, contributing to the push for reform as said assets became more lucrative investments. There is a clear line drawn between the interests of incumbents and the legal institutional structures that can be leveraged to maintain their economic status, as evidenced by the support and opposition to reforming the system of property rights. Not only is this demonstrative of the relative standing of the relevant classes, but the tensions between political and economic power.

Mercantilist policy by means of tariffs, import controls, and other trade barriers serve as a means of protecting domestic producers from foreign competition and have historically been promoted under the argument that they are being implemented for the sake of fostering infant industries (List, 1885: Hamilton, 1791). However, the national system of political economy and neo-mercantilist policies could also be abused by domestic capital and landowners and leveraged to increase rents and secure future incomes. The classic example of rent extraction through trade restriction was the Corn Laws between 1815 and 1846, limiting grain imports and protecting domestic agriculture. These laws were the basis of Ricardo's (1911) rent analysis and advocacy for a system of free trade, as the ban on grain imports was used to increase prices and maintain the elevated rentier incomes of the landowning class. Billed as a means of protecting English farmers from cheap foreign grain, the laws ultimately contributed primarily to the incomes of the incumbent landowning classes. As previously discussed, this set of regulations is credited with elevating grain costs contributing to wage

stagnation through 'Engel's pause' in the early to mid-19th century, and the accrual of benefits to landowners demonstrates the distributional consequences of this kind of policy intervention.

Another key set of laws determining the importation of foreign goods was the Acts of Trade and Navigation, enacted in 1651, reenacted in 1660 and eventually repealed between 1849 and 1854, were a series of regulations on foreign trade between Britain's colonial holdings and other commercial rivals. Again, market protection and the development of domestic production may have been the stated goal of these policies but in practice, it granted an effective monopoly for manufactured goods imports from Britain to the far reaches of the empire. This time rather than landowners it was capital owners and manufacturers in Britain that were able to secure rents as the only source for processed industrial goods for the colonies, which was a boon for the growing textiles and manufacturing industries. The political dimensions of this policy were clear, with the intention to foster an economic dependency among the colonies, but it also offered an opportunity for rent-seeking among the British exporters and the expansion of profits contributing to an upward consolidation of income.

Intellectual property is an area that is difficult to pin down, and most influential in the realm of innovation and the diffusion of new inventions but was in some cases early on a de facto monopoly to produce a good for a set number of years. A letter of patent was a fixed term license from the crown enabling an innovator the sole right to produce a specific good or invention for a predetermined period. This is a relatively new form of property rights compared with more traditional assets like land and capital but was a direct outgrowth of the issuance of monopolies by the crown on the provision of a specific good or service, which presented an incredible opportunity for rent-seeking in and of itself. This was issued on an individual basis and constituted a non-transferrable right to the patent holder.

The process of petitioning and enforcement for patents was expensive and irregular throughout much of history, subject to high application fees across several jurisdictions and

limited guarantees as far as actual protection. However, the discretion afforded to patentholders under the original statute of monopolies allowed one to reap incredible returns without competition. This changed with the 1852 patent reforms, introducing a much more systematized process, reducing the costs of patenting and enforcement and limiting the scope of what was considered a patentable innovation. This also allowed for the licensing of inventions by patentholders, generating a new claim on income for inventors as they were no longer sole proprietor of an innovation and could now charge rents to entrepreneurs who employed said patented innovation. While theoretically open to anyone this system often favored repeat inventors and those who with the financial means to patent frequently and litigate often.

Finally, the most obvious means by which the law could be leveraged to shape income distribution between different income sources were laws regulating different activities such as limitations on organized labour. This included the regulation of strike activity and the outright banning of union organizing. The suppression of the bargaining power of labour via the state backing of strikebreaking efforts in addition to the conditions of the legal environment produced an upward distribution of income towards capital owners the basis of which was formally codified in the law. This was true until the Trade-Union Act of 1871, which legalised unionisation and extended legal protections to labour organizations, with income inequality incidentally declining soon thereafter. Even then, recurring bans on strikes and other union activity during periods of conflict or economic stress still constituted an institutional barrier to long-run wage growth.

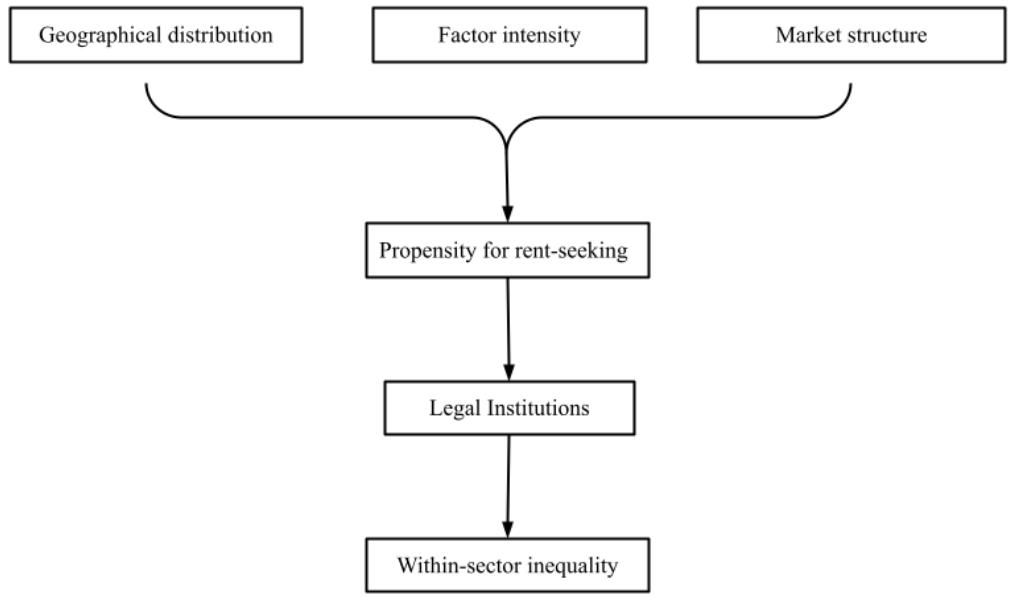
Altogether this is a simple overview of a handful of the legal instruments that have been employed to shape income distribution in Britain through the Industrial Revolution. Each represents a different set of methods by which various classes and professional interests are able to transform the economic environment in their favour and secure future incomes. This

speaks to the numerous dimensions that structure the distribution of income and the different channels through which the law interacts with economic inequality at the industry and sector levels.

Theoretical Framework

The theoretical framework employed in this paper identifies two primary sets of variables that impact the rate of within-sector inequality, producing the observed trends in income distribution over the course of development. First are sector-level characteristics that compose the propensity for rent-seeking which is partially mediated by the second, legal institutions. This is represented in Figure 5 below, demonstrating the variables of interest and their proposed relationship with the distribution of income within a given sector of the economy as the outcome of interest. As previously outlined, there are numerous channels and mechanisms that are capable of shaping income distribution, but this is the general framework and set of specific attributes that are useful to determine the industry-specific effects of the process of structural economic change on the distribution of income.

FIGURE 5. Proposed Model of Inequality Outcomes by Sector



Geographical distribution, factor intensity and market structure each contribute to the general propensity for rent-seeking in a given sector or specific industry, with the inequality outcomes mediated through legal institutional arrangements.

Industry-Level Structural Characteristics

There are many characteristics that define the organization of different industries and are essential components of their fundamental predisposition towards rent-seeking and capture. The boundaries separating the categorization of these attributes are porous since they are often related and, in many cases, jointly determined, but each represents a set of characteristics that ultimately contribute to the tendency a given sector or industry has towards generating inequality. These classifications are meant as a general overview of the key non-institutional factors that contribute to variation in income distribution across industries, both directly and through the mediation and interaction with legal and economic institutions.

First and foremost, the geographical distribution of production plays an important role in the propensity for rent-seeking and overall organization of industry. Factors like centralization and the concentration of industry in urban versus rural areas contribute to the monopoly (or monopsony) power of firms and skew the relative market influence held by a firm in terms of both wages and prices. Additionally, proximity to a significant supply chain network and necessary inputs, particularly for primary resources like sources of energy and mineral resources, can fundamentally alter the consideration of those operating within an industry. The spatial organization of industry is capable of shaping distributional outcomes through market power in terms of both access to labour and resources through monopolies organized geographically. furthermore, on an institutional level regulation and legal recourse against some actors within different industries can additionally be facilitated or hindered based on proximity.

Textiles provide an example of how spatial variation may change over time, with textile production having initially been a primarily cottage-based industry performed often at the household level in rural areas. With the advent of new innovations in cleaning, spinning and weaving, this process became centralized in mills and factories at a much larger scale. This

increased the geographical concentration in urban areas like Manchester which became the center of the global cotton industry. This transition occurred over the long run as new innovations are adopted, meaning that short-term variations can still provide some insight into the structural predispositions of an industry or sector, but long-term shifts are a relevant component of the structural transformation of the British economy.

Agriculture on the other hand is a land intensive sector that is necessarily geographically diffuse. This means that even through increasing capital intensity and the implementation of mechanical innovations in agriculture, the sector as a whole has a wide geographical distribution. There are of course exceptions, as different climates and environmental conditions are required for different crops resulting in greater regional concentration, but even these corridors have lower populations as well as labour supply in the surrounding area relative to sectors located in predominantly urban, labour abundant areas.

Factor intensity, particularly the ratio of capital and labour inputs in production holds a significant bearing on the level of income extraction in a given industry. Additional variations in necessary inputs such as raw materials, human capital requirements, and the use of technologies, shape the income distribution for an industry insofar as it determines the relative value of each component of the production function. As addressed by Allen, the process of capital accumulation and the necessary savings for a firm to attain physical capital commensurate with technological progress means exerting downward pressure on wages. Hence the initial stages of capital-intensive production in a given sector will tend to result in rising inequality. Thus, with the rise in metals and manufacturing as key industrial sectors there is a corresponding rise in inequality during this period, due in theory to the factor intensity and relative demands for capital and labor.

