# Class, Power, and the Structural Dependence Thesis: Distributive Conflict in the UK, 1892-2018*

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**Abstract**

Can political parties, social movements, and governments influence market outcomes and shape the functioning of a capitalist economy? Is it possible for social democratic parties, and the labour movement in general, to promote a significant redistribution of income in favour of labour? According to proponents of the structural dependence thesis, the answer to both questions is negative. For, the structural dependence of labour upon capital severely constrains feasible income distributions. This paper provides a long-run analysis of the UK which casts doubts on the structural dependence thesis. There is some evidence of a short-run profit-squeeze mechanism, but income shares are much more variable in the long-run than the structural dependence argument suggests, and the power resources available to social classes are among the key determinants of distributive outcomes.

**JEL Classification**:

P16 – Political Economy;

D33 – Factor Income Distribution;

E32 – Business Fluctuations, Cycles;

J5 – Labor-Management Relations, Trade Unions, Collective Bargaining.

**Keywords**: structural dependence thesis, income distribution, power resources, labour movement.

# 1 Introduction

A foundational question in political economy concerns the nature of the interaction between politics and markets. To what extent can political parties, social movements, and governments influence market outcomes and shape the functioning of a capitalist economy? More specifically, given the inherent tendency of unfettered markets to yield major income and wealth inequalities, is it possible for social democratic parties, and the labour movement in general, to promote a significant redistribution of income in favour of labour?

According to a prominent tradition comprising both neo-pluralist (Lindblom [29, 30], Stone [44]) and neo-Marxist authors (Coates [8], Block [4], Offe [32]), the margins of intervention are extremely narrow, due to the unique power of business in capitalist economies. Capitalists do not need to organize and lobby in order to influence decisions: they enjoy a structural power which derives from their control over investment. If governments try to implement any policies or reforms that damage capitalist interests, and undercut profitability or business confidence, profit-maximizing capitalists respond by reducing investment, and thus economic activity. To the extent that economic activity matters for electoral outcomes, this severely reduces the margins for reforms, and it is "why the market might be characterized as a prison. For a broad category of political/economic affairs, it imprisons policy making, and imprisons our attempts to improve our institutions. It greatly cripples our attempts to improve the social world because it afflicts us with sluggish economic performance and unemployment simply because we begin to debate or undertake reform" (Lindblom [30], p.329).

In the last two decades, the structural power of business has played a key role in explanations of the declining ambitions *and* influence of social democratic parties. As Glyn ([14], p.1) remarked, "At the turn of the century more parties of the Left were in government in advanced capitalist countries than ever before, including, for the first time ever, those of the four largest West European countries" and yet this only brought "modest shifts in economic policy". This persistent ineffectiveness, compounded by the electoral decline of socialist parties across Europe, has led even prominent social democratic theorists to emphasize the structural limits that capitalism places on redistributive policies and reforms (Streeck [45]). But the structural power of business has also played a central role in analyses of financialization and globalization (Krippner [26], Bell [1], Panitch and Gindin [33], Roos [41], Starr [43]). "Indeed, the financial crisis revived the structural power debate" (Woll [51], p.375).

The structural power of capitalists does not constrain only government actions, however. In a series of seminal contributions, Przeworski [35, 36, 37, 38] has argued that there is an irreversible tendency that makes it impossible in capitalist democracies in the long-run to promote significant changes in the distribution of income in favour of labour, let alone any socialist objectives. While the immediate interests of capitalists and workers are in conflict in the short-run (higher profits lead to lower wages, and vice versa), this is not true in a dynamic context, because in a capitalist system profits are the engine of growth, and growth delivers (at least potentially) higher welfare in the future. It is this mechanism that is the material basis of workers' consent to capitalism and thus of capitalist hegemony, since it explains why, faced with the likely high costs of transition to socialism, self-interested rational workers will support capitalism: capitalism promises continued welfare growth.

Further, when socialist parties and the labour movement forsake revolutionary strategies, they inevitably enter into an economic logic of class compromise. For to gain the future benefit of returns to investment, they must forego any significant expropriation of profits today. Both high levels of taxation imposed by a sympathetic government and the promotion of working-class militancy through class struggle are counterproductive, because each will generate a profit-squeeze mechanism: low profits lead to a reduction in investment, which implies lower employment today and lower production and wages in the future. Changes in the distribution of income, either via a welfare state or via bargaining and conflict, are severely constrained. The working class is therefore structurally dependent upon capital, an argument summarized as 'the structural dependence thesis' (henceforth, SDT).

Przeworski's theory is extremely influential, and his conclusions widely debated. It is difficult to underestimate the theoretical and policy implications of the idea that the structural features of private ownership economies severely constrain the range of attainable distributions of income.

Przeworski has formalized some key intuitions of the neo-pluralist and neo-Marxist literature, extending the analysis of the structural power of capital beyond policy-making strictu sensu, but the basic idea is shared by many authors belonging to very different traditions. It also lies at the heart of neoliberal approaches and provides the foundations for criticisms of social democratic parties, the welfare state, and Keynesian policies.

Further, SDT has strongly influenced policy debates and the elaboration of political programmes. German chancellor Helmut Schmidt famously remarked, "The profits of enterprises today are the investments of tomorrow and the investments of tomorrow are the employment of the day after" (quoted by Glyn [14], p.16). More recently, Wickham-Jones [48, 49] has shown that during the 1990s and 2000s the UK Labour Party (first in opposition and then in government) formulated policy programmes explicitly on the basis of a belief in SDT.

Yet there is little empirical evidence that definitively supports the idea that income distribution in capitalist economies is severely constrained, for empirical analyses of SDT are few and inconclusive. Existing studies focus in the main on *redistributive* policies in order to ascertain the existence of limits to government policies either by examining differences in choices under different governments,[1] or by considering the limiting cases of governments elected with radical programmes (e.g., Allende's Chile or Manley's Jamaica). According to Przeworski and Wallerstein [38], such empirical analyses of SDT are uninformative because they "cannot speak to the issue of limits and possibilities" (Przeworski and Wallerstein [38], p.14). On the one hand, differences in policies would not prove much about "the existence of structural constraints that bind all governments. We cannot know whether the observed differences exhaust the realm of possibility" (ibid.). On the other hand, the issue of "possibilities cannot be determined on the basis of limited historical experience" (ibid.).

Those doubts about empirical tests of SDT that cannot distinguish between actual and possible choices are cogent. Trying to test choices generally involves counterfactual statements about what could have been done, and these are notoriously difficult to pin down. Yet to move from these problems to advocating a purely theoretical analysis of SDT, by constructing "a formal model with which the internal logic of the theory can be explored" (Przeworski and Wallerstein [38], p.14) is both doubtful and unwarranted. It is doubtful because while SDT is a theoretical construct to explain the empirical world, Przeworski and Wallerstein's claim suggests that it cannot be subjected to empirical scrutiny. Taken literally, this claim would place SDT in the realm of metaphysics. It is unwarranted because the examination of isolated historical episodes and of government choices does not exhaust the content of possible empirical tests. Indeed, although limiting cases of radical redistributive policies are interesting, it is the "more routine political-economic interactions that serve as a crucial test of the generalized form of [SDT]" (Swank [46], p.39).

This paper analyzes the core claims of SDT empirically. In order to circumvent the above objections, the empirical analysis proposed does not focus on *actual or possible choices* of the actors in the economy, but tries to trace the *effects* of the structural dependence of labour upon capital on income distribution. We investigate whether there is indeed a basic distributive trade-off and what its characteristics are. Instead of evaluating whether policy choices co-vary with the partisan orientation of cabinets in a cross-sectional context, we analyze the dynamics of distributive conflict by focusing on time series of UK data from the end of the 19th century in order to understand the behaviour of pre-tax functional distribution of income.

[1]For a survey of the older literature, see Cameron's [6] classic study. More recent contributions include King and Wickham-Jones [21], Quinn and Shapiro [39], Swank [46], Wickham-Jones [48], Beramendi and Rueda [3], Beramendi and Cusack [2].

There are two main reasons to focus on the functional distribution of income in the context of our analysis. First, SDT focuses primarily on the income distribution between classes, and emphasizes the central role of profits, and of the share of income accruing to capitalists, in private market economies. Although not *all* aspects of the relations between employers and employees should be viewed as a zero-sum conflict (Wright [52], Korpi [24]), empirically a focus on the functional distribution of income allows us to derive some precise testable propositions and to examine the conflictual dimension of the interaction between classes, and the existence of the distributive trade-offs postulated by SDT, in the starkest possible form.[2]

Second, SDT is a theory of the constraints that private control of investment imposes on any attempts to change the distribution of income: markets act as a prison leaving little margin to politics. This includes, but is not limited to, redistributive policies: taxation policy and welfare state provisions are only some of the means that can be used to alter market outcomes. Our focus on the pre-tax income distribution underlines a much broader set of policies and institutional factors – product and labour market regulations, trade union laws, restrictions on capital flows, regulation of the financial sector, and so on – with significant distributive implications. Changes in the functional income distribution should be considered – we shall argue – as a fundamentally political phenomenon.

In the context of our analysis, the key difference between different types of policies is the time scale at which they operate. Changes in tax rates and welfare state provisions can be seen as short-to-medium run policies, whereas transformative political decisions involving the basic legal and institutional framework in which economic actors operate have long-term effects. SDT has relevant, but distinct, implications for *both* types of political interventions on markets. This motivates our longitudinal approach and, unlike the existing empirical literature on SDT, we shall draw a fundamental distinction between short-run dynamics and long-run tendencies.

While a focus on the functional distribution of income allows us to capture the core mechanism linking private control of investment, economic activity, and distributive outcomes in SDT, it is important to stress at the outset that we do not provide a comprehensive empirical evaluation of *all* aspects of the privileged position of business in capitalist societies. Theories of the structural power of capitalists are arguably much richer and include, for example, a strong ideational dimension, which is not captured in our analysis.[3]

[2]This is more difficult in the case of redistributive policies. In empirical analyses of corporate taxation, for example, SDT can be, and has indeed been interpreted as implying *both* that investment determines taxes with *lower* investment leading governments to decrease taxes (Quinn and Shapiro [39], Swank [46]), *and* that taxes determine investment with a decrease in taxation yielding *higher* investment (Williams and Collins [50]).

[3]This is most evident in Lindblom [29], but an emphasis on hegemony and the 'battle of ideas' is also in Przeworski [35]. We are grateful to an anonymous referee for this suggestion.

## 2 SDT: two testable propositions

Consider a stylized account of class conflict over distributive shares in the process of capitalist accumulation. Investment increases employment, which in turn increases the bargaining strength of the working class, and increases the wage share in value added. The corresponding falling profit share reduces investment, hence employment and hence the bargaining strength of the working class. This recreates the profitability conditions necessary for renewed accumulation, investment rises, and the cycle repeats. This is the mechanism originally analyzed by Przeworski [35] and it can be considered as the canonical model of the profit squeeze cycle underlying SDT.

There are many possible ways of formalizing this mechanism by considering specific causal links between the variables, thus deriving different versions of the profit squeeze cycle.[4] For example, Block [4] emphasizes the role of labour-saving technical change in restoring profitability, while Offe [32] focuses on Kalecki's notion of 'business confidence' in determining investment decisions. However, we do not wish to analyze a specific formalization of SDT, and so we keep our analysis at a general level. Indeed, the stylized account above identifies the two key variables of the analysis, the wage share (in value added) and the employment rate (employees to workforce), postulating a cyclical interaction between them, and is sufficient to formulate our hypotheses.

At a general level, if SDT is correct and relevant, the range of income distributions attainable in capitalist democracies should be narrowly circumscribed. "No government ... can reduce the share of income that owners of capital consume. Any additional income for wage earners, whether it consists of wage gains won at the bargaining table or as transfer payments won through election, reduces total investment, dollar for dollar" (Przeworski and Wallerstein [38], p.16; see also Lindblom [30], p.327). Attempts to redistribute income should therefore only yield short-run, temporary effects. Two issues are thus of considerable interest in evaluating SDT: first, whether there has in fact empirically been a profit squeeze mechanism; and second, the behaviour of long-run income distribution.

Consider the first issue. A scatter plot of the employment rate (on the vertical axis) against the wage share (on the horizontal axis), with scatter points considered sequentially in time, should generate a clockwise path if it is to represent a profit squeeze mechanism. In the wage share (WS) – employment rate (ER) space, we call these clockwise movements *WSER cycles*. Thus, focusing on the short-run a first simple test of SDT can be formulated.

**Hypothesis 1 (The short-run SDT)**: If SDT is empirically valid, then at any given moment in time

[4] An influential model in this framework was proposed by Goodwin [15], with the wage share and the employment rate moving cyclically in conservative oscillations with a fixed period.

one should observe either a stable equilibrium income distribution (possibly with random deviations), or at most a clockwise WSER cycle around the equilibrium.

The latter pattern would derive from attempts to redistribute income by trade unions or social democratic parties when in power; the former would emerge in the absence of such attempts (because for example of an awareness of their futility given SDT).

It is less immediate to derive precise, testable propositions concerning the behaviour of the long-run income distribution according to SDT. For, both neo-pluralist and neo-Marxist accounts of the structural power of capital focus on *changes* in distributive variables due to government policies or labour militancy, but do not provide an explanation of the long-run equilibrium distribution. Thus, according to Lindblom ([29], pp.170-75), the key criterion for businessmen's decisions is whether the rate of return on investment is sufficient or not. Similarly, Przeworski ([35], p.43) posits a mechanism whereby "if profits are not sufficient then eventually wages or employment must fall". Lacking a proper definition of 'sufficient' profits, however, the explanatory power of these claims is limited, as they are consistent with an infinity of values of 'sufficient' profits. In the absence of an explanation of capitalists' expected or 'normal' profits, SDT is at best underdetermined.[5]

From the viewpoint of empirical testing, this omission would not be excessively problematic if actual distributive shares varied within a narrow range. For SDT can be interpreted as predicting that "within a very narrow range ... all [distributive] outcomes are equally possible, outside of this range they are nearly impossible" (Przeworski [35], p.162).

If, however, long-run income shares were not constrained "within a very narrow range", then the question would be whether an explanation of the determinants of long-run income distributions (i.e. of the level of 'sufficient' profits, or of 'business confidence') can be provided which is consistent with the key insights of SDT. For even if Hypothesis 1 were shown to be true, and a profit-squeeze mechanism were operating at any point in time, this would not provide decisive support to SDT. Profit squeeze cycles are consistent with an infinity of equilibrium income shares and if governments, or unions, could significantly alter the long-run income distribution, then SDT would be false – or at best correct but irrelevant. For SDT to be correct, and relevant, one requires a theory of long-run changes driven (entirely or mostly) by forces that are completely independent of government policies and distributive conflict (such as exogenous technical change or some Malthusian population mechanism).

The previous observations help us formulate the second testable hypothesis.

**Hypothesis 2 (The core of SDT)**: If SDT is empirically valid, and relevant, then either the long-

[5] A similar problem arises in versions of SDT based on the notion of 'business confidence' (e.g. Block [4], Offe [32]).

run income distribution varies within a very narrow range, or if it does display significant variation, this is driven by factors that are independent of class conflict and government policies.

# 3 Empirical strategy

We test Hypotheses 1 and 2 focusing on the UK as our case study. As a canonical example of a "liberal market" or "pluralist" economy (Hall and Soskice [17], Korpi [24]),[6] and given the influence of SDT on policy-making mentioned above, the UK should be an excellent test for the theory; indeed, it is so analyzed in much of the literature (King and Wickham-Jones [21], Wickham-Jones [48, 49]). Given the key distinction between short-run changes and long-run trends, it is obviously desirable to obtain as long a run of data as possible; and so we examine the period 1892-2018.

We use a mixed-methods approach. In section 4, we provide a detailed descriptive analysis of the co-movement of the wage share and employment rate in the UK during 1892-2018. The wage share variable is the ratio of total employee compensation to gross domestic product. The employment rate variable is the ratio of employees in employment to the sum of total employment and unemployment (the latter based on standardized international definitions and not on the administrative criteria of the claimant count).[7] In order to distinguish short-run movements from long-run trends, we use a Hodrick-Prescott filter. If trend values are interpreted as proxies for the long-run values of the two variables, this allows us to check whether the income distribution has remained "within a narrow range" (Hypothesis 2). Analysis of deviations from the trend allows us to track short-run changes in income distribution and check for the existence of profit squeeze cycles (Hypothesis 1).

In section 5, we develop a formal econometric analysis of the long-run variability of distributive outcomes for the UK. The aim is *not* to provide an exhaustive explanation of the determinants of the wage share and the employment rate, which have been the subject of a vast debate (see, e.g., Kristal [27] and the literature therein). Rather, our purpose is to test SDT, and in particular its predictions concerning the long-run movement of distributive shares (Hypothesis 2). To be specific, contrary to the key tenets of SDT, and in line with a long standing tradition in social theory,[8] we suppose that the *power resources* available to social classes in the economic and political spheres are

[6] One of the defining characteristics of liberal market, or pluralist economies is that "no enduring understanding is reached between the dominant forces representing business interests and wage earners and conflicts of interest are handled more as zero-sum than as positive-sum situations" (Korpi [23], p.338). This makes our two-class focus on distributive shares particularly appropriate.

[7] Data sources for all variables are given in Appendix A. While wage share and employment rate data can be constructed back to 1855, data limitations for the other variables imply that our first year is 1892.

[8] The literature is too vast for a full list of references. An illustrative but far from comprehensive selection includes: Korpi [22, 23, 24], Cameron [6], Esping-Andersen [11], Wright [52], Bradley et al. [5], Korpi and Palme [25].

important determinants of distributive outcomes, and that different equilibria correspond to different configurations of the balance of power between the two classes.

In the empirical power resources literature, various measures of working class power in the labour market (unionization, labour law, collective bargaining institutions), in the workplace (work councils, co-determination), and in the political sphere (strong labour parties, participation of the Left in government) explain a significant part of cross-national differences in the structure and development of welfare states (Korpi [22, 24], Esping-Andersen [11], Bradley et al. [5]) and even important macroeconomic outcomes, such as inflation and unemployment (Cameron [6], Korpi [23]). But a power resources approach also provides a general framework in which to analyze class relations and distributive conflicts (Korpi and Palme [25]). From this perspective, the main actors in the economy are "expected to organize for collective action in political parties and unions to modify conditions for and outcomes of market distribution" (Korpi [24], p.173). That is, classes use their power both to alter income distribution in the short-run, given a certain structure of trade-offs, and to modify that structure of trade-offs in the long-run.

We consider trade union density as the primary empirical measure of the bargaining strength of the working class. From a theoretical viewpoint, the key dimension of workers' power lies precisely in their ability to act collectively as a class, and unionization is the most basic form of workers' collective organization both in the labour market and in the workplace (Rothstein [42], Korpi [23], Wright [52], Korpi and Palme [25]). Trade union density captures working class strength better than indices of strike activity: there is no clear relation between conflict and organizational strength, because strength or power is a property, not an act, and powerful actors might not need to exercise it. Unionization is a causally important variable in the analysis of distribution and class conflict in a number of approaches across the social sciences (see, for example, Pontusson [34], Jaumotte and Osorio [19], and the literature therein).[9] Indeed, in empirical studies of pre-tax income distribution, other measures of working class power often turn out to be insignificant after controlling for unionization (see, e.g., Bradley et al. [5], pp.216ff). Finally, and pragmatically, for most of the variables used in cross-national studies – such as collective bargaining coverage, employment protection, or the existence of work councils – there exist no reliable data covering the entire historical period.[10]

We suppose that increases in the power resources of one class have positive, long-lasting effects

[9] We do not distinguish unionism in the private sector from unionism in the public sector on both theoretical and historical grounds. Theoretically, we do not regard the state as a referee between contending classes but as an active participant in that struggle. While the precise nature and timing of that participation is historically contingent, the state is not above class struggle. Historically, unionism in the public sector (nationalized industries, other public corporations and general government) was an important contributory factor to working class bargaining strength in the UK.

[10] More on this in section 6 below.

on the share of income that goes to that class. In particular, and contrary to SDT, we expect union strength to be positively associated with the wage share. We use a vector error correction model (henceforth, VECM) to investigate the long-run dynamics of income distribution and test whether there exist interaction and a common dynamic between wage share, employment rate, and trade union density in the UK since 1892.[11] In the profit squeeze mechanism, economic activity plays a key role in linking distribution (the wage share) and the employment rate. Therefore in our analysis we also include the logarithm of Gross Domestic Product, $\log GDP$.

# 4 Distribution and conflict in the UK: descriptive analysis

Figure 1 plots the annual values of the wage share and the employment rate in the UK.[12] On the face of it, this evidence is not encouraging for SDT: there is no tightly determined income distribution and the wage share is rather variable, a well-known empirical finding (Kristal [27]). The wage share varies between 50% (in 1996) and 68.7% (in 1947); the employment rate between 74.6% (in 1932) and 90.8% (in 1955). Although the data do not accurately describe a uniform profit-squeeze cycle, some have interpreted them as describing an erratic long-run cycle (see for example Flaschel [13]). This interpretation is unconvincing: a single cycle of over 100 years is not a periodic motion, and if a profit squeeze mechanism is at work, it is not plausible that it takes six generations to complete. Besides, this would not rescue SDT: if profitability is only restored after some 125 years, worker gains could hardly be considered ephemeral.

This is however a rather crude test. As argued in section 2, a clear distinction should be drawn between the long-run and the short-run. In the long-run, the wage share and the employment rate may vary because of long-run processes – such as technical change and institutional changes – that continually modify the political-economic equilibrium. The WSER cycles are then the shorter-run cycles that appear around the long-run motion, and are subject to continual displacement. If SDT is valid, then either random deviations or stable WSER cycles should be visible in the short-run (Hypothesis 1), and second, most of the variability in the data should derive from these short-run movements around (reasonably) constant long-run values of the two variables (Hypothesis 2).

In order to evaluate SDT in these terms, we filter the data to distinguish between short-run

[11] Virtually all of the empirical literature on the power resources approach focuses on social spending and redistributive policies (Bradley et al. [5]). An exception is the recent work by Kristal [27, 28], which analyzes the determinants of the functional distribution of income within the power resources framework. Yet the focus of our analysis, the econometric methodology adopted, the historical period considered and the definition of the key variables of interest are different.

[12] Some basic descriptive statistics for both variables are provided in Table 1 below.

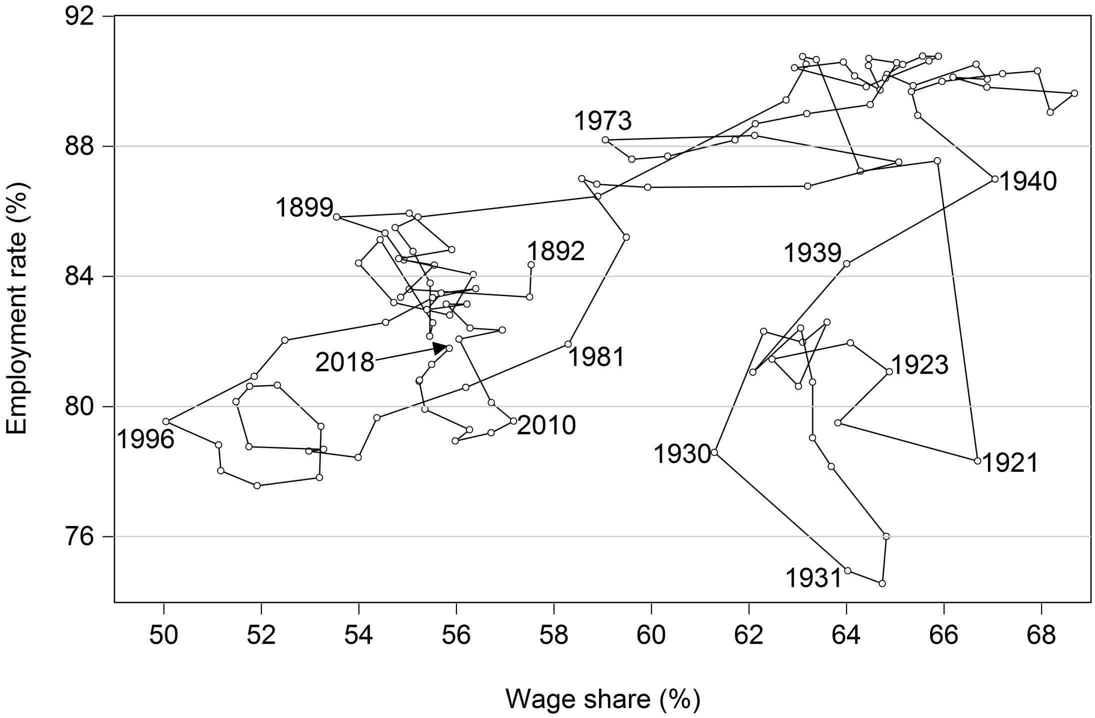



Figure 1: *Employment Rate Against Wage Share, UK, 1892-2018*

fluctuations and long-run changes. We use the Hodrick-Prescott filter with a value of 100 for the smoothing parameter. The time paths of the annual values of the wage share and the employment rate (total and trended) are shown in Figure 2.

First, we investigate visually whether the scatter plots of deviations from trend display a cyclical motion. For each variable, its cyclical value is the percentage points difference between the raw data and its trend value. Figure 3 displays illustrative examples of such short-run cycles, two from the pre-1914 era, two from the 1945-73 ('golden age') period, and two from the neoliberal era after 1979.[13] Over the whole period, there are 21 cycles, of which 15 display clockwise movements (covering the years 1892-1914, 1925-30, 1947-81, 1986-2002, and 2008-2018); five display anti-clockwise movements (covering the years 1914-24, 1930-47, and 2002-08); and one is just erratic (1981-86). So the pattern is mixed. For about thirty per cent of our sample SDT appears not to work. But visual inspection suggests that for about seventy per cent of the sample, the data do indeed describe a repetitive (clockwise) cyclical process, yet with cycles that are very variable in both amplitude and periodicity

[13]The remaining cycles are shown in section 1 of the online Addendum.

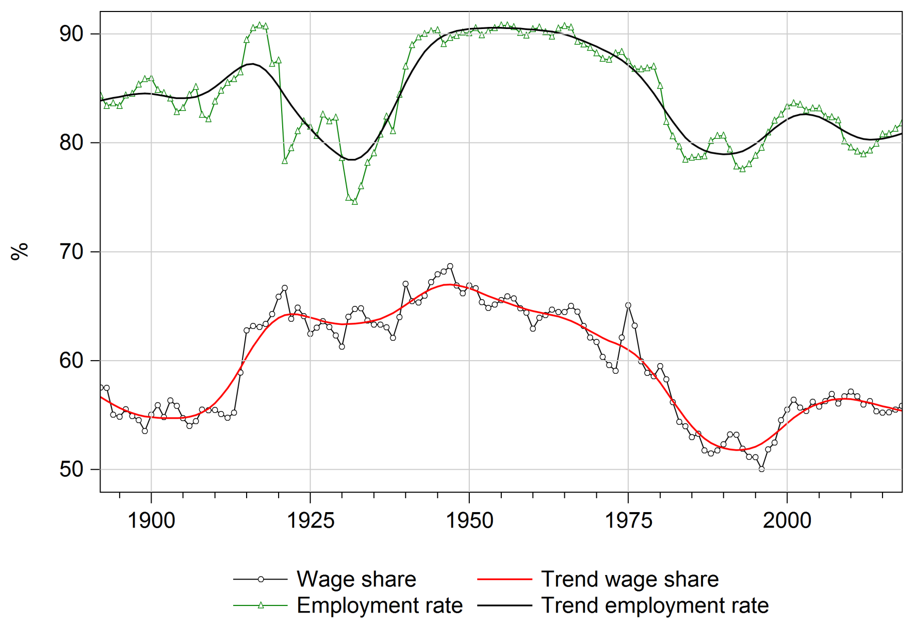



Figure 2: *Wage Share and Employment Rate, UK, 1892-2018*

(witness the different axis scales in Figure 3). Data of these years are broadly in line with the basic intuitions of SDT; at any given time, an increase in the wage share triggers a profit squeeze, and after an increase in unemployment weakens workers' bargaining power, profitability is restored.

However, this provides only a partial picture of distributive conflict. As noted above, SDT is not just about short-run trade-offs: it is primarily a theory of the constraints on feasible long-term equilibrium distributions. The long-run dynamics of the wage share and the employment rate are shown in Figure 4 which depicts a connected scatter of their trend values.