Finally, market structure, in terms of firm concentration, the intensity of competition, and other upstream structural attributes that shape these factors directly impact the

distributional outcomes at a firm and industry level. The degree and nature of competition for the market of goods and services is the final catch-all for the variation in predisposition for institutional capture, with the number of firms and differentiation within a market serving to enable or hinder upward consolidation of incomes. A tendency towards monopoly and monopsony power as a structural attribute can be a key determinant in the rate of profits and returns prior to institutional interventions which may ameliorate or magnify these effects. The production of goods and provision services requiring intensive infrastructure have a natural tendency towards monopoly. The emerging railroad transportation sector exemplifies this kind of predisposition where market entrance is impractical due to infrastructure costs, often leaving routes in the hands of a single railway company with little to no prospect of competition.

Together these specific structural attributes compose a general tendency towards different distributional outcomes. As outlined, there are key characteristics that are inherently linked with a greater likelihood of the consolidation of income across specific economic interests, leading to the theory that income inequality is at least partially linked to structural sectoral attributes. These characteristics alone are not adequate to explain the trends in income distribution, however identifying the ways in which these key attributes interact with features of the legal institutional environment begins to provide a more complete illustration of these general distributional tendencies.

The Propensity for Elite Capture of Growth

The aforementioned structural characteristics incentivize and enable the behaviours of the various classes and actors of interest not just within the market but in terms of shaping the legal institutional environment in which they operate. Geography, factor intensity, and market structure contribute to the within-sector rate of inequality directly by creating a general sectoral tendency towards different relative income distributions, but the actual rate of distribution varies from this natural tendency through the capture of different institutions. As previously

outlined, there are numerous institutional arrangements that can shape income distribution, but due to the sector and industry level characteristics said laws and executive actions vary in their impact. For example, rent extraction as a landowning noble requires a very different set of laws and policies than wage suppression by a capitalist textile factory owner. This of course becomes a more complex relationship once we account for intra-class interests and sub-industry attributes. However, across each of these factors, in the short term we can identify a general propensity towards elite capture of growth and an upward consolidation of income that varies primarily on an institutional basis complementary to the structural predisposition.

All else held equal, the industries of interest each have tendencies that enable different degrees and types of capture that can be exploited to better understand the role of institutions in shaping income dynamics. While the structural characteristics I have outlined above do impact the propensity of rent-seeking in and of themselves, the rate of extraction is mediated by economic and legal institutions. The construction and classification of property rights as well as variation in enforcement each contribute to cross-sector differences in the distribution of income. The previously discussed modes of capturing growth and expanding economic rents are each suited to different structural characteristics across classes and industries. Property rights configurations are suited to protecting the incomes of landowners but can be reconfigured to suit the interests of capital holders or developed into intellectual property rights to provide inventors with a fixed-term monopoly. Protectionist policies regulating the import of foreign goods and the regulation of labour organizing can more effectively suppress wages in capital-intensive industries. The structure of pay through contractor services and the use of day labour creates additional within-class legal distinctions, subject to different considerations and income structures.

The two-stage model of within sector inequality is ultimately meant to help explain why the process of industrialization resulted in the peak in income inequality at its height. Evidence

to support this theory would show that as specific sectors and industries increase as a share of total output, the general rate of income distribution trends in a direction consistent with the structural predisposition of said industries, and additionally respond to policy interventions in terms of output. Demonstrating this requires reformulating the measures of inequality and output to more effectively demonstrate these changes, accounting for the scale of economic transformation through the Industrial Revolution.

Surplus Income and Inequality Extraction

Rather than the aggregate measures of production in income, the massive changes in output over the course of industrialization necessitate a better measure for inequality that decomposes the trends in the extraction of income growth. The inequality extraction ratio offers a useful measure to account for changes in distribution over the course of the transition from subsistence towards modern economic growth, accounting for the level of possible inequality at a given income level.

In order to carry on in the long run an economy must provide a minimum subsistence income to its lowest classes. Surplus income above subsistence however can be distributed unequally so long as the bare minimum for survival is provided. Thus, the greater the surplus, the greater the possible inequality. With the level of inequality necessarily limited by per capita income, most measures like the GINI index fail to capture the dynamics of income distribution at pre-industrial income levels. A solution to this is the use of the inequality possibility frontier, demonstrating the maximum feasible level of inequality at a given income level. The ratio of possible inequality to actual inequality provides a clearer estimate of how extractive an economy is by illustrating distribution in terms of what is possible. (Milanovic et al, 2011)

Milanovic's inequality extraction ratio is a model that can be applied at the sectoral level. Through the Industrial Revolution, certain key sectors saw massive increases in productivity and output, raising the inequality possibility frontier in terms of income

distribution. Where a sector like textiles in the proto-industrial period had a relatively low extraction ratio due to the low profit margin, the much more productive factory model that emerged later was able to generate a greater amount of inequality by virtue of generating a greater amount of surplus income. Some industries produce a greater surplus than others and are thus capable of creating a more unequal distribution, which is why when determining extraction across sectors it becomes important to compare the extraction ratio rather than absolute inequality.

Higher incomes increase the range of possible inequality, so higher-income industries will likely produce greater inequality by virtue of producing per capita output far greater than subsistence. To avoid the issue of upward bias in the contribution of highly productive industries to national income distribution I will look specifically at the distribution of surplus income and identify the extraction rates within-sector. To do so requires calculating the inequality possibility frontier (Milanovic 2011; 2013) at a sector level using income i and employment n to determine the maximum possible contribution to inequality. Measuring the distribution of surplus income S over subsistence s with the minority ε representing the uppermost 10% of the income distribution.

$$S = i - n(1 - \varepsilon)s$$

All future references to real output have been transformed in terms of the surplus output and the income distribution measures in terms of the income extraction ratio, to fit in this framework and better illustrate the trends in distribution during industrialization.

Drawing from Piketty's (2014) simple formulation of $R > G$ where inequality increases when the rate of return on capital exceeds the growth rate of an economy, we can observe that under the institutional conditions where extraction exceeds growth, within sector inequality increases. This basic identity is the foundation of the proposed relationship in this paper,

supporting the conclusion that inequality during this period exceeded the expected returns on physical and human capital as a direct result of institutional structures intended to concentrate the growth of income within specific classes and sub-classes.

Methodology

Data and Methods

Data availability is a significant limitation in this research, which is why I have elected to employ three separate identification strategies, each of which illustrates a key aspect the outlined relationship. For the macro time-series of income inequality, rough income distribution can be estimated for the years 1290, 1688, 1759, and 1801 from reconstructed income tables and used for a variety of measures including GINI coefficient estimates and income ratio by percentiles, which can be modified to determine the income extraction ratio (Milanovic et al. 2011; Campbell, 2007; Lindert and Williamson, 1982). This in addition to income share for the 50th, 90th, and 99th percentiles by decade from 1810-1990 creates an irregular series spanning nearly seven centuries, with more observations clustered around the period of interest (WID, 2022). Additionally, annual output estimates from 1270-1870 (Broadberry et al., 2012) as well as income estimates from 1200-1860 (Clark, 2010) show the changing growth trends over time and allow us to identify the inequality possibility frontier for a given year. Finally, international trade in terms of annual imports and exports from 1800 to 1930 can be used as controls for the additional wealth entering and leaving the United Kingdom during this same period (Federico and Tena 2018).

In addition to the time series, social tables offer a unique opportunity to observe the mean income of different professions and assess the relative class positions over time and can be employed for descriptive cross-sectional analysis of specific years in the series. There are issues with the uppermost classes due to sample size, with those highest on the income scale being the most difficult to obtain an accurate measure of wealth for, but the data available provides essential context on the composition of employment and relative distribution of income for select professions across these cross sections. A combination of simple linear regression, as well as a more robust vector autoregression model allows us to create a general

historical decomposition of variables of interest, seeing how the output across sectors correlates with variations in the rate of inequality, controlling for trade flows. Working around the constraints of the data, impulse response functions can be generated to roughly estimate the dynamic between industry surplus output and economy-wide inequality over a 20-year horizon. Finally, within the series there are numerous structural breaks corresponding with significant changes in the economic and legal institutional environment (ie. the repeal of navigation acts, trade-union act, etc.). Leveraging these reforms, we can see increases and reductions in the costs of different economic behaviours, identifying the direction and magnitude with which the indicators of interest respond to these changes. This demonstrates the rough correlation between different policies and the distribution of the benefits of growth over the long run, contributing towards a better understanding of the relationship between institutional features and economic outcomes.

Social Table Trends

Beginning with the table of incomes in the 13th century containing seven broad social classes and continuing to the more detailed accounts of the 17th through 19th centuries each containing more than 30 distinct professions, social tables provide insight into not just the distribution of income but the relative class position of different professions. We see landowners are the highest earning social strata in the earliest table, but their displacement by capitalists, merchants and other non-titled classes provides a basic illustration of the relative economic standing. This reflects the legal influence and capacity for institutional capture as well, with land rents representing the dominant mode of extraction in the earliest period, subsiding to more modern methods of inflating capital returns, and the protection of new classes of assets.

From the bottom-up perspective, we can observe the transfer of the labouring population between sectors and the change in expected wages associated with different jobs

over time. This contrasts with the narrative of elite capture, as the owner classes each have a contrasting labouring class whose income is reflexive to the legal institutional arrangements in addition to the broader economic environment. For example, landlords and farmers, capital owners and factory workers are representative of these countervailing interests in terms of the relative distribution of benefits within a particular industry or sector.

The trends in the social tables do not present a narrative of individual class mobility but give an impression of the mobility of classes themselves. The lens of inter-class competition is useful within the context of the institutional environment to demonstrate the interests and outcomes during this period of rapid economic change. From this exercise, we can observe the rise and decline in the economic performance of the various professions relative to their peers and compare them with the processes of institutional and economic development occurring contemporaneously.

Time-Series Historical Decomposition

There are numerous ways to measure the correlation between inequality and sectoral growth trends. Multiple regression can be used to illustrate the basic shape of the relationship over time, indicating the sectors and industries that tend to correlate with increases in the income distribution ratio, controlling for net imports. Despite the useful illustration of the general trends that this provides, it fails to account for the endogenous relationship between the variables of interest and any conclusions drawn from this exercise should be supported by additional evidence.