The long-run movement of the variables can be thought of as depicting changes in their equilibrium values, after purely erratic or cyclical fluctuations are purged from the data. The short-run WSER cycles of the type shown in Figure 3 move along a long-run trend, and it is this trend that has to be interpreted by SDT, for visual inspection shows that the set of attainable equilibrium values of the wage share and employment rate are by no means "within a very narrow range", *even after all temporary and cyclical movements have been eliminated.*

Indeed, rather than a single mechanism determining an equilibrium income distribution over the whole period, Figure 4 shows several periods reflecting significant changes in the political-economic equilibria of UK capitalism. The last years of the 19th century saw a falling trend wage share, followed

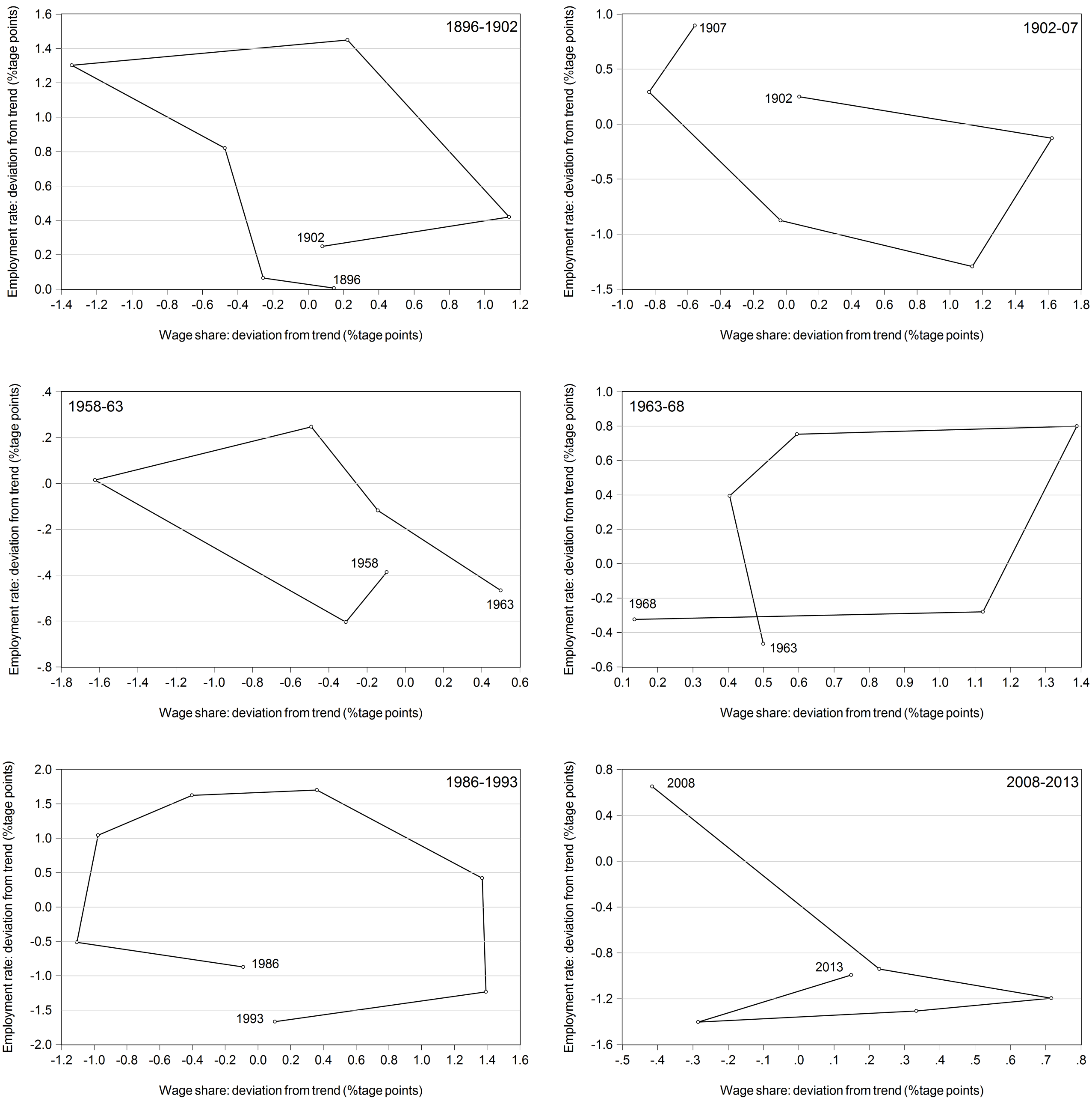



Figure 3: *UK WSER Cycles: Some Examples*

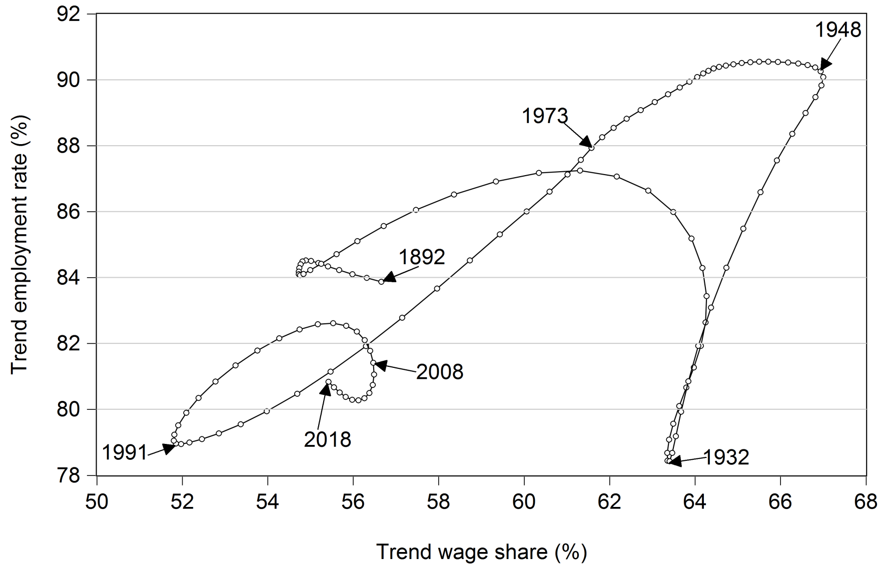



Figure 4: *Trend Employment Rate Against Trend Wage Share, UK, 1892-2018*

by a rising trend wage share to the early 1920s, both with only a slowly rising trend employment rate. The 1920s saw falling trend wage shares and employment rates to 1931 followed by rising trend wage shares and employment rates to 1947. The 'golden age' divides into two phases, 1947-60 with a gently rising trend employment rate and a falling trend wage share, and 1960-73 with a falling trend employment rate and wage share. Following the collapse of the 'golden age', 1974-91 sees much steeper falls in both trend wage share and employment rate; both then rise through the 1990s to 2004, and both then fall thereafter. These changing patterns are much more challenging for SDT to interpret.

In summary, there is indeed some evidence of a short-run profit squeeze mechanism as predicted by SDT but there is significant variability of the long-run income distribution that is prima facie inconsistent with SDT. While eyeballing the data is not encouraging for SDT, the question arises as to whether a satisfactory explanation of this empirical evidence can be provided which is broadly consistent with SDT. This is addressed in the next section.

# 5 Power, conflict and distribution: a VECM approach

We use a VECM to test whether there exist interaction and a common dynamic between wage share, employment rate, and trade union density in the UK since 1892. Our annual data comprise 127 yearly observations from $t = 1892$ to $t = 2018$, which allow us to study the long-run properties of the data (Hakkio and Rush [16]). At any time $t$, our data are represented as a vector of four variables, $y_t$, comprising measures of wage share, employment rate, trade union density and $\log GDP$. For any $t$, $\Delta y_t = y_t - y_{t-1}$ denotes the change in the four variables between period $t$ and period $t-1$.[14]

Table 1: Summary statistics for the main variables, UK, 1892-2018.

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| $w_t$ | 127 | 59.588 | 5.026 | 50.045 | 68.676 |
| $e_t$ | 127 | 84.388 | 4.351 | 74.561 | 90.767 |
| $u_t$ | 127 | 29.539 | 10.805 | 9.248 | 51.119 |
| $logGDP$ | 127 | 10.361 | 2.480 | 7.128 | 14.450 |

Note: our calculations on the data of Appendix A.

Basic summary statistics of all variables are provided in Table 1. The time paths of the wage share ($w_t$), the employment rate ($e_t$) (both on the left hand axis), and the trade union density variable, the ratio of trade union membership to employees ($u_t$, on the right hand axis) are reported in Figure 5, Panel (a). Union density increased markedly before World War I, decreased in the interwar period, and remained at about 38% for twenty years after 1945; it reached a maximum of 50% at the end of the 1970s and then decreased steadily reaching a level just above 20% in 2018. In Figure 5 Panel (b) we plot the deviation of $\log GDP$ from its linear time trend, suggesting that $\log GDP$ followed a U-shape pattern below trend before the end of the 1980s and moved above it afterwards.

Visual inspection suggests that all four variables are nonstationary. We investigate whether the single processes have a unit root by using the modified Dickey–Fuller $t$ test, including a linear trend (Elliott et al. [10]),[15] and conclude that $w_t$, $e_t$, $u_t$ and $\log GDP_t$ are integrated of order 1.[16] Figure 6 shows the four variables in first differences: on average they are about zero, although considerable variation remains.

Given our interest in detecting the long-run interaction between the four variables considered, we estimate a cointegrated vector auto-regressive model with finite lag $p$ (VAR($p$)) and having found

[14] We estimate all of our VECMs in this section and in the next using the raw, unfiltered data.

[15] This is an augmented Dickey–Fuller test, where the time series is transformed via a generalized least squares regression before performing the test. It has significantly greater power than the previous versions of the augmented Dickey–Fuller test.

[16] In asymptotic econometric theory, bounded variables - such as shares - cannot be nonstationary. However, interpreting the linear model as an approximation of the true process and considering that shares that are relatively distant from the boundaries can have nonstationary properties in finite samples, one can analyze their long-run statistical properties using cointegration methods. In fact, there is a vast empirical economic literature analysing the dynamics of bounded variables - such as (nonnegative) interest rates, exchange rates fluctuating within a bandwidth, and unemployment rates - with cointegration models. For an advanced analysis of bounded time series with unit roots, see Cavaliere [7].

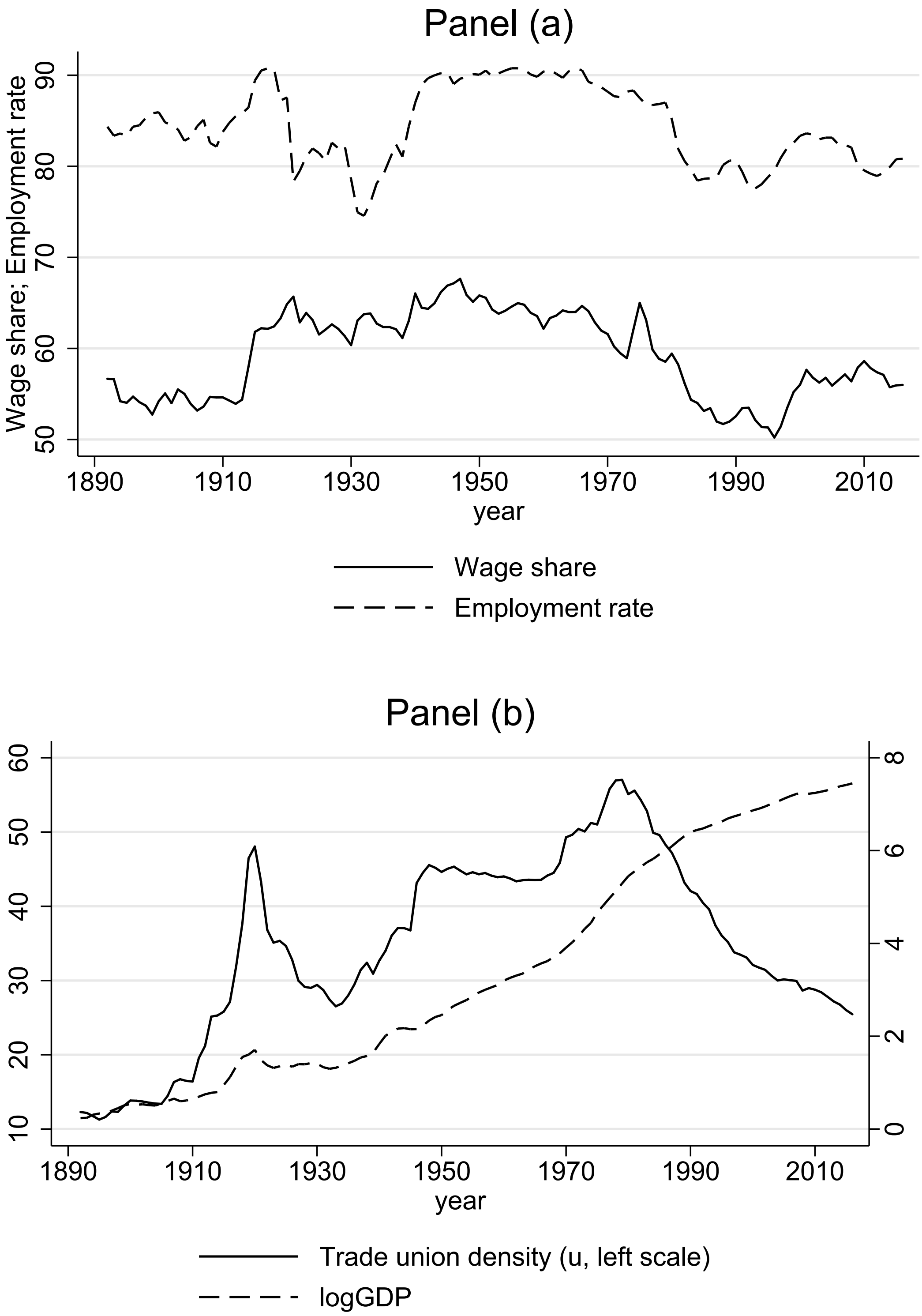



Figure 5: The pattern of the main variables, UK, 1892-2018.

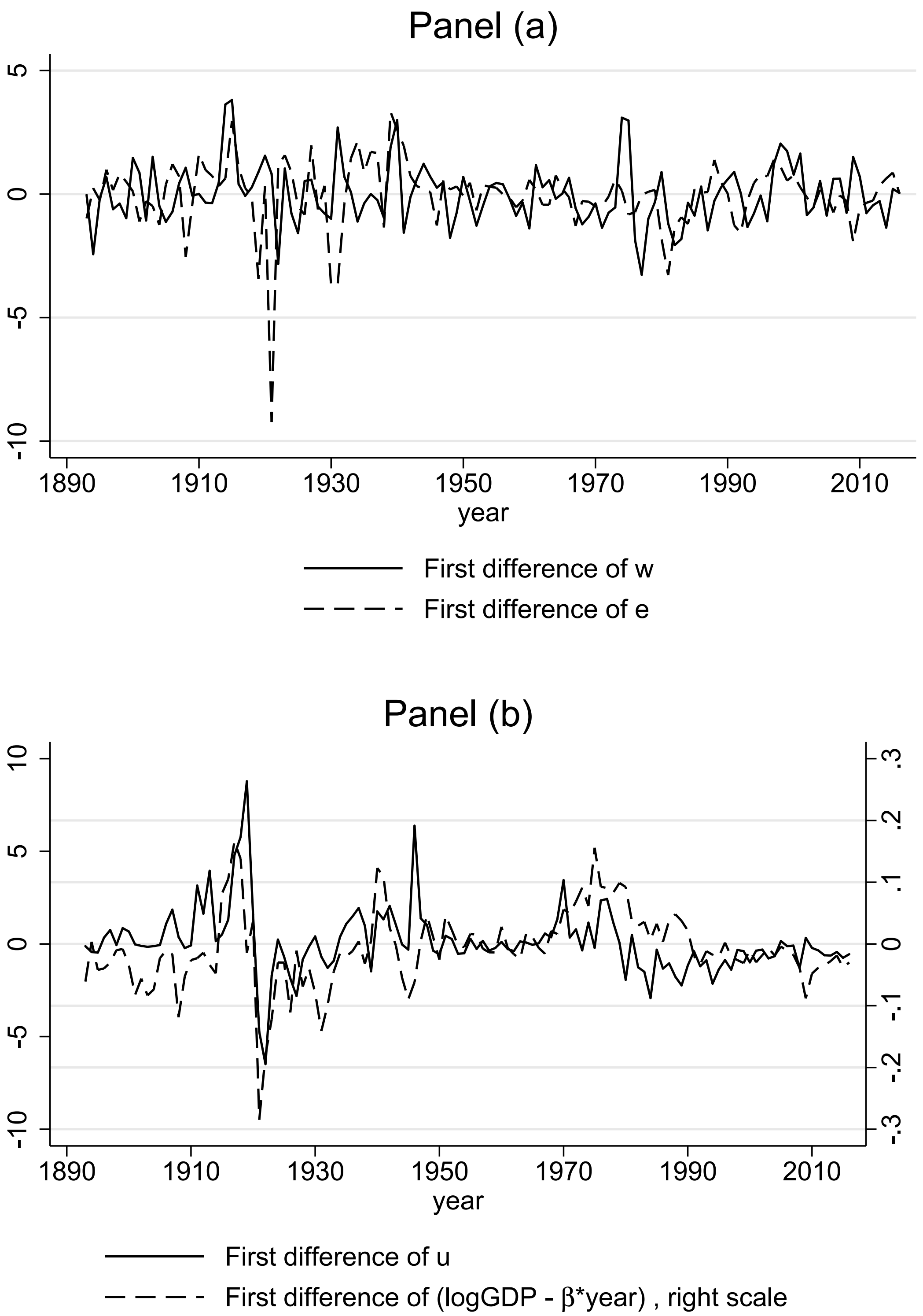



Figure 6: The main variables in first differences, UK, 1892-2018.

cointegrating relations among them, we estimate first a VAR($p$) and then its VECM representation:[17]

$$\Delta y_t = \sum_{j=1}^{p-1} \Gamma_j \Delta y_{t-j} + AB y_{t-1} + v_t \tag{1}$$

where $y_t = (w_t, e_t, u_t, \log GDP_t)'$; $v_t$ is a sequence of independently and identically distributed shocks, with zero mean and full rank variance-covariance matrix; $\Gamma_j$ is the $4 \times 4$ matrix capturing the short-term interactions among the variables; $B$ is the $r \times 4$ cointegrating matrix (with rank $r$, also known as the *cointegrating rank*) which captures the long-run relations between the variables; and $A$ is the $4 \times r$ matrix capturing the link between short-run and long-run dynamics by expressing the effects of deviations from the long-run equilibrium, $By_{t-1}$, on the short-term dynamics, $\Delta y_t$. Given the cointegrating rank $r$, simultaneous estimation of $\Gamma_j, A$ and $B$ can be obtained using the full information maximum likelihood framework (Johansen [20]). In order to investigate the number of lags $p$ in the model, we use Schwarz's Bayesian information criterion and a series of specification tests, which suggest estimating a VAR(2). This is not surprising given the yearly frequency of our data and it is also advisable in order to keep the model as parsimonious as possible.[18]

Consistent with the pattern of the series under analysis, we assume a model with only a constant and a deterministic trend in the cointegrating equation, to account for the linear trend of $\log GDP$ and estimate the cointegrating rank by iterating the cointegration test from $r = 0$. Table 2 shows the trace test, allowing us to reject the hypotheses that $r = 0$ but not that $r = 1$.

Table 2: Johansen rank test

| max. rank ($r$) | parms | Log-likel. | eigenvalue | trace statistic | 5% crit. value |
|---|---|---|---|---|---|
| 0 | 20 | -340.717 | . | 73.335 | 62.990 |
| 1 | 28 | -319.717 | 0.285 | 31.3328* | 42.440 |
| 2 | 34 | -310.072 | 0.143 | 12.043 | 25.320 |
| 3 | 38 | -305.968 | 0.064 | 3.835 | 12.250 |
| 4 | 40 | -304.050 | 0.030 | | |

Notes: The null hypothesis of the trace test is that there are no more than $r$ cointegrating relations in the VECM.
Constant and linear trend included in the model. Number of observations: 125. Sample period: 1894 - 2018. Lags in the VAR models: 2

Assuming the presence of one cointegrating equation, we have checked that the residuals of the estimated VECM are not subject to significant heteroskedasticity. Letting $r = 1$, the estimated VECM

[17] For further details on the econometric methodology adopted see section 2 of the online Addendum.

[18] Lütkepohl and Krätzig [31] demonstrate that choosing the lag order to minimize Schwarz's Bayesian information criterion or the Hannan and Quinn information criterion provides consistent estimates of the true lag order.

with $p = 2$ can then be written as:

$$\Delta y_t = \widehat{\alpha}(\widehat{\beta}' y_{t-1} + \widehat{\mu} + \widehat{\rho} t) + \widehat{\Gamma} \Delta y_{t-1} + \widehat{v}_t. \tag{2}$$

Table 3 gives the estimate of the cointegrating equation $\widehat{\beta}' y_{t-1} + \widehat{\mu} + \widehat{\rho} t = 0$. Because it is stationary, it provides a picture of the long-run equilibrium, as shocks affecting this relationship have only a temporary effect.

Table 3: Estimated VECM

| | Model 1 (unrestricted) | Model 2 (with restrictions) |
|---|---|---|
| $w_{t-1}$ | 1.000 | 1.000 |
| $e_{t-1}$ | -0.093 | 0.000 |
| | (0.194) | |
| $u_{t-1}$ | -0.624 | -0.931 |
| | (0.099) | (0.138) |
| $logGDP_{t-1}$ | 2.822 | 0.000 |
| | (1.501) | |
| $t$ | -0.132 | 0.000 |
| | (0.104) | |
| *constant* | -53.998 | -31.951 |
| LR test for binding restrictions (rank = 1): | | $(\beta_1 = 1, \beta_2 = 0, \beta_4 = 0, \beta_5 = 0)$ |
| Chi-square(3) | | 4.090 |
| Probability | | 0.252 |

Notes: Standard errors in parentheses. The coefficient $\beta_1$ is normalized to one.

As we have no *a priori* theoretical restrictions to impose, we test the model with all variables included. In order to apply Johansen's [20] maximum likelihood estimation methods, we normalize to unity the coefficients of the wage share as this allows a straightforward economic interpretation of the relations.[19] The estimated cointegrating equation reported in the first column of Table 3 suggests that, in the long-run, trade union density and wage share are positively correlated (if $u_t$ increases by one standard deviation, i.e. by 10.805, cf. Table 1, $w_t$ increases by $10.805 \times 0.624 = 6.742$ percentage points). The estimated long-run equation also suggests that the wage share is positively correlated with

[19] In order to interpret the effect of the various variables on the wage share, note that one must change the signs of the various coefficients in the estimated cointegrating equations.

the employment rate and with the linear trend and negatively correlated with $\log GDP$, although none of these relations is statistically significant. In the second column of Table 3 we use the likelihood-ratio (LR) to test the binding restrictions $\beta_1 = 1, \beta_2 = \beta_4 = \beta_5 = 0$, which is not rejected by a chi-square statistic with three degrees of freedom. The estimated coefficient of the trade union variable remains highly significant and increases in magnitude suggesting an even larger effect on the wage share: one standard deviation increase of $u$ yields a $10.805 \times 0.931 = 10.059$ percentage point increase in $w$.

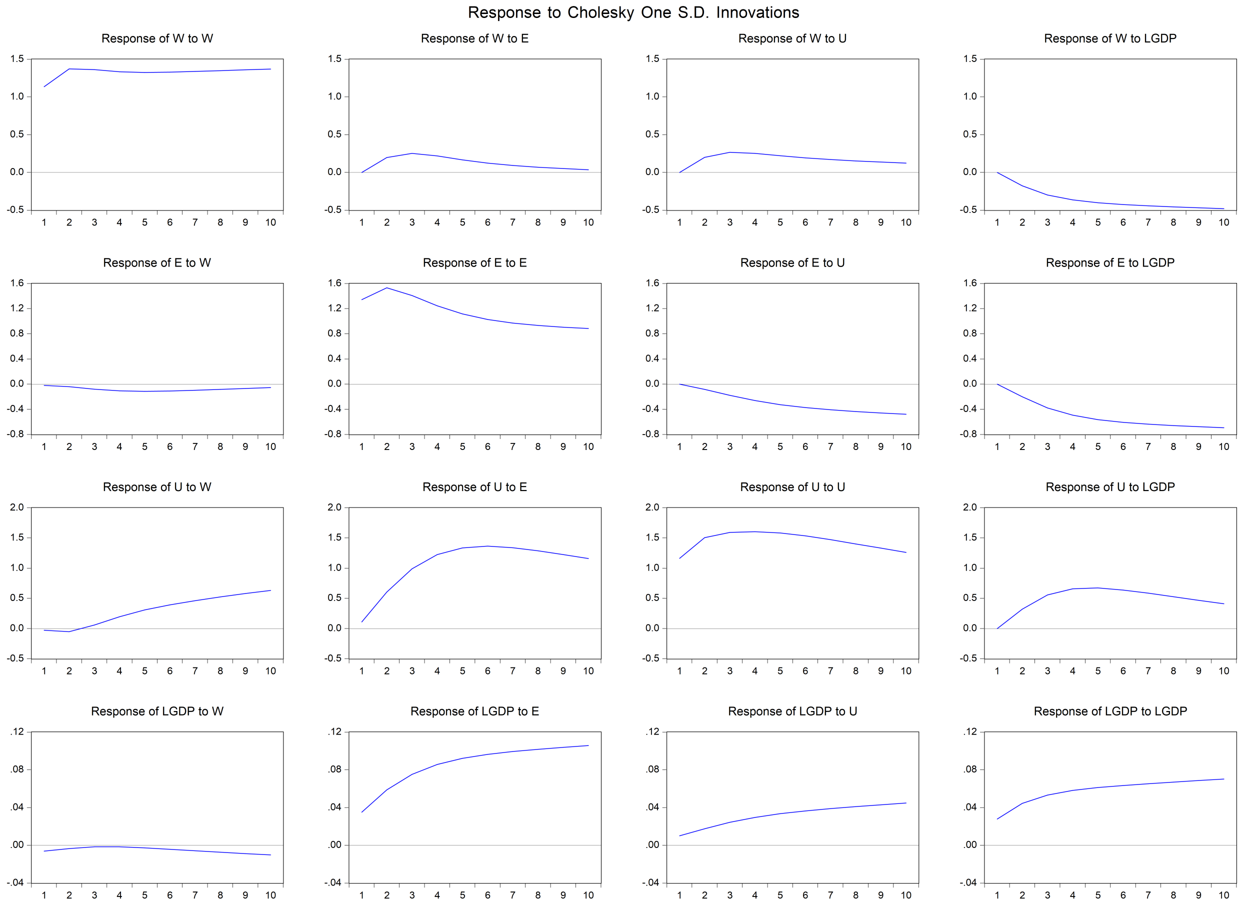
In other words, in the long-run, the dynamics of the wage share is significantly correlated with the dynamics of unionization: an increase in the power resources of workers, proxied by the union density measure, is correlated with a long-run increase in the wage share. These results both support a power resources approach and raise serious doubts about SDT. For an increase in the power resources of the working class tends to modify the long-run income distribution in favour of workers. This conclusion is further supported by an analysis of Granger-causality, which suggests that $\log GDP$ helps predict all other variables, and both the employment rate and union density Granger-cause the wage share, whereas the wage share does not Granger-cause any other variables.[20]

As all variables are endogenous, we analyze long- and short-run dynamics jointly, simulating the orthogonalized impulse response function (IRF), which traces out the response of current and future values of each of the variables to a one unit increase in the current value of one of the errors at a time, holding everything else constant. We use the Cholesky factorization of the residuals covariance matrix to orthogonalize the impulses. Figure 7 plots the response of each variable, $y_i, i = 1, .., 4$, to a Cholesky standard deviation shock of itself and the other three variables, $y_j, j = 1, ...4$, for a time lag that goes from 1 to 10 years (denoted *Responses of* $y_i$ *to* $y_j$).[21]

Summing up the main findings, Figure 7 shows that a one standard deviation shock on union density has a positive, permanent effect on the wage share (panel in first row, third column). The employment rate is gradually negatively affected by increases in union density (panel in second row, third column). Figure 7 may be seen as providing also some evidence consistent with the short-run profit squeeze mechanism identified in section 4, for a one standard deviation shock on employment has a positive transitory effect on the wage share. Moreover, a one standard deviation shock on the wage share has a temporary negative effect on employment. Yet both effects are comparatively rather small. In general, however, a shock in one of the variables has a permanent effect on the others.

[20]The details of the Granger-causality analysis can be found in section 3 of the online Addendum.
[21]Results are qualitatively identical by using the reduced form Generalized IRFs.

Figure 7: Impulse Response Functions of the restricted model. Cholesky decomposition, shocks of 1 standard deviation



# 6 Robustness

We assessed the robustness of our results in several ways.[22]

Consider first the analysis in section 4. The Hodrick-Prescott procedure is sometimes considered ad hoc because it relies on the choice of smoothing parameter, $\lambda$, which determines what is trend and what is cycle. None of our insights, however, depends on $\lambda = 100$. By choosing a relatively high $\lambda$, we have adopted a conservative strategy. Lower values of $\lambda$ in line with the literature would assign more of the variability of the wage share and employment rate to the trend, thus *reinforcing* our conclusions on the significant long-run variation of distributive shares. Nor would our conclusions on short-run cycles vary significantly. Opting for the value of 6.25 commonly used in the literature, for example, makes some difference to cycle shapes (because it puts more in the trend and less in the deviation), but does not alter their direction. More generally, the qualitative conclusions in section 4 do not depend on the Hodrick-Prescott methodology and can be obtained using alternative data filtering.[23]

Consider next the econometric analysis in section 5. To begin with, we have analyzed the two key variables of our model, the wage share and the employment rate, in isolation and the results are unambiguous, and in contradiction with SDT: quite strikingly, there exists no long-run cointegrating relationship between $w_t$ and $e_t$ in the period 1892-2018, and the same conclusion holds if one restricts the analysis to the period in which the short-run WSER cycles in section 4 seem most consistent with SDT, namely the period after World War II. The wage share and employment rate are cointegrated only if at least another variable is added. Our preferred specification – on both theoretical and econometric grounds – is the model described in section 5. However, our empirical conclusions are robust to a number of perturbations of the model.

First, our results are robust to alternative definitions of the main variables, including alternative measures of union density and the employment rate. For example, if we use claimant count unemployment rather than the standardized international definition, in the denominator of the union density variable and of the employment rate variable, our conclusions remain unchanged.

Second, we have considered collective bargaining coverage as an alternative measure of workers' power. The lack of a continuous long-run series of the coverage of collective pay-setting institutions in the UK makes it impossible to formally estimate our VECM. However, we have reconstructed various time series starting in 1895 based on (incomplete) historical data and compared them with the union density variable: the correlation coefficient ranges between 0.92 and 0.96.

[22]The robustness checks briefly discussed in this section are presented in more detail in the online Addendum.
[23]For example, a loess filtering procedure, formed from a locally weighted least squares regression.

Third, theoretically, in the profit squeeze mechanism underlying SDT, it is arguably economic activity in general, rather than investment, that provides the link between distribution (the wage share) and the employment rate, and $GDP$ more accurately measures overall economic performance. Nonetheless, we have estimated the VECM using various measures of investment instead of $\log GDP$: our results continue to hold.