To address this, I employ a vector autoregression to parse out the relationship between surplus income by industry and economy-wide income inequality. This allows for an estimate of the impulse response of a shock to endogenous variable s (surplus income) on outcome y (income ratio) at a particular horizon as indicated in the formula below (Pfaff, 2008).

$$y_t = \alpha + \sum_{j=1}^{p} \phi_j \, y_{t-j} + \sum_{j=1}^{p} \psi_j \, s_{t-j} + \varepsilon_t^y$$

$$s_t = \mu + \sum_{j=1}^{p} \theta_j \, y_{t-j} + \sum_{j=1}^{p} \eta_j \, s_{t-j} + \varepsilon_t^s$$

In doing so we can account for the endogenous relationship between the surplus income of a given sector on the overall rate of inequality in the economy over time. Despite the limitations of the data, this offers some insight into how the distribution of income changes as a result of an increase in the surplus income of a given sector, highlighting the possible predisposition of some sectors to increase inequality.

Structural Breaks in the Series

Using a Chow (1960) test we can identify structural the occurrence of breaks in the time series at the aforementioned significant legal-institutional shifts. This allows us to determine whether a given policy development coincides with a significant break in the trend of the variable of interest, representing a shift in the trend in the series. Though these discontinuities fail to provide causal evidence of the proposed relationship it does point towards the correlation between the policies of interest and output and income over time demonstrating a turning point in terms of institutional and economic outcomes.

In addition to testing for structural breaks in the series, a modified difference-in-differences approach can be employed to identify the degree to which a policy shock affects some sectors relative to others. This can be used to demonstrate the disparate effects that a policy has across sectors and industries, showing the relative gains by sector for a given policy intervention. Together this can point towards the institutional effects, specifically the sector-level interactions, that contribute to long-run trends in distributional outcomes.

Results

Summary of Changes in Relative Incomes

From the social tables, we can determine shifts in the structure of income distribution over time. The titles of the surveyed professions indicate the important characteristics and how they vary over time, including distinctions between the modes of land tenure, heterogeneity within the emerging merchant, capitalist, and financial classes, in addition to the legally significant differences between said groups.

The social table for 1290 is an outlier due to a lack of detail and the subsequent gap of nearly four centuries before the next observation. The broad professional categories and interpolation necessary between 1290 and 1688 risk an overgeneralization of results meaning it is better used as a framing device than as an observation in the time-series. Despite the limitations the social table for 1290 does provide essential context for pre-industrial class structure and rough income distribution, with nearly one-third of the population living at subsistence level as cottagers, paupers, vagrants, etc. while the uppermost five per cent is made up of landowners and substantial tenants. Other professions including lawyers, miners, clergy, and soldiers, in addition to small and moderate landholders, are clustered around the mean income which was at the time about 2.13 times subsistence. This serves to demonstrate that wages at the time were compressed, substantiating the claim that pre-industrial inequality in the United Kingdom was relatively low as a product of the incredibly low rate of income per capita associated with a predominantly agrarian economy.

Across the various landholding and agricultural working classes; smallholders, yardlanders, substantial tenants, and landowners, the average income is a product of the tenure relationship in addition to the size of holdings. Legal claims on a given property were a significant determinant of the income received, with direct claims on land representing greater income returns. Agriculture is the predominant source of income during this period, and in line

with the legal institutional argument of inequality, the distribution of income is largely a product of the legal standing of social classes in terms of the land they occupy. Property relations in an agrarian, feudal society observed in this cross-section take on a specific character that demonstrates the significance of the legal institutional order in determining relative incomes with the noble, landed elites receiving greater land incomes than their non-titled landholding peers, or the indentured labourers working the land with no ownership claims so to speak.

The following tables for years 1688, 1759, and 1801 provide a far more detailed view of class and professional wages, allowing for a more thorough examination of mobility and the changes in relative position. First and foremost the population increased from 5.7 to 9 million employed across the surveyed professions between 1688 and 1801, with the population increasing by 0.9 million between 1688 and 1759 followed by a massive increase of 2.4 million over the next 42 years. Tracking the same professions over just over a century and comparing income relative to the mean shows the incredible economic progress at this time, with mean income rising from 4.79 to 5.06 times subsistence over the first 71 years up to 10.97 over the following 42 years. Similarly, the proportion of the population living at subsistence level declined from 18.3% to 11.5% over the course of just over a century, with the total population living at subsistence sitting around one million through this period. This is illustrated in Figure 6 which displays the change in proportion of the population living at an income of just over £2 per annum, or subsistence level across all four tables.

Figure 6: Share of Population Living at Subsistence Income (£2 per annum)

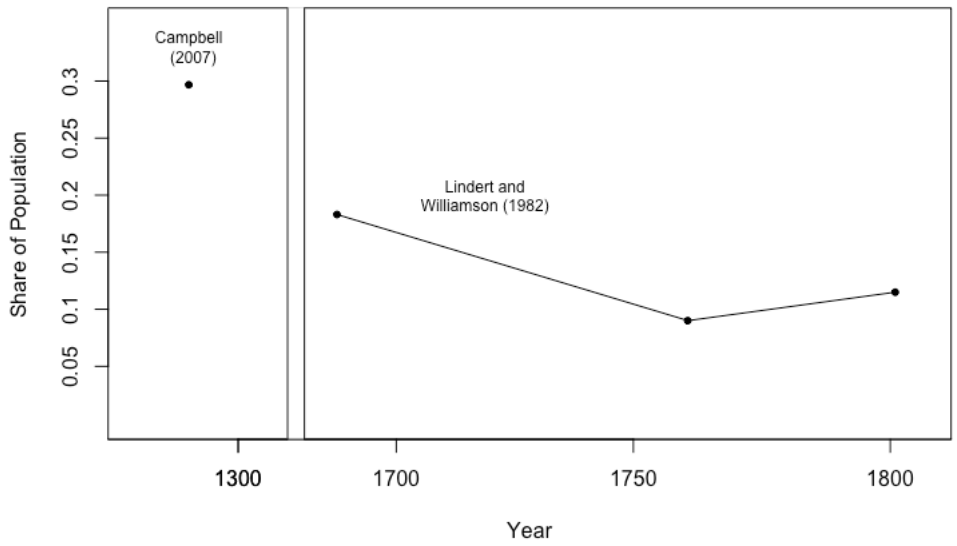


Figure 6. demonstrates the change in the share of the population living at a subsistence income of roughly £2 per annum across the four social tables. This category is primarily composed of vagrants, cottagers, paupers, small tenants, and other professions earning little to no surplus income.

Comparing the relative class positions, surplus income is converted to a proportion of the mean surplus income of the population. This allows for relative comparison across years, emphasizing the changes in earnings greater than subsistence income for a given profession in terms of the mean and accounting for the changes in mean income across the population during this period. To better illustrate these changes the working classes containing subsistence and labour professions are separated from the professional and landed classes containing clergy, public officials, merchants, nobles, and capital owners. Many of the professions and classes more broadly tend to retain their position when ranking in terms of income alone but rise and decline relative to the mean between 1688, 1759, and 1801, often correlating with industry and sector-level developments.

Looking first at the relative income of the working-class professions, there is a clear convergence towards mean income between 1759 and 1801, with the exception of tradesmen and miners as shown in Figure 7. Freeholders, as well as labourers in agriculture, manufacturing, and others are compressed towards the mean, with the various labourers rising

and freeholders declining. This points to increasing regional and professional mobility across the lower skilled labouring professions, likely contributing to a less segmented labour market and collapsing the wage differential across industries.

Figure 7: Subsistence and Labour Relative Incomes 1688-1801

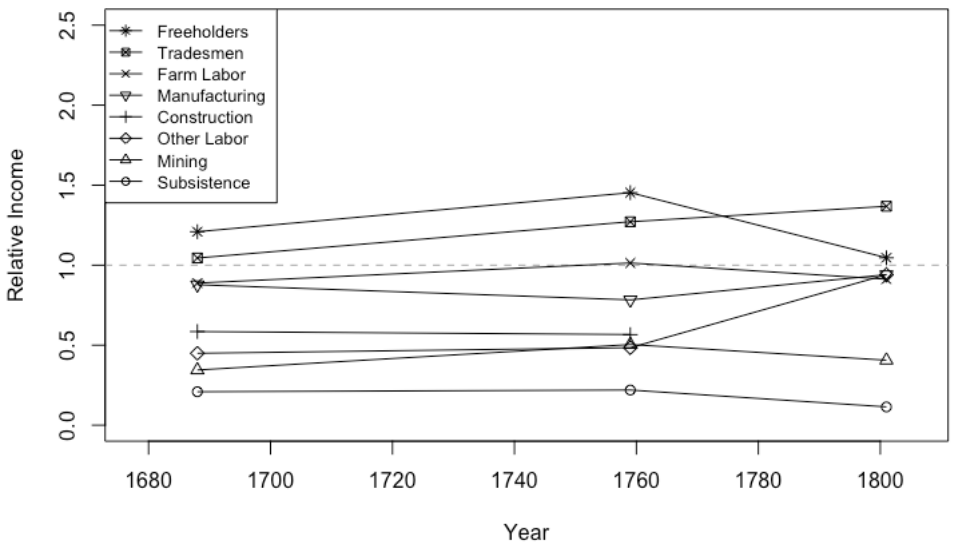


Figure 7. illustrates the change in the relative position of labour and subsistence professions between 1688 and 1801. There is a clear trend towards the mean for most unskilled labouring professions except for mining which saw a decline in relative income and an increase in the relative income of tradesmen.

The mobility argument is supported by the relative employment rate across professions. Figure 8 shows the massive decline in the share of the working population employed as tradesmen and farm labourers and the corresponding rise in manufacturing. The relative changes in employment correspond with the wage convergence seen in the prior figure as employment shifts across sectors. This is also indicative of the trends in rural-to-urban population transfer also reflected in labourers switching sectors to more urban concentrated industries, alluding to the geographical dimension of this transformation.