Fourth, it may be argued that if the long-run dynamics of income distribution (and employment) are – at least partly – the product of class struggle, then what matters is the relative power of *both* classes. On the other side of our two-class framework, the primary power resources of employers are economic assets, or capital. Therefore we have estimated our model using the log of total non-dwellings capital stock as a proxy of capitalist power. The results confirm our conclusions and provide support to the power resources approach: an increase in union density has a positive, long-run effect on the wage share, while an increase in the stock of productive capital has the opposite effect.

Yet, the capital stock may be an imperfect proxy of the employers' power resources, because the extent to which ownership of economic assets translates into power depends on a number of factors, and in particular on capitalist control over investment. Assets can be divested and transferred (Korpi [24]), but the actual mobility of capital depends both on technological factors and on the broader legal, political, and institutional framework. From this perspective, the openness of an economy may be deemed a better proxy of the power of employers (Wright [52], Bradley et al. [5], Korpi and Palme [25], Beramendi and Rueda [3], Kristal [27]). Increased capital mobility tends to increase the capacity of capitalists to control investment and the allocation of capital, and provides an indirect measure of the extent to which, in their relation to workers (and the nation state), capitalists can choose 'exit' as opposed to 'voice'. Hence it measures their incentive to find a compromise in distributive conflicts.

Two sets of measures of openness are used in the literature: *de jure* measures of openness – such as the indices constructed by Quinn [40], Fernandez et al [12], Ilzetzki et al [18] – capture the legal restrictions on capital movements or foreign exchange transactions. *De facto* measures capture instead the actual movements of capital across borders. While insightful for cross-national comparative analysis, de jure measures suffer from some major shortcomings in our context as they cover only a small part of the period under investigation and provide a rather coarse classification with limited room for variation.[24] Furthermore, the legal framework of a given country is only one of the determinants of capital mobility and can only partially capture capitalists' ability to exercise the exit option.

[24] These indices rely on the information contained in the International Monetary Fund's *International Financial Statistics* and *Exchange Arrangements and Exchange Restrictions*, and are typically weighted averages of binary variables measuring the presence (1), or lack thereof (0), of various types of restrictions.

Therefore we have experimented with a de facto measure, focusing on property income from overseas as a percentage of the sum of property income from overseas, total domestic profits, and an estimated profits component of mixed income as our main measure of openness and proxy of capitalist power. The estimated VECM replacing $\log GDP$ with the openness variable suggests that union density maintains its sign although its magnitude and significance is partly absorbed by the capitalist power measure, suggesting that an increase in capitalists' power reduces the wage share.[25]

Finally, it may be objected that SDT concerns the wage share as a class share, and that is not what is captured in our empirical analysis. For employee compensation includes the labour income of the highest paid executives on the same basis as the labour income of the most lowly paid unskilled worker. Ideally, a much narrower definition of wage share would be appropriate to throw light on SDT. This objection is pertinent but it does not question our conclusions. For a focus on all employees puts our assumptions concerning the relevance of power resources, and our critique of SDT, to a stronger test. It is all the more remarkable that the empirical evidence and econometric analysis support our theoretical hypotheses despite the data limitations. Moreover, the available data for the UK that distinguish different categories of employees provide strong support to our conclusions. Census of Production data provide a continuous series for Manufacturing for the years 1971-1995, and for the Production Industries (Mining, Manufacturing and Utilities) for the years 1974-1995. These data are too limited to use the econometric techniques above. Yet the pattern of the data for manual workers in production industries is strikingly similar to that for all employees: over the period for which there are data, short-run cycles are visible around a sharply declining trend.

# 7 Discussion

Both the descriptive analysis in section 4 and the VECM suggest that a profit squeeze mechanism may be operating in the UK, for at least part of the sample. This provides some (limited) support for Hypothesis 1. However, the econometric analysis shows that there exists a robust long-run relation between distributive outcomes and the power resources of the two classes. Hence while a short-run profit-squeeze mechanism may be operating at any given time, this hardly provides support to SDT. Hypothesis 2, the core SDT proposition, is false. For the long-run equilibrium values are much more variable than required by SDT *and* they are correlated to the power resources of economic classes, consistent with power resources theory.

[25] Our results continue to hold if we use (cumulated) capital stocks arising out of foreign direct investment flows in and out of the country as our main measure of openness. However, available data cover the period after 1966 only.

These results point to a key conceptual limitation of SDT: the mechanism underlying SDT operates at a very high level of generality, and is based only on the most basic institutions of capitalism, namely "the laws of private property" (Lindblom [29], p.172) and the control over investment decisions that they afford, together with profit maximizing behaviour. In this sense, SDT operates in a sort of institutional vacuum. Yet, ownership comprises various rights, powers, claims, and immunities, not all of which must be vested in one agent, including in capitalist economies. The exact allocation of these rights depends on political decisions, institutions, social norms, and so on, and it determines the degree of control that businessmen have over investment. Thus, although capitalists do enjoy structural power, this power is mediated by institutions, which "shape the mechanisms and forms of business power" (Quinn and Shapiro [39], p.855), and is limited by the power of other actors, starting from the working class. Power relations and institutional rules affect "the rights and powers accompanying private ownership of the means of production" (Wright [53], p.111) and the boundaries of feasible income distributions, and tend to change over time. Contrary to Hypothesis 2, the structural features of class conflict – including the political, economic and institutional framework – are central determinants of distributive outcomes. For this reason there is no cointegrating relationship between wage share and employment rate taken on their own. A focus on class struggle requires, as we have seen, additional variables capturing the power resources of the main classes in the economy.

# 8 Conclusions

That an increase in the power resources of one class has a positive, long-lasting effect on the share of income that goes to that class does not imply that any income distribution is feasible at any moment of time. Nor does it imply that the prospects for an electoral socialism/social democracy pursuing redistributive class policies are good. For there certainly are structural limits to attainable distributions within capitalist institutions, and the empirical evidence suggests that some form of profit squeeze may be operating at any given time. It does suggest, however, that strong versions of SDT based on a profit squeeze mechanism, such as Przeworski's, do not explain the actual choices and trade-offs faced by the labour movement. In contrast, our analysis provides novel empirical support for power resources theory and the relevance of class in the determination of distributive outcomes.

It may be objected that the evidence in favour of the power resources approach – and against SDT – is inconclusive, for the power resources of the two classes may themselves be exogenously determined. This objection is not entirely convincing. For it is theoretically very difficult to find some long-run explanatory mechanism that is completely independent of power resources, distributive conflict, and government policies. This includes long-run changes in the institutional and legislative framework, and in the basic structural features of the economy (including long-run trends in technological progress, labour supply, skills, and so on). There is robust historical evidence that political actors intentionally act to modify the structural and institutional features of the economy in order to change the balance of power between classes (Rothstein [42], Korpi [24]). Indeed, "institutions are created with the object of giving the agent ... an advantage in the future game of power" (Rothstein [42], p.35). The dynamics of unionization in the UK, for example, has been largely driven by political and institutional factors (Dunn and Metcalf [9]). Although technical innovations may affect trade unions, technical change itself is a site of class struggle and is often introduced in order to alter power relations (Kristal [27, 28]). Changes in the degree of openness of an economy are anything but exogenous. In general, assuming the existence of a set of completely exogenous explanatory variables would imply the endorsement of a crude economic determinism which Przeworski [35] himself has convincingly rejected.

In summary, power resources matter, and therefore institutions and politics matter. They matter for their short-run effect *on* market distribution, but also – and perhaps more importantly – for their long-run effect on the *conditions for* market distribution. Therefore, going back to our opening questions, the social democratic model is more undetermined than SDT suggests, especially from a long-run perspective. For political and class struggles are not just about choosing the optimal position in a given structure of trade-offs, but first and foremost about altering those trade-offs themselves. This can, and should, be the starting point for a renewal of the social democratic project.

# A Data sources

The time series data are for the whole UK economy. Apart from data on trade union membership, all time series data are taken from the Office for National Statistics with the earliest ONS year spliced into Thomas and Dimsdale [47] to obtain an 1892-2018 dataset.

The wage share is Compensation of employees (ONS HAEA for 1948-2018, with the 1948 figure spliced into Thomas and Dimsdale [47] Worksheet A17, column H for pre-1948 figures) divided by GDP at factor cost (ONS CGCB for 1948-2018, with the 1948 figure spliced into Thomas and Dimsdale [47] Worksheet A17, column AW for pre-1948 figures).

The employment rate is [Total employment in heads (ONS MGRZ for 1971-2018, with the 1971 figure spliced into Thomas and Dimsdale [47] Worksheet A50, column B)] less [Self-employment (ONS

MGRQ for 1984-2018, with the 1984 figure spliced into Thomas and Dimsdale [47] Worksheet A50, column D)] all divided by [Total employment in heads plus Unemployment (ONS MGSC for 1971-2018, with the 1971 figure spliced into Thomas and Dimsdale [47] Worksheet A50, column G)].

The log of GDP is Gross Domestic Product at factor cost, as above, in natural logs.

Trade union density is the constructed ratio of employee trade union membership for the UK to employees (the numerator of the employment rate above), where trade union membership is derived as follows:

(a) Derive the annual rate of growth of all trade union members in Great Britain from Table 1.1 of Trade Union Statistics 2018, at https://www.gov.uk/government/statistics/trade-union-statistics-2018, with the 2018 figure drawn from Annual Report of the Certification Officer 2018-2019, at https://www.gov.uk/government/publications/annual-report-of-the-certification-officer-2018-2019.

(b) Employee trade union members for Great Britain from 1989 are taken from Table 1.2a of Trade Union Statistics 2018. Pre-1989 figures are derived using the growth rates determined in (a).

(c) Employee trade union members for the UK from 1995 are taken from Table 1.2a of Trade Union Statistics 2018. Then the difference between the UK and the GB figure as a proportion of the UK figure is calculated for 1995-2018 and their average is calculated. This average is then applied to the whole series of (b) to construct a series of UK employee trade unionists from 1892-1994.

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# Online addendum for the paper *"Class, Power, and the Structural Dependence Thesis: Distributive Conflict in the UK, 1892-2018"*

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May 16, 2020

**Abstract**

This online-only addendum contains some additional material related to the paper "Class, Power, and the Structural Dependence Thesis: Distributive Conflict in the UK, 1892-2018". Section 1 displays the short-run WSER cycles not shown in the paper. Section 2 describes the estimation methodology adopted in the paper. Section 3 presents the causality analysis of the Vector Error Correction Model (VECM). Section 4 compares our union density variable with various measures of collective bargaining coverage. Section 5 reports on the results obtained with different specifications of the VECM. Section 6 contains a description of trends in the functional distribution of income and WSER cycles focusing on manual production workers.

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# 1 Additional WSER cycles

This section provides the scatter plots of the short run WSER cycles describing deviations from trend values not included in section 4 of the paper. Figures A1 and A2 each display four additional clockwise cycles. As mentioned in the main paper there are five cycles that display anticlockwise patterns, displayed as Figure A3, and one, Figure A4, that has a pattern difficult to discern. Finally, Figure A5 portrays a clockwise but possibly incomplete cycle encompassing the last few years of our sample.

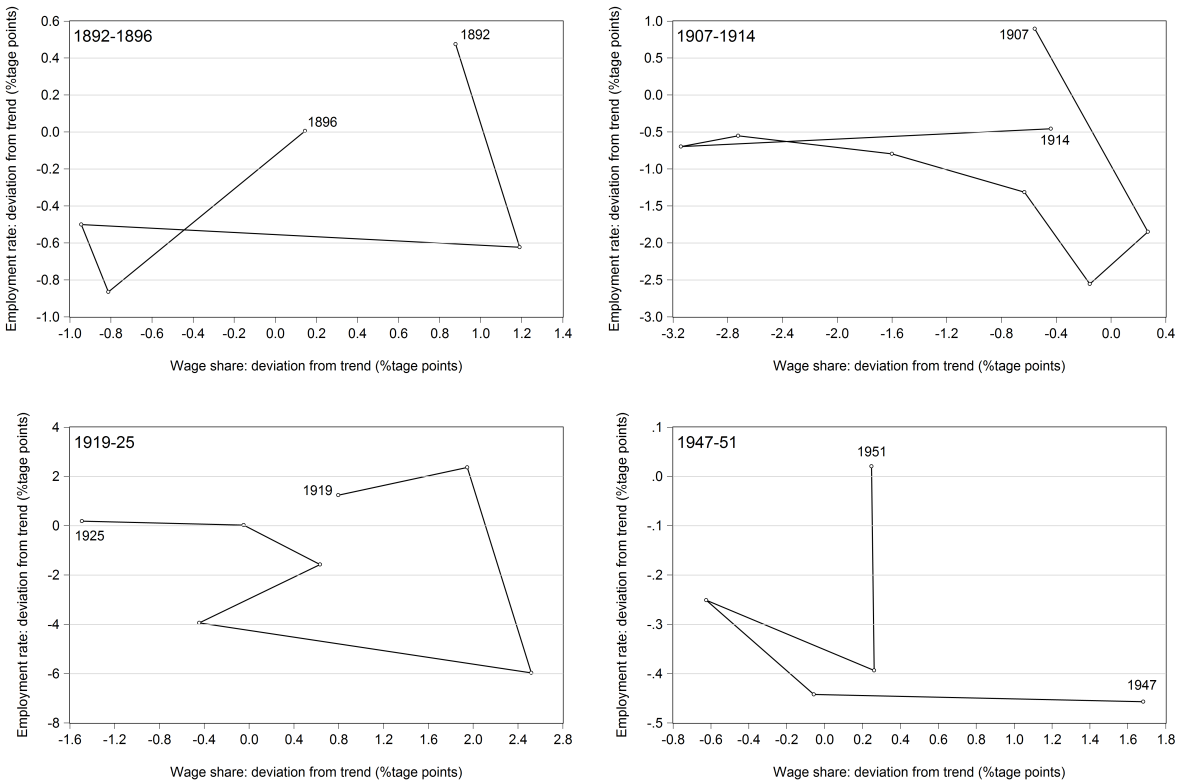



Figure A 1: *Four WSER Clockwise Cycles, UK, 1892-1951*

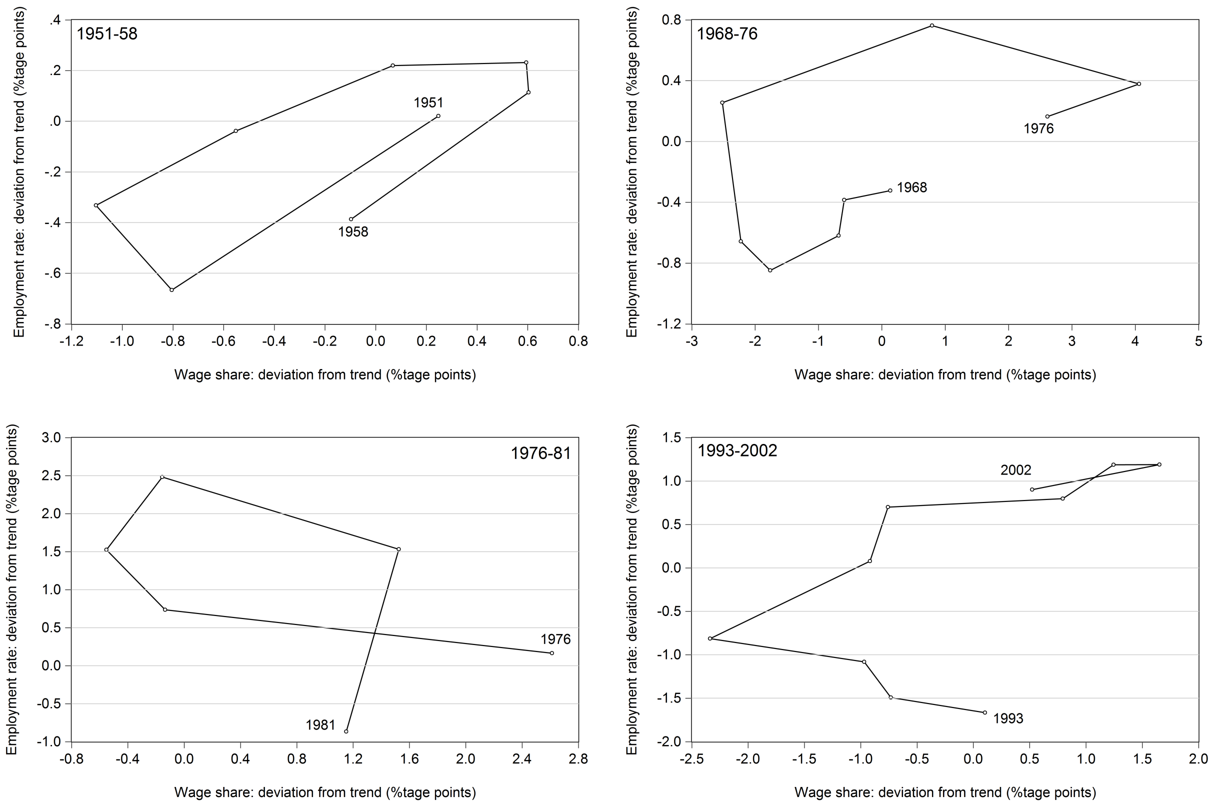



Figure A 2: *Four More WSER Clockwise Cycles, UK, 1951-2002*

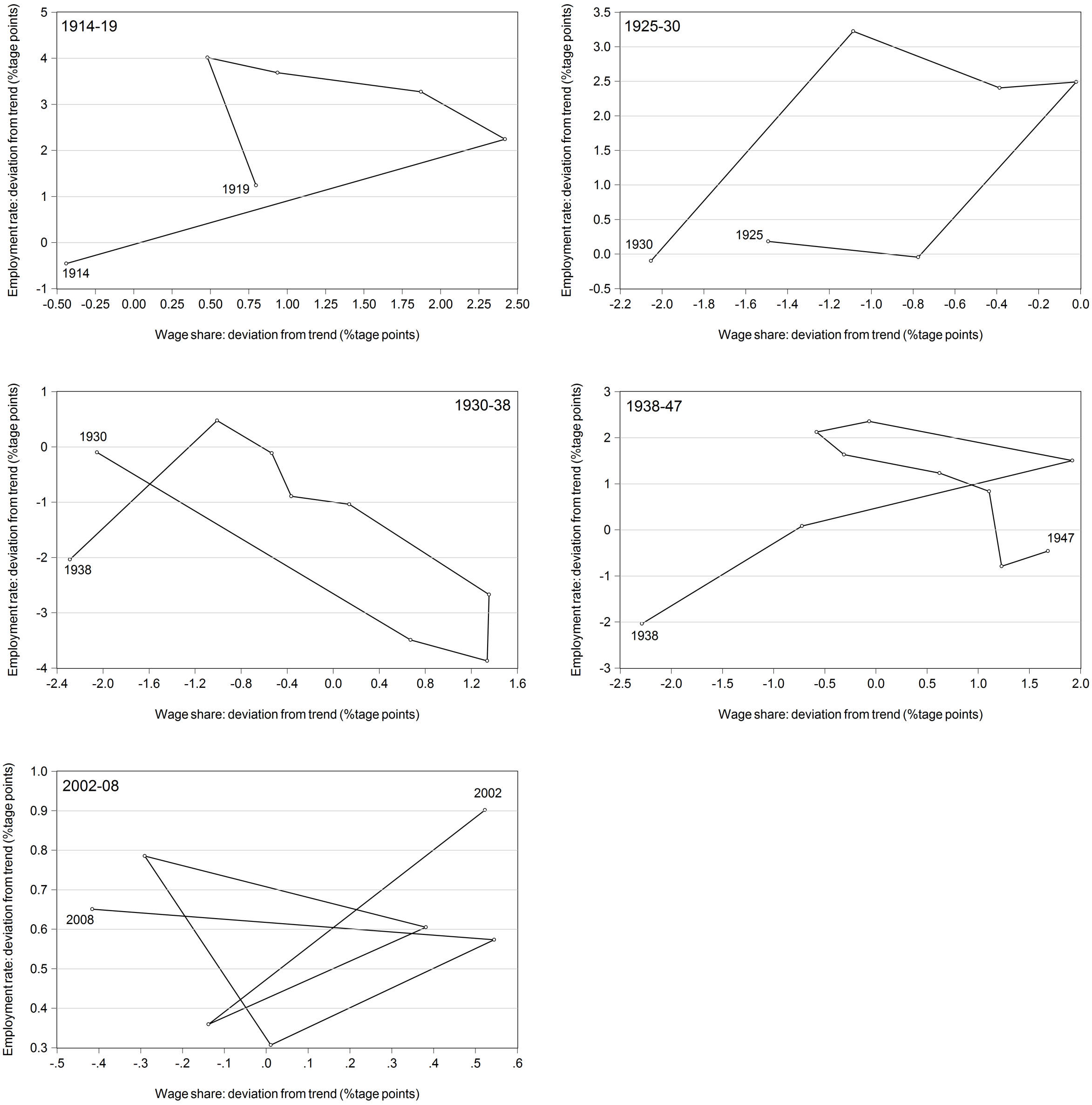



Figure A 3: *Five WSER Anti-Clockwise Cycles, UK, 1914-2008*

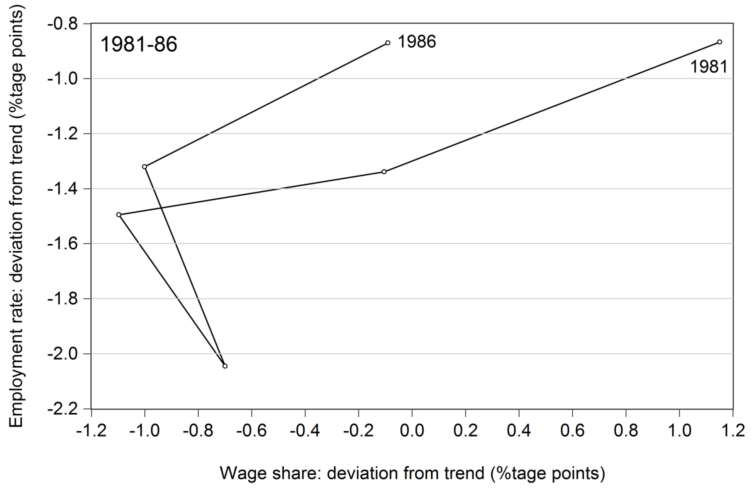



Figure A 4: *One Period With No Clear Cyclical Pattern, UK, 1981-86*

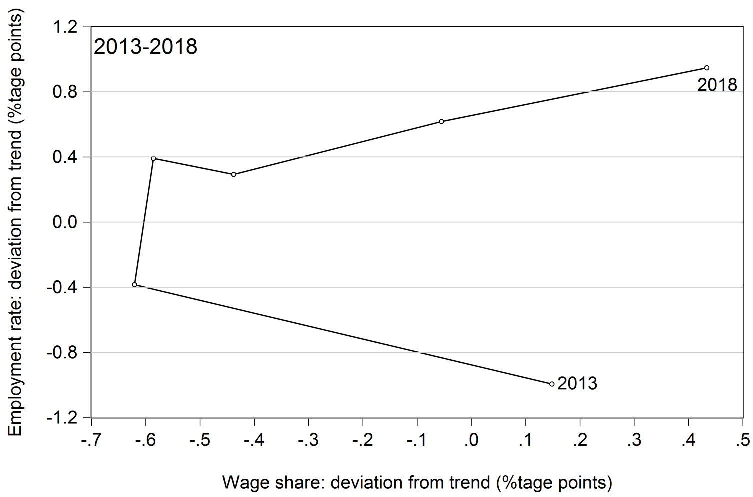



Figure A 5: *One Incomplete Clockwise Cycle, UK, 2013-2018*

## 2 Estimation of long-run relations: methodology

This section provides a general description of the econometric methodology adopted in the paper, mostly following Lütkepohl and Krätzig [4]. Consider a set of $K$ time series variables, $y_t = (y_{1t}, ..., y_{Kt})'$. Using a vector auto-regressive approach (VAR), the dynamic interactions of the vector components are:

$$y_t = \sum_{j=1}^{p} \Phi_j y_{t-j} + v_t, \tag{1}$$

where $v_t = (v_{1t}, ..., v_{Kt})'$ is a sequence of independently and identically distributed shocks, with $E(v_t) = 0$, $E(v_t v_t') = \Omega$ , with $rank(\Omega) = K$, $p$ is the finite number of lags and the order of the VAR model, and $\Phi_j$ is a $K \times K$ matrix.

In general, a process such as (1) is stable if the polynomial defined by the determinant of the autoregressive operator has no roots in and on the complex unit circle, i.e. $\det(I_K - \sum_{j=1}^{p} \Phi_j z^p) \neq 0$ for $|z| \leq 1$, where $I_K$ is the $K \times K$ identity matrix. On the assumption that it has initiated in the infinite past ($t = 0, \pm 1, \pm 2, ...$), it generates stationary time series that have time-invariant means, variances, and covariance structure. If the variables in $y_t$ are integrated of order 1 ($I(1)$) the process is not stationary, but if they have a common stochastic trend so that there are linear combinations of them that are $I(0)$, they are cointegrated.

A convenient representation of (1) with cointegrated relations is the Vector Error Correction Model (VECM):

$$\Delta y_t = \sum_{j=1}^{p-1} \Gamma_j \Delta y_{t-j} + \Pi y_{t-1} + v_t. \tag{2}$$

If the $VAR(p)$ process has unit roots, i.e. $\det(I_K - \sum_{j=1}^{p} \Phi_j z^p) = 0$ for $z = 1$, the matrix $\Pi = (I_K - \sum_{j=1}^{p} \Phi_j)$ is singular. If $rank(\Pi) = r$, then $\Pi$ can be written as a product of $(K \times r)$ matrices $A$ and $B$, with $rank(A) = rank(B) = r$ as follows: $\Pi = AB'$. In a VECM representation, long- and short-run dynamics are modelled separately and $By_{t-1}$ expresses the effects of deviations from each long-run equilibrium. The matrices $\Gamma_j$ express the short-term interactions among the variables of interest.

If the multivariate process $y_t$ is not stationary, the shocks may also have permanent effects. Hence, there may be $r$ nontrivial $1 \times K$ vectors $\beta_i$, $i = 1, ..., r$, such that $\beta_i' y_t$ is stationary for all $i$. In this case the deviations from the linear relation $\beta_i' y_t$ are only temporary, and $\beta_i' y_t$ is a stable relationship in the long-run. For all $i$, the variables in $y_t$ with nonzero coefficients in $\beta_i' y_t$ are then cointegrated and $\beta_i$ is the cointegrating vector and $r$ is the cointegrating rank.

A stationary $y_t$ can also be expressed in its Wold moving average representation, i.e. as a function of the original shocks $v_t$, $y_t = \sum_{j=0}^{\infty} \Psi_j v_{t-j}$where $\Psi_0 = I_K$ and

$$\Psi_s = \sum_{j=0}^{s} \Psi_{s-j} \Phi_j, \qquad s = 1, 2, ... \tag{3}$$

can be computed recursively from the reduced-form coefficients of the VAR in levels in (1). The coefficient of this representation can be interpreted as reflecting the responses to impulses hitting the system. The $(i, j)$th elements of the matrices $\Psi_s$ trace out the expected response of $y_{i,t+s}$ to a unit change in $y_{it}$ holding constant all past values of $y_t$. Since the change in $y_{it}$ given its past is measured by the innovation $v_{it}$, the elements of $\Psi_s$ represent the impulse responses of the components of $y_t$ with respect to the $v_t$ innovations. In the stationary case, $\Psi_s \to 0$ as $s \to \infty$, hence the effect of an impulse vanishes over time. When $y_t$ is nonstationary the $\Psi_s$ impulse response matrices can be computed in the same way as in (3) based on VARs with integrated variables, even though a Wold representation as such does not exist for nonstationary cointegrated processes. In this case the $\Psi_s$ may not converge to zero as $s \to \infty$ and some shocks may have permanent effects. As the impulse responses have been criticized because underlying shocks are not likely to occur in isolation if the components of $u_t$ are instantaneously correlated, orthogonal innovations are preferred by adopting a Choleski decomposition of the covariance matrix. As the ordering of the variables in the vector $y_t$ may produce different shocks, we followed standard practice of trying various triangular orthogonalizations, checking the robustness of the results with respect to the ordering of the variables (Lütkepohl and Krätzig [4], p.167).

As in our analysis $y_t$ is a $K \times 1$ vector, there may be only $r \leq (K - 1)$ nontrivial cointegrating vectors, which can be stacked in a $r \times (K - 1)$ cointegrating matrix $B$ with cointegrating rank $r$. The cointegrating rank can be estimated using a likelihood-ratio test known as the trace test, whose null hypothesis is that there are no more than $r$ cointegrating relations. The method starts by testing $r = 0$ and accepts as $\widehat{r}$ the first value of $r$ for which the trace statistic fails to reject the null (Johansen [3]). Finding the $r$ stable long-run relationships is of interest for the economic interpretation of SDT since they provide information concerning the determinants of long-run income distribution. But it is also important for statistical reasons, for when $y_t$ is not stationary, the estimates of the VAR in (1) and of the IRF are consistent but less efficient, unless integration and cointegration are properly accounted for.

Given the cointegration rank $r$, simultaneous estimation of $\Gamma_j$, $A$ and $B$ can be obtained using the full information maximum likelihood framework (Johansen [3]).

## 3 Causality analysis

In this section, we provide the results of our Granger-causality analysis for the four key variables $\log GDP_t, u_t, e_t, w_t$ using our main model, that is, the VECM estimated in Table 3, Model 2 (with restrictions). According to Granger-causality, "variable $x$ Granger-causes $y$" means that past values of $x$ provide information that helps predict $y$ above and beyond the information contained in past values of $y$ alone.

Table 1, reporting standard $\chi$-squared tests, suggests that the structure of causality goes from $\log GDP_t$ to all other variables, and from $u_t$ and $e_t$ to $w_t$, whereas $w_t$ does not help predict any other variables, as shown by the Granger-causality scheme presented in Figure A6.