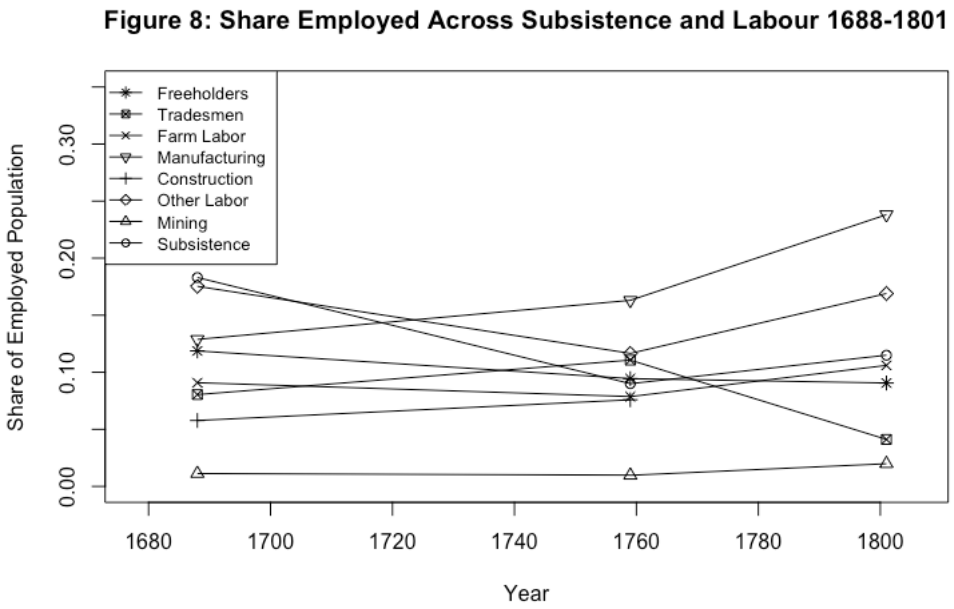


Figure 8. shows the change in the share of the population employed across labour and subsistence professions between 1688 and 1801. The hundred-year period saw a decline in the share of the population living at subsistence and working as tradesmen, with a large jump in the proportion in manufacturing and steady increases among the other labour professions.

The declining relative wages and increasing population employed in metals and mining is notable since it coincides with the beginning of the expansion of the share of output at the start of the 19th century. Additionally, the transition from relatively skilled tradesmen, declining by nearly 100 thousand over this period, to low-skilled labour in manufacturing, increasing by 1.4 million, presents a structural shift in the distribution of human capital that sets up the trend in 19th-century inequality through "Engel's pause" as the demand for physical capital and increases in the rate of profit displaces higher labour wages for skilled workers.

Looking from labour and subsistence towards the professional and landed classes, we are able to see a new set of trends that contribute to our understanding of the relative wages and class position during the early stages of industrialization, as displayed in Figure 9. On its face, the general trend over the century is a slight decline in the relative income of the upper noble classes such as temporal lords and baronets, though lower nobility such as esquires and gentlemen see level or even slightly increasing relative incomes during this period. The professional classes like public officials, lawyers, and merchants as well as clergy see rising

incomes during this same timeframe, again pointing towards the beginning of a shift away from upper landed nobility as the dominant legal and economic class.

Figure 9: Professional and Landed Classes Relative Incomes 1688-1801

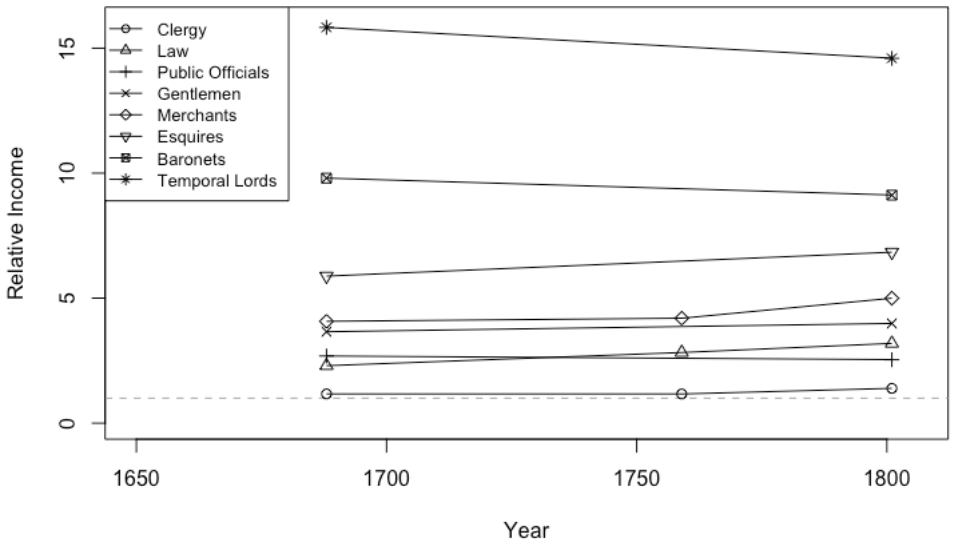


Figure 9. illustrates the change in the relative position of professional and landed classes between 1688 and 1801. The uppermost landed nobility saw a slight decline in income relative to the mean while lesser nobles and professionals tended to see an increase in their relative incomes.

Shifting focus to the share of employment, it is evident that the uppermost professional and landed classes make up an incredibly small share of the employed population during this period. The most significant trend during this period is the massive decline in share of merchants from roughly 3% to less than 1% in 1759 before returning to just under 2% in 1801, matching the same count of individuals employed as in 1688. The common trend during this period is the steady decline in the share of nobility, across both the higher and lower titles. Alongside the slow decline in relative income, the landed elites make up a less and less significant share of the population over each respective table. This harkens back to the aforementioned trends of the early stages of development and the economic displacement that occurs over the process of industrialization, as the rents extracted by landowners are eclipsed by the returns on capital.

Figure 10: Share Employed Across Professional and Landed Classes 1688-1801

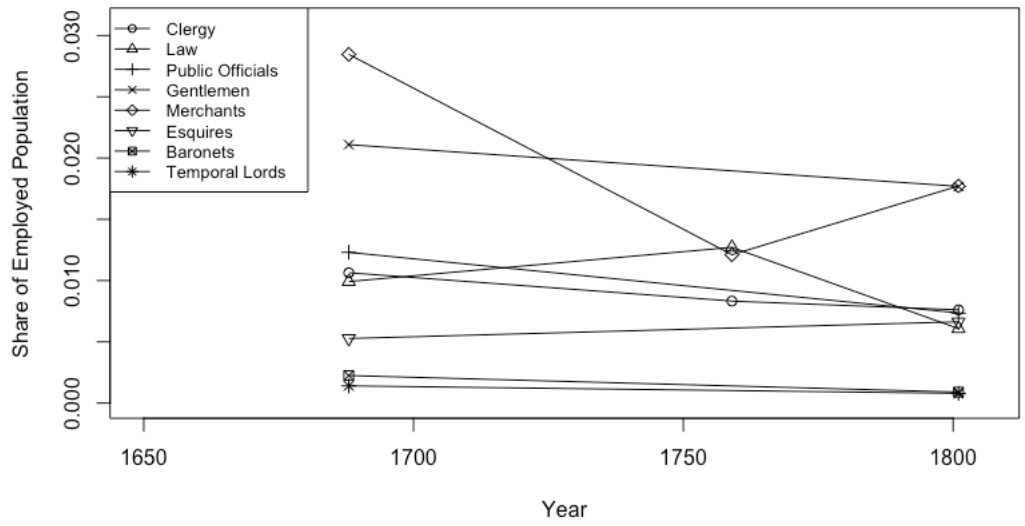


Figure 10. shows the change in the share of the population employed across professional and landed classes between 1688 and 1801. There is a drastic fall in the share of the population employed as merchants, with most other professions also seeing a decline, aside from legal professions.

The social table results provide a solid foundation on which future results can be understood. The general trends in class position and the legal distinctions between professions give insight into the structure of British economic life during the early stages of the Industrial Revolution, following the expected trends in pre-industrial distribution and providing essential context for the larger structural changes that followed.

Industrial Composition and Income Distribution

Moving forward from the framing provided by the social table estimates we can observe the effects of industry and sector-level developments on inequality in a more general sense by regressing surplus output on the income extraction ratio. Beginning at the turn of the 19th century where the social tables left off, with annual observations up just prior to the start of the 20th century a simple linear regression model provides an outline of the correlation between the sectors and industries of interest and the ratio of the top decile of income to the bottom nine. This method is quite limited but does at least indicate the general direction of the income ratio

given the growth of first the three primary sectors, and second with the inclusion of the key industrial subsectors, as well as controls for net exports.

Table 1. Income Distribution as a Function of Sectoral Output

	Dependent variable:			
	Top 10% to Bottom 90% Income Ratio			
	(1)	(2)	(3)	(4)
Agriculture	0.002***	0.001***	0.001**	0.001***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Services	0.0004	0.001***	-0.0003	0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Industry	-0.0003*		0.0002	
	(0.0002)		(0.0002)	
Construction		0.00002		0.00002
		(0.0001)		(0.0001)
Metals and Mining		-0.0002***		-0.0002***
		(0.00003)		(0.00005)
Textiles and Leather		0.00002		0.00002
		(0.0001)		(0.0001)
Other Industry		-0.0002		-0.0003
		(0.0004)		(0.0004)
Net Exports			0.0003	-0.0001
			(0.0002)	(0.0002)
Constant	0.491***	0.432***	0.765***	0.437***
	(0.044)	(0.034)	(0.077)	(0.087)
Observations	75	75	71	71
R^2	0.684	0.827	0.454	0.625
Adjusted R^2	0.671	0.812	0.421	0.583
Residual Std. Error	0.065 (df = 71)	0.049 (df = 68)	0.058 (df = 66)	0.049 (df = 63)
F Statistic	51.345*** (df = 3; 71)	54.208*** (df = 6; 68)	13.710*** (df = 4; 66)	14.998*** (df = 7; 63)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 1. shows the basic correlation between the distribution of income as a ratio of the top 10% to the bottom 90% of earners with the surplus output of the various sectors and industries of interest. Agriculture and services tend to correspond with rising inequality, even when controlling for net imports. Industry trends towards decreasing inequality but when broken down by subsector it appears that this correlation is being driven by metals and mining.

The regression output of Table 1 shows income as the surplus output of the three primary sectors, with agricultural output consistently corresponding with a marginal increase in inequality, even when controlling for exports. Services however have no stable effect and

are correlated with a slight increase in inequality, but only when industry is broken down into its component parts. Industry as a sector again has no consistent effect on inequality, and as the sector undergoing the greatest amount of change during this period is more useful when decomposed into key industries. Between the four industries of interest, a slightly more significant pattern begins to emerge when regressed against the income ratio than the sector as a whole. Metals and mining have a consistent negative effect on the rate of inequality extraction while the other sectors of interest yield no significant results.

Building on the basic correlations, the impulse response functions derived from the vector autoregression model demonstrate the response to a change in sector or industry output over a 20-year horizon. We can see in Figure 11 below that at a sector level, the VAR analysis tends to track the linear regression output with an increase in surplus agricultural output producing an elevated income ratio that levels out over time and the same occurring for services. The results for agriculture contribute to the argument that the entrenched legal institutional interests of landowners have allowed the landed classes to extract incomes disproportionate to their contributions to productivity growth, contributing to the increasing inequality ratio even as they decline in the relative share of output. Industry sees a brief rise and decline but fails to achieve any sort of significant result.

Again, decomposing industry into its component parts yields more substantive results and presents the response of the income ratio to specific industrial developments over a 20-year horizon. Construction output results in declining income ratio over the first half of the series, before converging back towards zero, possibly a result of high wages in London relative to other labour professions. Metals and mining see a slight dip in the rate of inequality before rising but not of a large enough magnitude to be significant. Conversely, textiles and leather produce a slight uptick in the income ratio followed by a decline that only becomes significant

around 20 years after the initial impulse. Finally, the catch-all category of ‘other’ industry sees a significant rise in the rate of inequality, before declining back to zero.

The implications of these test are partially in line with the theory. Agricultural incomes which were up to this point primarily an outcome of land tenure arrangements, and was historically a significant source of rent seeking, is associated with rising inequality in both models. Similarly, services are also attributed with an increasing rate of inequality, likely an outcome of the rising professional and mercantile classes. The effects of industry are more difficult to parse out and square with this theory, the trend seen in the ‘other’ category is representative of expectations with a sharp rise and leveling in the inequality extraction rate, however the other categories do not produce particularly compelling results otherwise. Additional testing ought to consider the time varying consequences of specific attributes and find more inclusive methods to account for how these structural characteristics interact with the broader economic changes over time.

Figure 11: Inequality Impulse Response from Sector Output

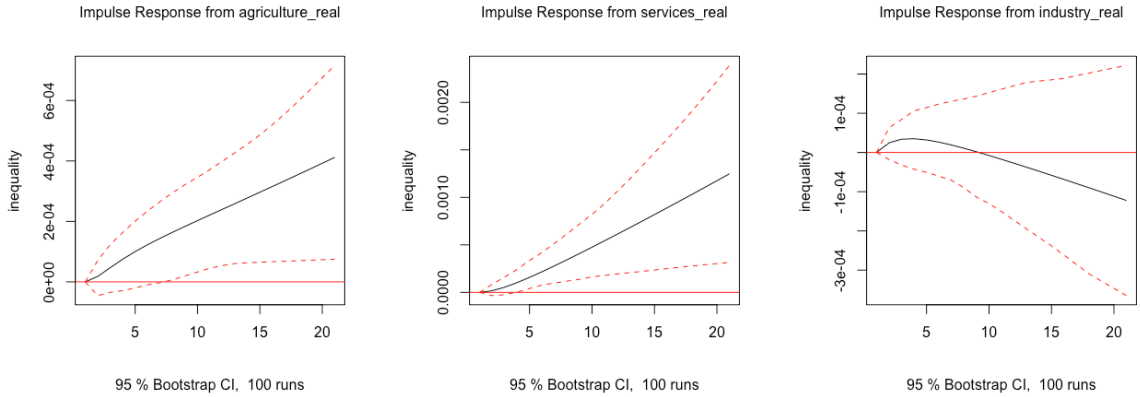


Figure 11. shows the impulse response function of surplus output of the three primary sectors on the income ratio at a 20-year horizon. An increase in agriculture and services results in an elevated ratio of income received by the top decile, while industry tends towards reducing inequality but not at a significant level.

Figure 12: Inequality Impulse Response from Industrial Output

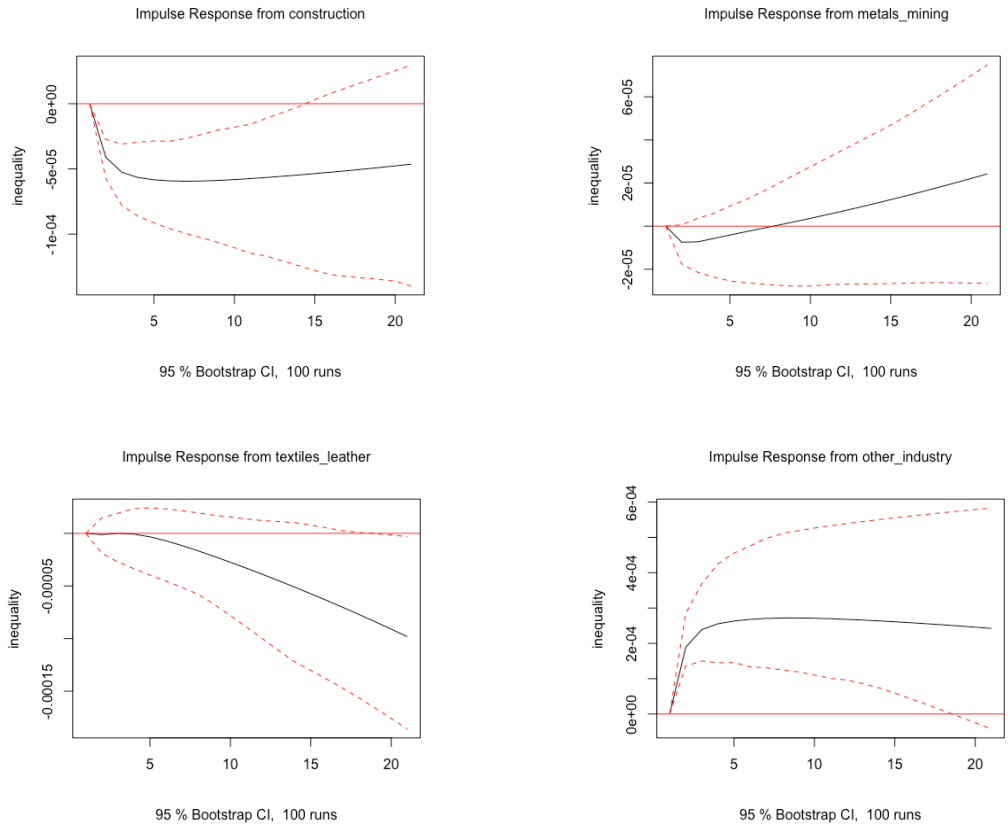


Figure 12. shows the impulse response function of the surplus output of the four primary industries that comprise industrial output on the income ratio at a 20-year horizon. Increasing construction places downward pressure on inequality while metals and mining, and textiles do not produce a significant trend.

Filtering for quality and completeness there are too few and infrequent observations between the inequality and sectoral trends series for substantive VAR analysis, with breaks in the series leading to potentially spurious results. Future series of estimated income distribution with more complete annual estimates across a longer time horizon would offer a more substantive look at the relationship of interest and would provide compelling evidence of the outlined trends across sectors, but as it stands these trends offer an interesting starting point for possible future research.

Significant Legal and Economic Reforms

The final set of evidence contributing to my claim is the correlation between distributional outcomes, sectoral trends in output, and specific legal developments. We can see numerous discontinuities in the time series where there is a clear break in the trend prior to and after a relevant policy shock, indicating that the policy had an effect on the variables of interest. Looking across the output series, it is evident that specific policy shocks have a greater impact on select industries despite on its face impacting each sector equally, contributing to the argument that said reforms might be leveraged to increase the income extraction in specific sectors.

First and foremost of the key turning points is the peak of inequality in the late 19th century. Unsurprisingly the Trade-Union Act of 1871 registers as a significant break in the inequality series as it coincides with the height of the income ratio (See output in Appendix C). This correlation does not provide evidence of a causal effect in and of itself but can be seen as emblematic of an economic and institutional turning point in the series where the legal and economic gains of labour occur over a similar timeframe. This effect is not causal but can be understood as a related series of trends, potentially driven by an underlying latent factor of institutional influence and marking the fundamental shift in the inequality dynamic as seen in the “inverted U” shape trend.

Testing the impact of trade policies on the surplus output of different industries, there is evidence of a disparate effect across the industries of interest from the repeal of the Navigation Acts. The following plots present a general account of the different relative effects the policy shock had across sectors. First, a basic chow test reveals that there is a significant break in the net-exports series at the year 1849, corresponding with the rolling back of the Acts of Navigation, and freeing trade between Britain's colonial holdings. This presented a significant downward shift in the rate of exports, with net imports increasing nearly threefold across the following 20 years. Following from this shift, we can identify the specific industries where this decline in trade had the greatest effect on output.

Looking first at the sector level in Figure 13, there is little indication of a change in the real output trend over the course of repeal between 1849 and 1854. Each of the three primary sectors sees a consistent rate of increase unhindered by the policy shift, with a slight dip in agricultural output but no substantial change in the general trend. This is notable as it was largely industrial goods that were exported at the time, yet there is no visible change in the output trend as a result of increasing international competition with the colonies.