## 4 Collective bargaining coverage

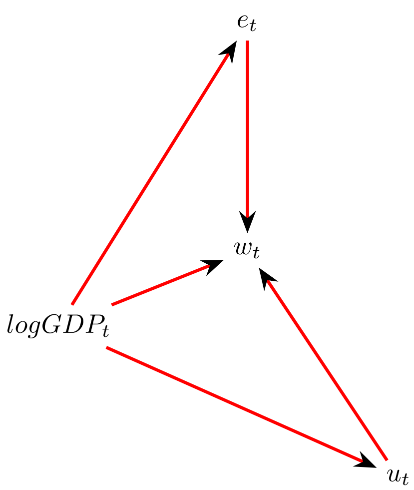
There exists no continuous, long-run series providing information on the coverage of collective pay-setting institutions in the United Kingdom. The OECD dataset starts in 1960 and annual data are available only from 1993. In his authoritative study, Milner [5] provided a set of estimates starting in 1895, but the reconstructed series has major gaps. Therefore we cannot estimate our VECM model using collective bargaining coverage as an alternative measure of workers' bargaining power. However, Figure A7 shows the time path of the two indices of the power resources of the working class.

Table A 1: Granger-causality analysis

| | | | |
|---|---|---|---|
| Dependent variable: $\Delta w_t$ | | | |
| Excluded | Chi-sq | df | Prob. |
| $\Delta e_t$ | 10.211 | 1 | 0.001 |
| $\Delta u_t$ | 6.474 | 1 | 0.011 |
| $\Delta logGDP_t$ | 5.856 | 1 | 0.016 |
| All | 12.644 | 3 | 0.006 |
| Dependent variable: $\Delta e_t$ | | | |
| Excluded | Chi-sq | df | Prob. |
| $\Delta w_t$ | 0.256 | 1 | 0.613 |
| $\Delta u_t$ | 0.009 | 1 | 0.924 |
| $\Delta logGDP_t$ | 5.355 | 1 | 0.021 |
| All | 8.742 | 3 | 0.033 |
| Dependent variable: $\Delta u_t$ | | | |
| Excluded | Chi-sq | df | Prob. |
| $\Delta w_t$ | 0.061 | 1 | 0.805 |
| $\Delta e_t$ | 0.293 | 1 | 0.588 |
| $\Delta logGDP_t$ | 18.599 | 1 | 0.000 |
| All | 33.817 | 3 | 0.000 |
| Dependent variable: $\Delta logGDP_t$ | | | |
| Excluded | Chi-sq | df | Prob. |
| $\Delta w_t$ | 3.305 | 1 | 0.069 |
| $\Delta e_t$ | 0.326 | 1 | 0.568 |
| $\Delta u_t$ | 0.034 | 1 | 0.854 |
| All | 3.676 | 3 | 0.299 |

Notes: Sample: 1892 2018. Included observations: 125

Figure A 6: Granger-causality scheme



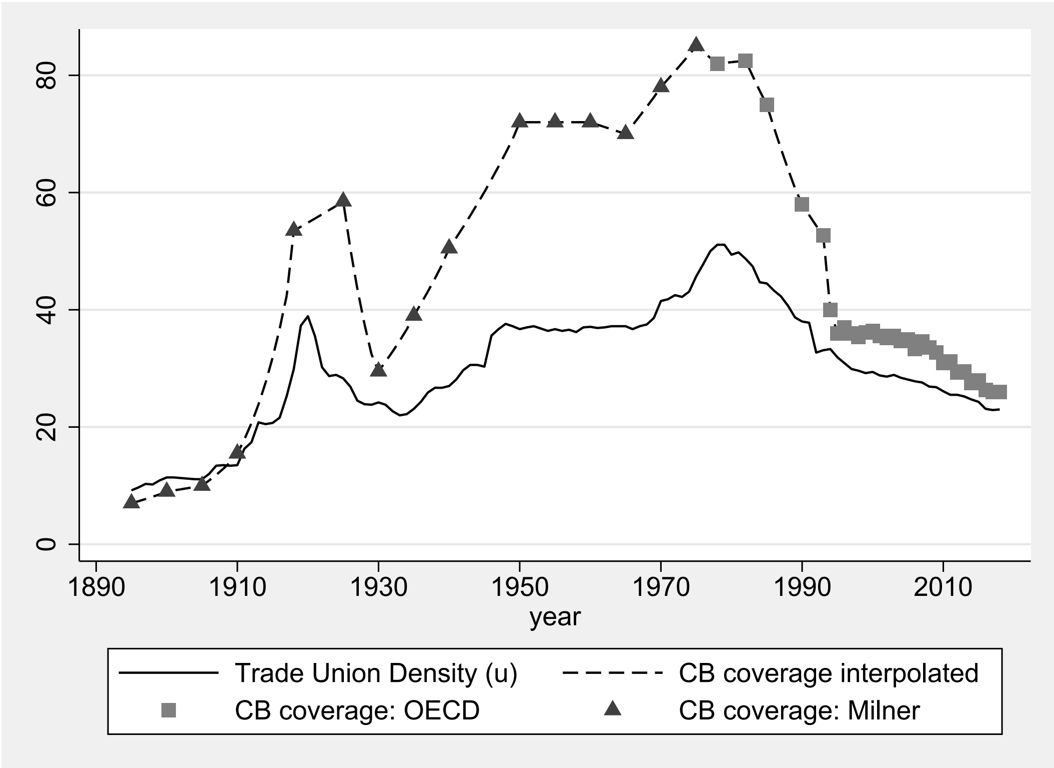



Figure A 7: Collective bargaining coverage and Union Density, UK, 1892-2018

The time series of the union density variable is the same as in the paper. The time series of the collective bargaining index is constructed as follows: from 1895 to 1975 we use the midpoint of Milner's [5] estimates of the coverage of collective pay-setting machinery in Britain; from 1975 onwards we use OECD data. The dashed line represents interpolated values for missing years. The correlation coefficient between union density and collective bargaining coverage thus constructed is 0.946. This result does not change if either the lower or the upper bound of Milner's estimates are used instead, or if one drops the interpolated values of the collective bargaining coverage index and measures the point correlation between the two variables: in all cases, the correlation coefficient is above 0.92.

Data on collective bargaining after 1960 can be found on the OECD website at

https://stats.oecd.org/Index.aspx?DataSetCode=CBC

# 5 Alternative specifications of the VECM model

We have run a host of different robustness checks on the main econometric model, testing – among other things – a set of different definitions of all variables. In this section we present in more detail *only* the results of the estimation of the most significant alternative specifications of the Vector Error Correction Model (VECM), which are summarized in section 6 of the paper. The other results are available from the authors upon request.

First, we estimated the VECM using an alternative measure of trade union density, namely the ratio of trade union membership as measured in the paper to total employment in heads plus claimant count unemployment, i.e. total labour force. Second, we estimated the model using an alternative measure of the employment rate as the ratio of employees in employment to the sum of total employment and claimant count unemployment. Third, we replaced $\log GDP$ with a measure of accumulation of capital, $i$.

We then estimated the VECM including various measures of the power resources of capitalists. Here we present the results of the model in which we replaced $\log GDP$ first with the log of total non-dwellings capital stock, $\log K$, and then with an openness index, $k$, capturing property income from overseas as a percentage of the sum of property income from overseas, total domestic profits, and an estimated profits component of mixed income.

In each of the robustness checks, our strategy has been to replace *one* variable at the time (either union density or the employment rate or $\log GDP$) and closely replicate – step by step – the estimation procedure of the VECM outlined in section 5 of the paper (see also section 2 above). In this section, for each of the robustness checks, we present only the estimated VECM and the Impulse Response Functions (IRFs). Details of the results of all other tests (the modified Dickey–Fuller $t$ test, the Schwarz's Bayesian information criterion, and so on) underlying the estimates below are available from the authors upon request.

Concerning data sources for the robustness checks in this section, the time series data are for the whole UK economy. Apart from data on trade union membership and claimant count unemployment, all time series data are taken from Thomas and Dimsdale [6]. Claimant count unemployment data for 1971-2018 are electronically available from the Office for National Statistics at http://www.ons.gov.uk/ (each series has a 4 digit identifier, as listed below). Prior to 1971 they are taken from Hills et al [2]. The main series are described in Appendix A of the paper. Therefore here we only describe data sources for the additional variables.

In Table A2:

Trade union density is the ratio of trade union membership as measured in the paper to total employment in heads (Worksheet A50, column B) plus Claimant Count unemployment (ONS, Series BCJD for 1971-2018, and prior to 1971 Worksheet 22, column O from Hills et al [2].

In Table A3:

The employment rate is [Total employment in heads (Worksheet A50, column B, updated by ONS Series MGRZ) less Self-employment (Worksheet A50, column D), updated by ONS Series MGRQ] divided by [Total employment in heads (as above) plus Claimant Count unemployment (as above)]

In Table A5:

Total nominal non-dwellings capital stock is taken from Worksheet A55, column V. Then natural logs are taken.

In Table A4:

The variable $i$ is the growth rate of total nominal non-dwellings capital stock as constructed in Table A5.

In Table A6:

Investment income inflows to total property income:

(i) Investment income inflows to the UK from 1946-2018 are from ONS HMBN. Data from 1892-1946 is from Thomas and Dimsdale [6] Worksheet A36, Column X. These latter are adjusted by splicing backwards from 1946 using the 1946 ratio of ONS to Thomas and Dimsdale [6], and then growth rates backwards.

Table A 2: Estimated VECM, with an alternative measure of $u_t$ and Impulse Response Functions of the restricted model (Cholesky decomposition, shocks of 1 standard deviation).

| | Model 1 (unrestricted) | Model 2 (with restrictions) |
|---|---|---|
| $w_{t-1}$ | 1.000 | 1.000 |
| $e_{t-1}$ | 0.163 | 0.000 |
| | (0.220) | |
| $u_{t-1}$ | -0.710 | -0.850 |
| | (0.117) | (0.123) |
| $logGDP_{t-1}$ | 2.223 | 0.000 |
| | (1.654) | |
| $t$ | -0.089 | 0.000 |
| | (0.115) | |
| *constant* | -70.587 | -35.501 |

| | |
|---|---|
| LR test for binding restrictions (rank = 1): ($\beta_1 = 1, \beta_2 = 0, \beta_4 = 0, \beta_5 = 0$) | |
| Chi-square(3) | 3.801 |
| Probability | 0.284 |

Notes: Standard errors in parentheses.
The coefficient $\beta_1$ is normalized to one.

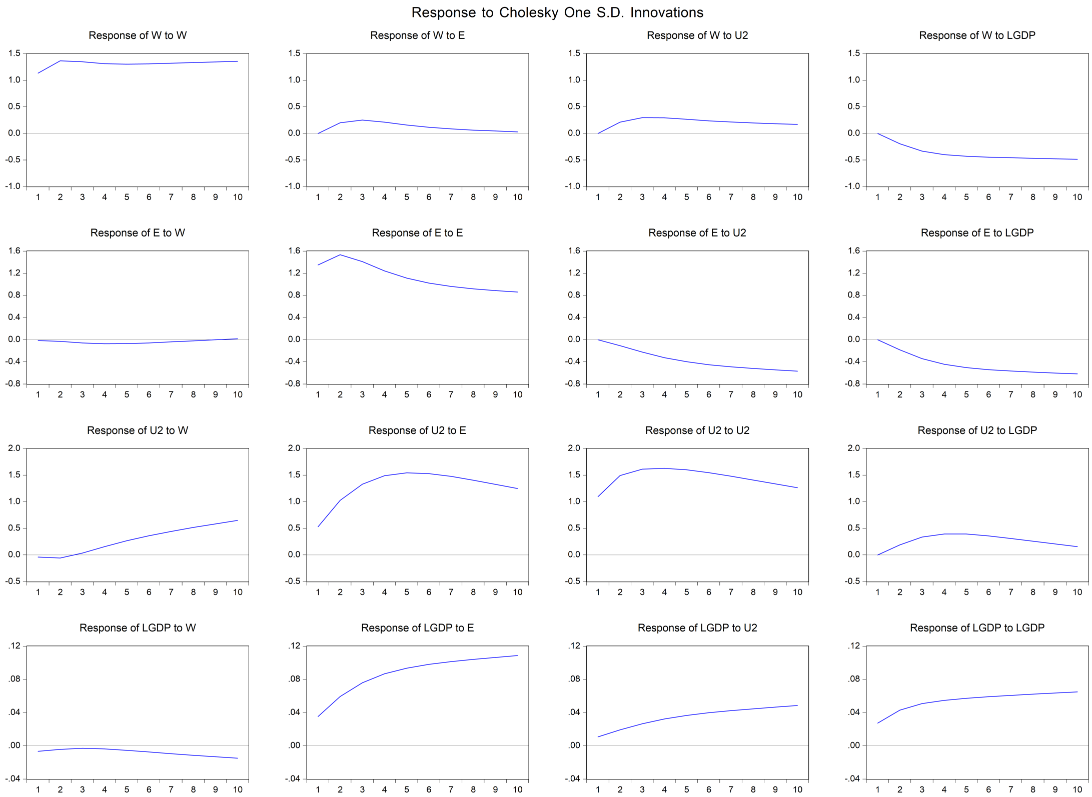


Table A 3: Estimated VECM, with an alternative measure of $e_t$ and Impulse Response Functions of the restricted model (Cholesky decomposition, shocks of 1 standard deviation).

| | Model 1 (unrestricted) | Model 2 (with restrictions) |
|---|---|---|
| $w_{t-1}$ | 1.000 | 1.000 |
| $e_{t-1}$ | -0.104<br>(0.173) | 0.000 |
| $u_{t-1}$ | -0.597<br>(0.094) | -0.825<br>(0.105) |
| $logGDP_{t-1}$ | 3.217<br>(1.386) | 0.971<br>(0.395) |
| $t$ | -0.158<br>(0.098) | 0.000 |
| *constant* | -56.14972 | -45.10190 |
| LR test for binding restrictions (rank = 1): ($\beta_1 = 1, \beta_2 = 0, \beta_5 = 0$) | | |
| Chi-square(3) | | 0.967 |
| Probability | | 0.617 |

Notes: Standard errors in parentheses.
The coefficient $\beta_1$ is normalized to one.