Figure 13: Impact of Navigation Act Repeal Across Sectors

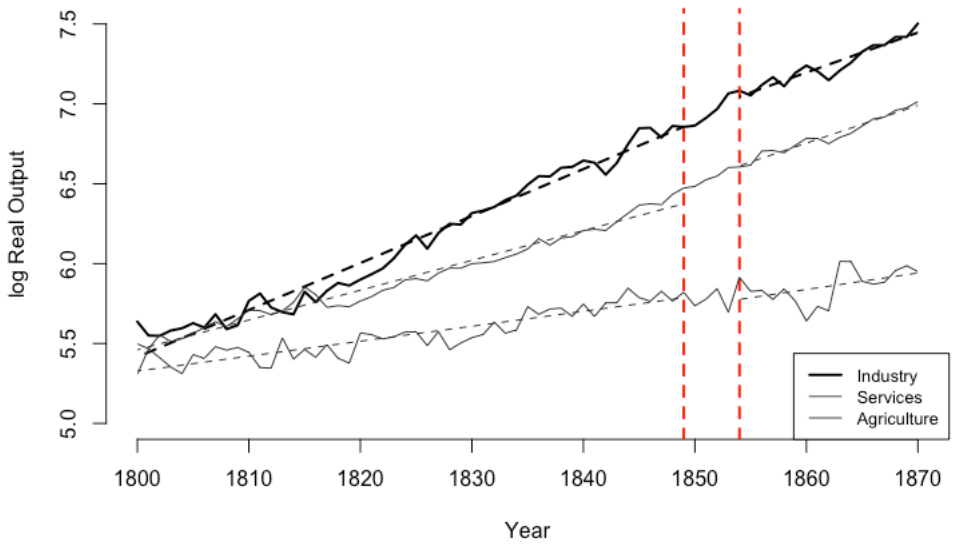


Figure 13. illustrates that at a sector level, there was no visible effect of the rolling back of the Navigation Acts between 1849 and 1854 on surplus output. The trends across industry (bold) services, and agriculture hold relatively constant prior to and after the rolling back of the trade restrictions.

With no immediately evident trend at the sector level, we can decompose the industrial sector into key industries to identify whether there was an effect within a narrower subset of output. As seen in Figure 14, each of the subset of industries including metals and mining, construction, and other industry follow a similar upward trajectory. However, textiles and leather began to level after the formal repeal of the Navigation Acts, indicating that this shift in policy or some latent event occurring simultaneously likely resulted in slowing textile production during this period. Despite the causal limitations, the implied relationship between increasingly free trade and a decline in British textiles leads to interesting questions regarding the structural tendencies of textiles as an industry and the economic interests involved in this development.

Figure 14: Impact of Navigation Act Repeal Across Industries

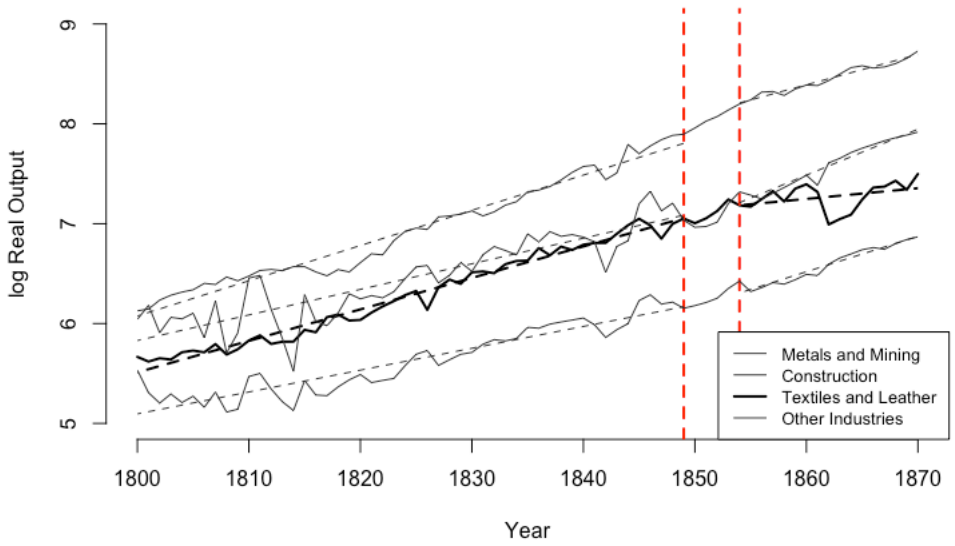


Figure 14. shows that once disaggregated to the industry level the repeal of the Navigation Acts coincides with a slowdown in the growth of textile and leather (bold) surplus output relative to other industries. There is a distinct levelling of the rate of textile output, relative to the roughly parallel trends in the period before repeal.

Building on the visual evidence of this trend, a difference-indifferences model can be used to estimate the magnitude of this effect. Identifying the beginning of the repeal as the start of the post-treatment period and textiles as the treated group we can estimate roughly the impact of this policy, assuming the other industries were trending roughly parallel prior to the repeal as evidenced by the prior plots. Table 2 below shows that there is a significant negative effect on textiles and leather post repeal, relative to the other industries. This includes a term controlling for net exports, accounting for the overall decline in exports across all industries as a result of this policy reform, and emphasizing the specific effect on textile output in particular.

Table 2. Difference in Differences for Repeal of Navigation Acts

	Dependent variable:	
	Output	
	(1)	(2)
Textiles	-129.970	-129.970
	(147.081)	(140.475)
Post-Repeal	1,599.076***	902.719***
	(135.221)	(184.465)
DiD	-787.965***	-787.965***
	(270.443)	(258.297)
Net Exports		-4.941***
		(0.935)
Constant	725.211***	407.657***
	(73.540)	(92.417)
Observations	284	284
R^2	0.364	0.422
Adjusted R^2	0.358	0.414
Residual Std. Error	900.682 (df = 280)	860.232 (df = 279)
F Statistic	53.496*** (df = 3; 280)	50.972*** (df = 4; 279)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 2. indicates that the decline in textile output at the time of the repeal of the Navigation Acts is significant relative to other industries, even controlling for the overall decline in net exports as a result of this policy the decline in textiles remains significant.

The post repeal trend represents a significant blow to textiles output, with significant decline relative to other industries, even controlling for the overall decline in net exports. This matches the intuition on the interaction between institutional developments and specific industries. The nature of the British textiles industry at this time left it exposed to the opening of colonial markets, hence the stagnant output in the wake of the Navigation Act repeal. The structural attributes unique to textiles and the specific historical circumstances of British imperial trade mean that the repercussions of this policy shock fell primarily on the textile industry, with the counterfactual where these restrictions remained in place resulting in a continued rate of increase in output.

To reiterate, the implications of this exercise are limited but contribute to the conclusion that the structural attributes of different sectors result in differential responses to policies. The repeal of the Acts of Navigation provides a straightforward case of the removal of trade barriers

that saw a subsequent decline in British exports and potentially contributed to the levelling of textile production. The argument follows that despite impacting all exports nominally, there were industry-specific consequences of the rolling back of trade barriers. Put simply, relevant policies reflect structural shifts in the series, with specific cross-industry effects. While this is by no means evidence of a causal relationship, the results are in line with the theoretical model of the institutional and sectoral channels of change in income distribution.

This series of structural breaks represents just a few of the potential shifts in the dynamics of inequality and output during this period, with numerous other possible policy shocks worth interrogating. Future research would benefit from a narrower scope, focusing on a shorter period and clusters of related policies over said period, with the use of micro-level data to present the contours of this relationship. However, as it stands, the results presented indicate towards the significant interaction between specific institutional changes and their differential impacts across sectors, and offers an interesting first step for future research.

Conclusion

The portrait of the Industrial Revolution as immiserizing growth is not a wholly accurate depiction, but many of the more optimistic narratives on inequality and the general welfare of the population overlook the very real dynamics of income extraction and the capture of growth by elites. The 19th century was an exceptional period in terms of an elevated rate of income accruing to the uppermost percentiles, in stark contrast to the more equitable distribution both immediately before and after. The destitution and deprivation that characterized much of British history were mitigated by the expansion of real incomes, such that the lowest percentiles in the population distribution still saw increasing real incomes during this period even as their share of total income declined.

There are numerous factors contributing to variation in the distribution of income over this period, with most of the outlined theories having tended to focus on the process of structural transformation as a catalyst for the upward consolidation of income. In evaluating the salience of these explanations, I have presented the theoretical basis of my claim that there is a sector-level explanation for this phenomenon, structured by specific characteristics by industry and their interaction with changes in the institutional environment. It follows that certain industries are simply predisposed to creating inequality, hence a shift in the composition of the economy necessarily results in variation in the distribution of income. This is explained by sectoral attributes and their interaction with the institutional environment, producing a general sector level rate of inequality that contributes to the economy wide rate of income distribution.

There is still ambiguity in the degree to which the distributional outcomes were the consequence of human capital gains and the institutional environment, but a sectoral analysis indicates that legal arrangements across industries are responsible for a greater share of the unequal distribution than described in previous accounts. The incomes and relative class

position of various professions over time relative to legal institutional changes show that despite there being a skill premium contributing to the rates of distribution, elite institutional capture and political sway held by the classes and asset holders in question did have some bearing on the distribution of benefits. Sources of income and ownership claims which vary by class and sector do at least in part structure distributional outcomes over the observed period.

The more general sectoral trends and contribution to inequality are difficult to fully parse out and demand greater scrutiny, but the interim results largely conform with the outlined narrative of structural predisposition and interaction with institutional changes. Over the course of the 19th century, agricultural output was most closely correlated with increasing inequality extraction, and further analysis of the land tenure system and institutional channels for rent extraction show how agriculture has historically been a source for inequality in Britain. However, the degree to which this explains the rise in income inequality over the course of development is limited, as total output rose but the share of the total economy derived from farming and livestock, though increasing capital intensity in the agricultural process may serve as a partial explanation for the direction of this trend.

Services followed a similar trajectory but again lacks any substantive explanatory power in terms of the trends occurring during this period. Further research on the rise of the service sector should serve to expand on this analysis, particularly in recent decades with the rise of multiple labour and capital income streams among the uppermost income percentiles, presenting a novel example of the significance of the source of income on long-run distribution.

Industry is the focal point of the structural argument, broken down into key subsectors to determine which areas were predisposed to a rising rate of income accruing to the uppermost percentiles during this period. The capital intensity story of income distribution appears to cover the industries falling into the ‘other’ category, which systematically results in an elevated income ratio for the uppermost decile of earners. Conversely, increasing construction during

this period produced a downward pressure in the rate of inequality, likely as a result of it being a labour-intensive industry, with relatively high skilled workers earning commensurate wages. Finally, textiles and leather, and metals and mining fail to present any significant trend over the century surveyed and may provide more interesting results if observed over a longer time horizon.

On the institutional front, it is clear that the policies described coincide with fundamental shifts in the trajectory of both sectoral output and the general inequality ratio. The most stylized of these facts was the passing of the Trade-Union Act of 1871, at the peak of inequality, immediately followed by a decline in the share of income going to the top decile of earners. This points to the covariation of the economic and institutional environment as the laws associated with increasing wages occur in tandem with a more equal distribution of income. The occurrence of institutional shifts and followed by changes in income distribution and sectoral output contributes to the argument that there are structural attributes within the sector that structure the response to changes in the institutional environment. This is demonstrated by the Navigation Acts exercise, illustrating the sector-specific effects on textiles relative to other key industries.

Altogether this evidence is in line with the theory outlined in this paper. It appears that certain industries are correlated with increasing inequality relative to others, and that said output is affected by prevailing institutional structures. The policy shocks that occur demonstrate the response of key industries to changes in the institutional environment, which has distributional implications as far as the industries that tend to generate inequality. This is in turn structured largely on the basis of structural sectoral attributes, the most significant of which appears to be capital intensity, which tends to be the most consistent indicator of increasing income inequality within a given sector. Future research with more complete data

ought to look further into the question of sectoral characteristics and their interaction with institutions on the overall distribution of income over the course of development.

Works Cited

Acemoglu, Daron, and Simon Johnson. “Unbundling Institutions.” *Journal of Political Economy* Vol. 113, no. 5 (2005): 949–95.

Acemoglu, Daron. *Introduction to Modern Economic Growth*. United Kingdom: Princeton University Press, 2008.

Acemoglu, Daron, and James A. Robinson. “On The Rise and Decline of General Laws of Capitalism.” *Journal of Economic Perspectives*, Vol. 29 no.1 (2015): 3-28

Alfani, Guido. "Epidemics, Inequality, and Poverty in Preindustrial and Early Industrial Times." *Journal of Economic Literature*, Vol. 60, no. 1 (2022): 3-40.

Alfani, Guido, and Matteo Di Tullio. *The Lion's Share: Inequality and the Rise of the Fiscal State in Preindustrial Europe*. Cambridge Studies in Economic History - Second Series. Cambridge: Cambridge University Press, 2019

Allen, Robert C. "Capital Accumulation, Technological Change, and the Distribution of Income during the British Industrial Revolution," Economics Series Working Papers 239, University of Oxford, Department of Economics. (2005)

Allen, Robert C. “Engels’ pause: Technical change, capital accumulation, and inequality in the British industrial revolution.” *Explorations in Economic History*, Vol. 46, no. 4, (2009a): 418-435

Allen, Robert C. *The British Industrial Revolution in Global Perspective*. Cambridge: Cambridge University Press, 2009b.

Allen, Robert C. "Real Wages Once More: A Response to Judy Stephenson," Working Papers 20170006, New York University Abu Dhabi, Department of Social Science, revised Jul 2017.

Becker, Gary S. “Investment in Human Capital: A Theoretical Analysis.” *Journal of Political Economy* Vol. 70, no. 5 (1962): 9–49.

Becker, Gary S., Kevin M. Murphy, and Robert Tamura. “Human Capital, Fertility, and Economic Growth.” *Journal of Political Economy* Vol. 98, no. 5 (1990): S12–37.

Berg, Maxine., Hudson, Pat. *Slavery, Capitalism and the Industrial Revolution*. United Kingdom: Polity Press, 2023.

Bottomley, Sean. *The British Patent System during the Industrial Revolution 1700–1852: From Privilege to Property*. Cambridge Intellectual Property and Information Law. Cambridge: Cambridge University Press, 2014.

Boushey, Heather, DeLong, J. Bradford and Steinbaum, Marshall. *After Piketty: The Agenda for Economics and Inequality*. Cambridge and London: Harvard University Press, 2017.

Broadberry, Stephen, Bruce Campbell, Alexander Klein, Mark Overton, and Bas van Leeuwen. ‘British Economic Growth, 1270-1870: An Output-Based Approach’. Studies in Economics, Studies in Economics, 2012

Campbell, Bruce. “Benchmarking medieval economic development: England, Wales, Scotland and Ireland c. 1209.” *Economic History Review*, Vol. 60 (2007): 1-50.

Clark, Gregory. “The Condition of the Working Class in England, 1209–2004.” *Journal of Political Economy,* Vol. 113, no. 6 (2005): 1307–40.

Clark, Gregory. “The Macroeconomic Aggregates for England, 1209-2008,” *Research in Economic History,* Vol. 27 (2010): 51-140.

Clark, Gregory. ‘Chapter 5 - The Industrial Revolution.’ In *Handbook of Economic Growth*, edited by Philippe Aghion and Steven N. Durlauf, 2:217–62. Handbook of Economic Growth. Elsevier, 2014.

Clark, John Bates. *The Distribution of Wealth: A Theory of Wages, Interest and Profits*. United States: Adamant Media, 2001.

Cloyne, James. "Discretionary Tax Changes and the Macroeconomy: New Narrative Evidence from the United Kingdom." *American Economic Review*, Vol. 103, no. 4 (2013): 1507-28**.**

Crafts, Nicholas, *British Economic Growth during the Industrial Revolution*. Oxford: Clarendon Press, 1985.

Crafts, Nicholas, and C. K. Harley. "Output Growth and the Industrial Revolution: A Restatement of the Crafts-Harley View." *Economic History Review* Vol. 45, no. 4 (1992): 703-30.

Crafts, Nicholas, Ian Gazely, and Andrew Newell. *Work and Pay in 20th Century Britain.* Oxford: Oxford University Press, 2007.

Crafts, Nicholas and Terence C. Mills, “Six centuries of British economic growth: a time-series perspective,” *European Review of Economic History*, Vol. 21, Issue 2, (2017). 141–158.

Deakin, Simon, David Gindis, Geoffrey M. Hodgson, Kainan Huang, and Katharina Pistor. "Legal institutionalism: Capitalism and the constitutive role of law." *Journal of Comparative Economics* Vol. 45, no. 1 (2017): 188-200.

Engels, Friedrich. *The Condition of the Working Class in England.* Oxford University Press, 2009.

Findlay, Ronald, and Kevin H. O’Rourke. *Power and Plenty: Trade, War, and the World Economy in the Second Millenium.* Princeton: Princeton University Press (2007)

Flaig, G. “Why we should use high values for the smoothing parameter of the Hodrick-Prescott filter,” Jahrbücher fur Nationalökonomie und Statistik Vol. 235, no. 6, (2015). 518 –37.

Floud, Roderick. *The People and the British Economy 1830-1914.* Oxford: Oxford University Press, 1997.

Floud, Roderick, Jane Humphries, and Paul Johnson, eds. *The Cambridge Economic History of Modern Britain: 1700-1870*. 2nd ed. Vol. 1. Cambridge: Cambridge University Press, 2014.

Floud, Roderick, Jane Humphries, and Paul Johnson, eds. *The Cambridge Economic History of Modern Britain: 1870 to the Present*. 2nd ed. Vol. 2. Cambridge: Cambridge University Press, 2014.

Galor, Oded, and Daniel Tsiddon. "The Distribution of Human Capital and Economic Growth." *Journal of Economic Growth* Vol. 2, no. 1 (1997): 93–124.

Galor, Oded, and Omer Moav. "From Physical to Human Capital Accumulation: Inequality and the Process of Development." *The Review of Economic Studies* Vol. 71, no. 4 (2004): 1001–26.

Galor, Oded, and Omer Moav. "Das Human-Kapital: A Theory of the Demise of the Class Structure." *The Review of Economic Studies* Vol. 73, no. 1 (2006): 85–117.

Greasley, D., and Oxley, L. ''Rehabilitation Sustained: The Industrial Revolution as a Macroeconomic Epoch.'' Economic History Review, 2nd Series 47, (1994). 760–768.

Greif, Avner, Lynne Kiesling, and John V. C. Nye, eds. *Institutions, Innovation, and Industrialization: Essays in Economic History and Development*. Princeton University Press, 2015.

Hamilton, Alexander. *The Report on the Subject of Manufactures.* 1791.

Hamilton, James D. *Time Series Analysis*. Princeton: Princeton University Press, 1994.

Harvey, A.C. and Trimbur, T. "Trend estimation and the Hodrick-Prescott filter," Journal of the Japan Statistical Society, Vol. 38, (2008). 41–9.

Hirschman, Albert O. *The Passions and the Interests: Political Arguments for Capitalism Before Its Triumph*. Princeton: Princeton University Press, 1997.

Hobsbawm, Eric J. *The Age of Revolution: 1789-1848.* Great Britain: Weidenfeld and Nicholson, 1962.

Hobsbawm, Eric J. *Industry and Empire.* London: Penguin Books, 1969.

Hobsbawm, Eric J. *The Age of Capital: 1848-1875.* Great Britain: Weidenfeld and Nicholson, 1975.

Hodrick, R.J. and Pescott, E.C. "Postwar U.S. Business Cycles: an Empirical Investigation," Journal of Money, Credit and Banking, Vol. 29, (1997): 1-16.

Hoffman, Philip T. "What do States do? Politics and Economic History." *The Journal of Economic History* Vol. 75, no. 2 (2015): 303-332.

Irwin, Douglas A. and Maksym G Chepeliev, "The Economic Consequences of Sir Robert Peel: A Quantitative Assessment of the Repeal of the Corn Laws." *The Economic Journal*, Vol. 131, no. 640 (2021): 3322–3337

Jha, Saumitra. Financial Asset Holdings and Political Attitudes: Evidence from Revolutionary England, The Quarterly Journal of Economics, Vol. 130, no. 3 (2015): Pages 1485–1545.

Komlos, John. "Shrinking in a Growing Economy? The Mystery of Physical Stature during the Industrial Revolution." *The Journal of Economic History,* Vol. 58, no. 3 (1998): 779–802.

Kuznets, Simon. "Economic Growth and Income Inequality." *American Economic Review* Vol. 45, no. 1 (1955): 1-28.

Kuznets, Simon. *Toward A Theory Of Economic Growth*. New York: W. W. Norton & Company, 1968.

Lindert, Peter H. and Jeffrey G. Williamson. "Revising England's Social Tables, 1688-1812," *Explorations in Economic History,* Vol. 19, no. 4 (1982): 385-408.

Lindert, Peter H., and Jeffrey G. Williamson. "English Workers' Living Standards during the Industrial Revolution: A New Look." *The Economic History Review,* Vol. 36, no. 1 (1983): 1–25.

List, Friedrich. *National System of Political Economy.* London: Longmans, Green, & Co., 1885

MacLeod, Christine. Inventing the Industrial Revolution: The English Patent System 1660-1800. Cambridge: Cambridge University Press, 1988.

Maddison, Angus. *The World Economy: A Millennial Perspectives*, Paris: OECD Development Centre, 2001.

Malthus, Thomas. *An Essay on the Principles of Population and Other Writings.* London: Penguin Books, 2015.

Marx, Karl. *Capital: Volume I.* United Kingdom: Penguin Books, 2004.

Mayhew, Nicholas J. "Modeling medieval monetization," in R. N. Britnell and B. M. S. Campbell, *A Commercialising Economy: England 1086 to c. 1300*, Manchester University Press (1995): 55-77.

McLeay, Michael, and Ryland Thomas. "UK Broad Money Growth in the Long Expansion 1992–2007: What Can It Tell Us about the Role of Money?" Chapter. In *The UK Economy in the Long Expansion and Its Aftermath*, edited by Jagjit S. Chadha, Alec Crystal, Joe Pearlman, Peter Smith, and Stephen Wright, 131–209. Macroeconomic Policy Making. Cambridge: Cambridge University Press, 2016.

Milanovic, Branko, Peter H. Lindert, and Jeffrey G. Williamson. "Pre-Industrial Inequality." *The Economic Journal.* Vol. 121, no. 551 (2011): 255–72.

Milanovic, Branko. "The Inequality Possibility Frontier: Extensions and New Applications." Policy Research Working Paper 6449, World Bank (2013)

Milanovic, Branko. *Global inequality: A new approach for the age of globalization,* Cambridge: Harvard University Press, 2016a.

Milanovic, Branko. 'Introducing Kuznets Waves: How Income Inequality Waxes and Wanes over the Very Long Run.' *CEPR VoxEU*, (2016b).

Mincer, Jacob. "Investment in Human Capital and Personal Income Distribution." *Journal of Political Economy* 66, no. 4 (1958): 281–302.

Mitch, David. "Education and skill of the British labour force." In: Floud, Roderick, Johnson, Paul (Eds.), *The Cambridge Economic History of Modern Britain, Industrialisation, 1700 –1860, vol.I.* Cambridge: Cambridge University Press (2004): pp.332–356.

Mitchell, Brian. *British Historical Statistics,* Cambridge: Cambridge University Press, 1988.

Mokyr, Joel. *The Lever of Riches: Technological Creativity and Economic Progress*. United Kingdom: Oxford University Press, 1990.

Nitzan, Jonathan. and Shimshon Bichler. *Capital as Power: A Study of Order and Creorder.* New York*: Routledge*, 2009.

North, Douglass C., and Barry R. Weingast. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England." *The Journal of Economic History* Vol. 49, no. 4 (1989): 803–32.

North, Douglass. *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press, 1990.

O'Rourke, Kevin H. "The European grain invasion, 1870 1913." *Journal of Economic History* Vol. 57 (1997): 775–801.

O'Rourke, Kevin H., and Jeffrey G. Williamson. *Globalization and History: The Evolution of a Nineteenth Century Atlantic Economy*. Cambridge: The MIT Press, 1999.

Ricardo, David. *The Principles of Political Economy and Taxation, Chapter 5. On Wages*. London: J.M. Dent & Sons, 1911.

Pfaff, Bernhard. *Analysis of Integrated and Cointegrated Time Series with R*. Springer-Verlag, New York. 2006

Pfaff, Bernhard. "VAR, SVAR and SVEC Models: Implementation Within R Package vars." *Journal of Statistical Software*, Vol. 27, no. 4 (2008)

Piketty, Thomas. *Capital in the Twenty-First Century*. Cambridge: Harvard University Press, 2014.

Piketty, Thomas. *Capital and Ideology*. Cambridge: Harvard University Press, 2020.

Pistor, Katharina. *The Code of Capital: How the Law Creates Wealth and Inequality*. Princeton: Princeton University Press, 2019.

Pollard, Sidney. Trade Unions and the Labour Market, 1870–1914. Bulletin of Economic Research, Vol. 17 (1965): 98-112.

Ravn, Morten O. and Uhlig, Harald. “On adjusting the Hodrick-Prescott filter for the frequency of observations,” The Review of Economics and Statistics, Vol. 84, no. 2, (2002) 371-380

Scheidel, Walter. *The Great Leveler: Violence and thew History of Inequality From the Stone Age to the Twenty-First Century.* Princeton: Princeton University Press, 2017.

Sefton, James, and Martin Weale. *Reconciliation of National Income and Expenditure: Balanced Estimates of National Income for the United Kingdom, 1920-1990.* Cambridge: Cambridge University Press, 1995.

Sefton, James, and Martin Weale. “The Concept of Income in a General Equilibrium.” The *Review of Economic Studies* Vol. 73, no. 1 (2006): 219–49.

Shorrocks, Anthony F. “The Class of Additively Decomposable Inequality Measures.” *Econometrica* Vol. 48, no. 3 (1980): 613–25.

Shorrocks, Anthony F. “Inequality Decomposition by Population Subgroups.” *Econometrica* Vol. 52, no. 6 (1984): 1369–85.

Stephenson, Judy Z. ‘“Real” Wages? Contractors, Workers, and Pay in London Building Trades, 1650–1800’. *The Economic History Review* Vol. 71, no. 1 (2018): 106–32.

Szreter, Simon. “Economic Growth, Disruption, Deprivation, Disease, and Death: On the Importance of the Politics of Public Health for Development.” *Population and Development Review,* Vol. 23, no. 4 (1997): 693–728.

Temin, Peter. “Two Views of the British Industrial Revolution.” *The Journal of Economic History* Vol. 57, no. 1 (1997): 63–82.

Thomas, Ryland, Nicholas Dimsdale "A Millennium of UK Data", Bank of England OBRA dataset, 2017.

van Zanden, Jan Luiten. “Tracing the beginning of the Kuznets curve: western Europe during the early modern period”, *The Economic History Review*, Vol. 48, no. 4 (1995): 1-23.

Williamson, Jeffrey G. The impact of the Corn laws just prior to repeal. *Explorations in Economic History*. Vol. 27 (1990): 123–156.

Williamson, Jeffrey G. *Did British Capitalism Breed Inequality?* Boston: Allen & Unwin, 1985.

“World Inequality Database (WID).” Paris School of Economics and the University of Berkeley: World Inequality Lab, 2022.

Wrigley, E. A. and R. S. Schofield. *The Population History of England, 1541-1871*, Cambridge: Cambridge University Press, 1981.

Appendix A. Social Tables

Table 1.1: Social Table Per Capita Incomes

social_group	1688	1759	1801
subsistence	2	2.2	2.5
mining_labour	3.3	5.1	8.9
laborers	4.3	4.9	6.9
construction	5.6	5.7	NA
seamen	6.7	6.7	38
manufacturing	8.4	7.9	20.6
farmers	8.5	10.3	20
tradesmen	10	12.9	30
clergy	11.2	11.8	30.5
freeholder	11.6	14.7	22.9
law	22	28.6	70
public_officials	25.7	NA	55.6
gentlemen	35	NA	87.5
merchants	39	42.5	109.6
esquires	56.3	NA	150
baronets	93.8	NA	200
temporal_lords	151.5	NA	320

Table 1.2: Social Table Share of Population

social_group	1688	1759	1801
subsistence	0.183	0.09	0.115
laborers	0.175	0.117	0.169
manufacturing	0.129	0.163	0.238
freeholder	0.119	0.094	0.091
farmers	0.091	0.079	0.106
tradesmen	0.08	0.111	0.041
construction	0.058	0.076	NA
merchants	0.028	0.012	0.018
seamen	0.026	0.027	0.006
gentlemen	0.021	NA	0.018
public_officials	0.012	NA	0.007
clergy	0.011	0.008	0.008
mining_labour	0.011	0.01	0.02
law	0.01	0.013	0.006
esquires	0.005	NA	0.007
baronets	0.002	NA	0.001
temporal_lords	0.001	NA	0.001

Appendix B. Output and Income Distribution Data

Table 1: VAR Data Summary

Statistic	N	Mean	St. Dev.	Min	Max
year	71	1,835.000	20.640	1,800	1,870
inequality	71	0.955	0.076	0.695	1.000
agriculture_real	71	286.686	54.862	201.878	409.400
services_real	71	527.628	248.859	236.705	1,112.361
industry_real	71	755.195	445.287	256.692	1,813.195
construction	71	1,035.016	653.378	249.843	2,744.096
metals_mining	71	2,144.830	1,663.412	458.228	6,177.580
textiles_leather	71	835.147	451.629	275.636	1,804.460
other_industry	71	414.685	219.488	166.253	960.995
net_exports	71	-105.954	84.984	-317.629	21.417

Appendix C. Structural Break Test Output

Table 1: Chow Test for Inequality Ratio at Year 1871

data: income_ratio ~ year

F = 27.438, p-value = 2.16e-05

Table 2: Chow Test for Net Exports at Year 1849

data: net_exports ~ year

F = 24.518, p-value = 1.022e-08