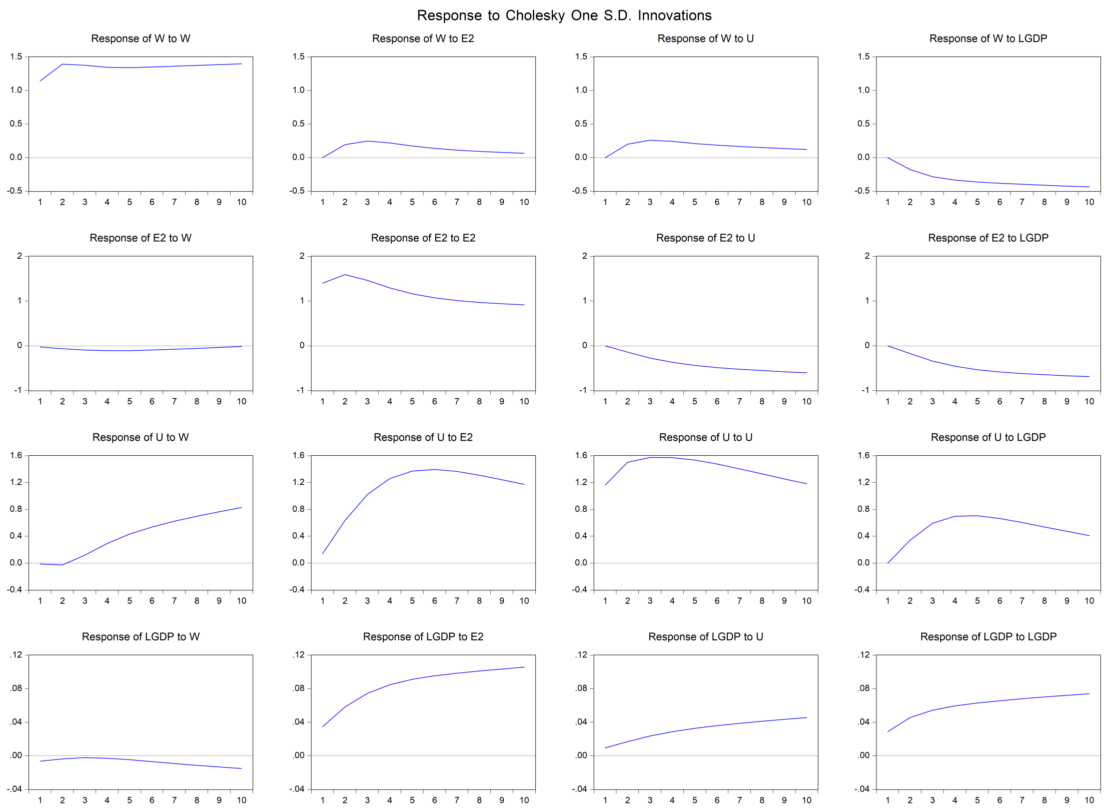


Table A 4: Estimated VECM, using the percentage change of total nominal non-dwellings capital stock, $i$, instead of $logGDP$ and Impulse Response Functions of the restricted model (Cholesky decomposition, shocks of 1 standard deviation).

| | Model 1 |
|---|---|
| $w_{t-1}$ | 1.000 |
| $e_{t-1}$ | -0.769<br>(0.257) |
| $u_{t-1}$ | -0.796<br>(0.114) |
| $i_{t-1}$ | 2.059<br>(0.216) |
| $constant$ | 16.209 |

Notes: Standard errors in parentheses.
The coefficient $\beta_1$ is normalized to one.

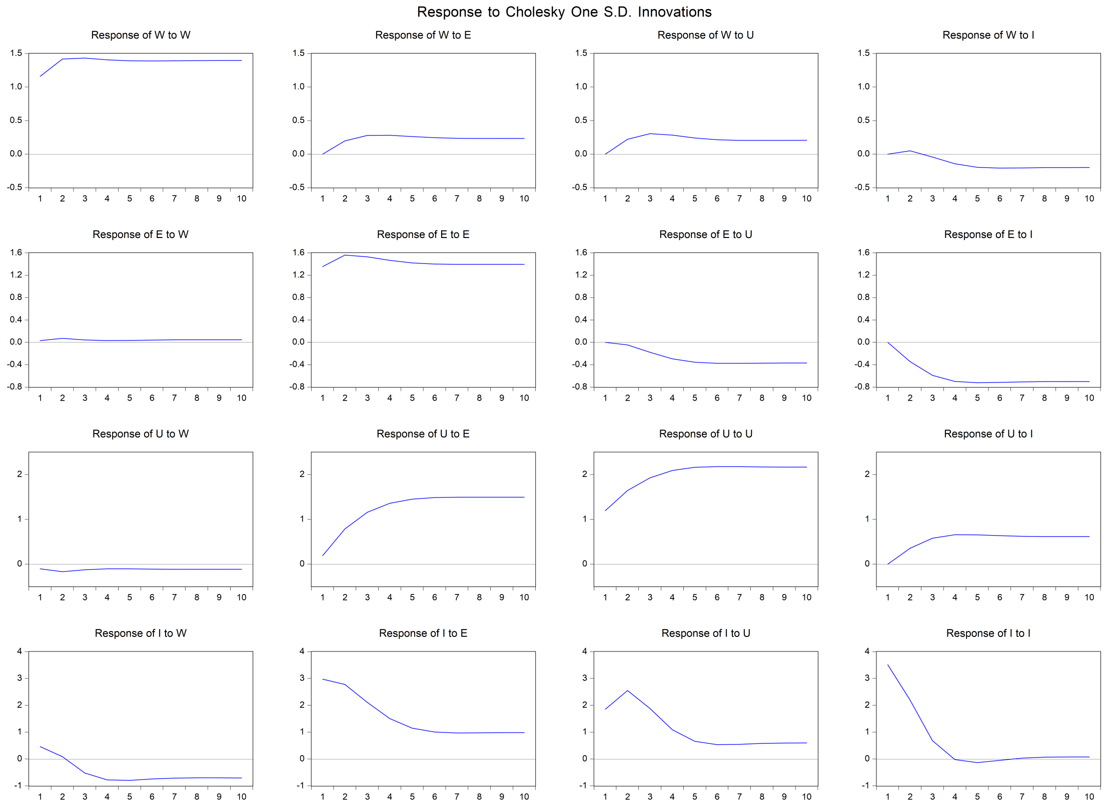


Table A 5: Estimated VECM, using the log of total nominal non-dwellings capital stock, $logK$, instead of $logGDP$ and Impulse Response Functions of the restricted model (Cholesky decomposition, shocks of 1 standard deviation).

| | Model 1 (unrestricted) | Model 2 (with restrictions) |
|---|---|---|
| $w_{t-1}$ | 1.000 | 1.000 |
| $e_{t-1}$ | -0.234 | 0.000 |
| | (0.158) | |
| $u_{t-1}$ | -0.457 | -0.509 |
| | (0.074) | (0.084) |
| $logK_{t-1}$ | 4.126 | 4.455 |
| | (1.051) | (1.081) |
| $t$ | -0.237 | -0.251 |
| | (0.072) | (0.077) |
| $constant$ | -55.781 | -76.618 |
| LR test for binding restrictions (rank = 1): | | $(\beta_1 = 1, \beta_2 = 0)$ |
| Chi-square(3) | | 1.680 |
| Probability | | 0.195 |

Notes: Standard errors in parentheses.
The coefficient $\beta_1$ is normalized to one.

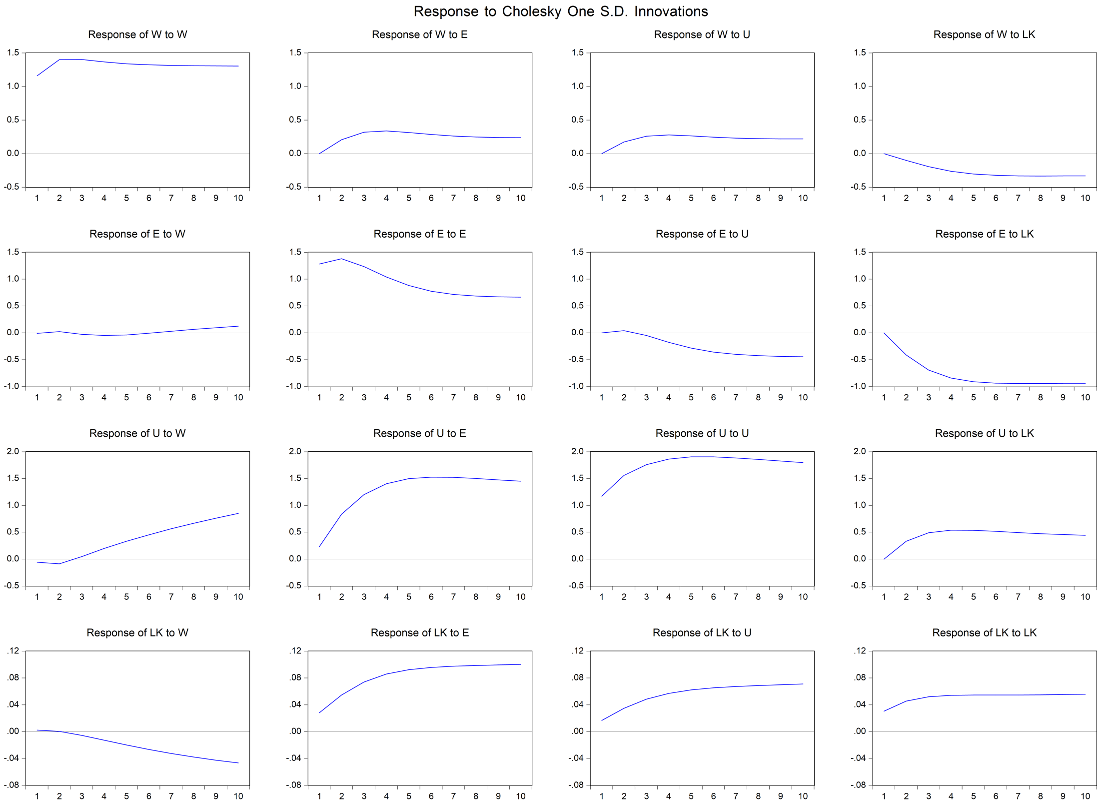
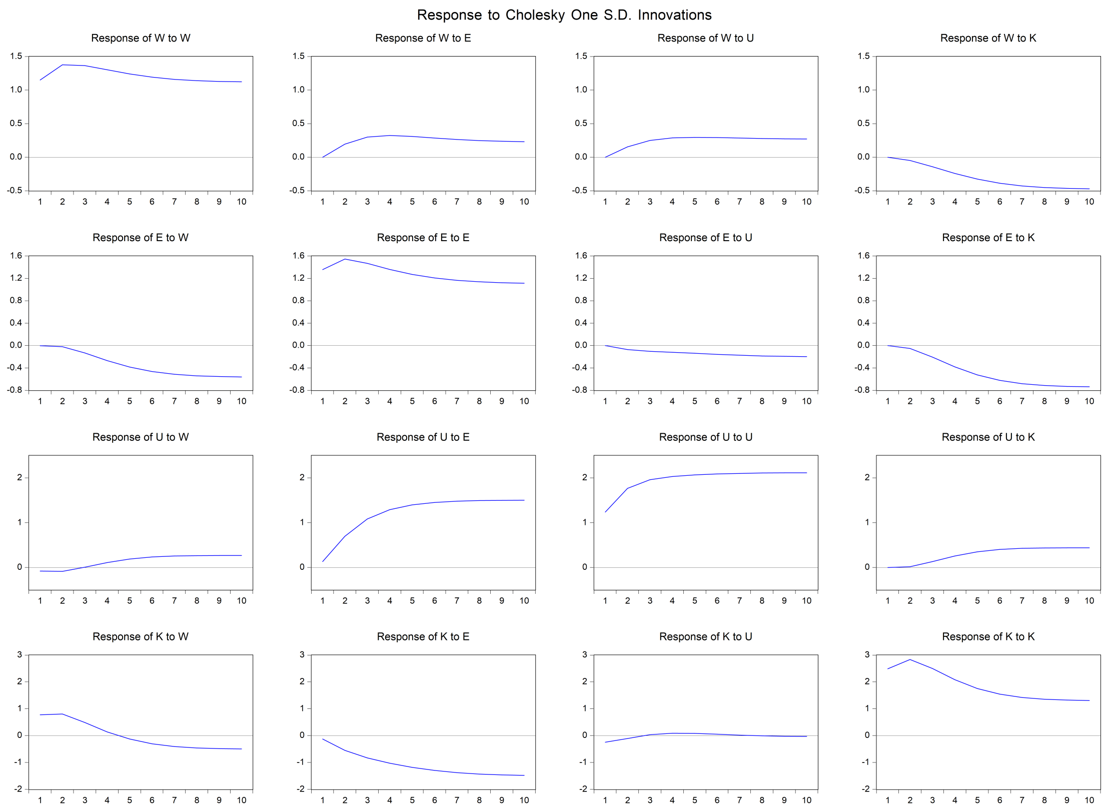


Table A 6: Estimated VECM, using property income from overseas, $k$, instead of *logGDP* and Impulse Response Functions of the restricted model (Cholesky decomposition, shocks of 1 standard deviation).

| | Model 1 (unrestricted) | Model 2 (with restrictions) |
|---|---|---|
| $w_{t-1}$ | 1.000 | 1.000 |
| $e_{t-1}$ | 1.090 | 1.127 |
| | (0.328) | (0.349) |
| $u_{t-1}$ | -0.146 | 0.000 |
| | (0.098) | |
| $k_{t-1}$ | 0.914 | 0.992 |
| | -0.153 | (0.166) |
| *constant* | -168.1687 | -177.4133 |

| | |
|---|---|
| LR test for binding restrictions (rank = 1): $(\beta_1 = 1, \beta_2 = 0, \beta_4 = 0, \beta_5 = 0)$ | |
| Chi-square(3) | 1.482 |
| Probability | 0.224 |

Notes: Standard errors in parentheses. The coefficient $\beta_1$ is normalized to one.



Total domestic profits are calculated as follows.

(ii) For 1948-2018, the gross operating surplus (GOS) of all corporations is calculated as GOS of the UK (ONS ABNF) less GOS of general government (ONS NMXV) less GOS of households and nonprofit institutions serving households (ONS QWLS).

(iii) For 1892-1948, the GOS of all corporations is calculated as the sum of the GOS for private companies, the gross trading surplus of public corporations and the gross trading surplus of other public enterprises (Thomas and Dimsdale [6] Worksheet A17, Columns AD, AE and AF respectively).

(iv) A complete series is then obtained by splicing (ii) on to (i).

(v) Total mixed income: for 1948-2018 is from ONS QWLT; for 1892-1948 self-employment income is from Thomas and Dimsdale [6] Worksheet A17 column N, which is then spliced on to the ONS series using the common 1948 figure.

(vi) The profit component of mixed income is determined by applying the ratio of the sum of (ii) and (iv) to GDP at factor cost.

(vi) Then the openness variable, $k$, is the ratio of (i) to the sum of (i) and (iv) and (vi).

## 6 Disentangling the wage share

Unfortunately, only very limited data exist for the UK economy that precisely distinguish different categories of employees. Census of Production data provide a continuous series for the Production Industries (Mining, Manufacturing and Utilities) for the years 1974-1995. Data are reported on wages paid to manual workers (operatives) and gross value added, and hence a manual worker wage share in production industries can be constructed. But there is no analogous sectoral employment rate, and so we have to assume that the economy-wide employment rate used in the paper can be used as a proxy for that of Production industries. This is difficult because of the secular decline of employment in Production industries. With that caveat, if WSER cycles can be found for the economy as a whole, then one would expect them to exist in Production industries.

We apply the same methodology as in section 4 of the paper to the raw data. First, Figure A8 displays three cycles in deviations from trend of the wage share in gross value added of manual workers (operatives) in production industries (horizontal axis) plotted against the deviations from trend of the national employment rate (vertical axis). As in the paper, the 1976-81 and 1986-93 cycles are clockwise, but unlike in the paper the 1981-86 data appear to show an anti-clockwise rather than an indeterminate pattern.

However, the long-run behaviour of the income share of the manual working class confirms, indeed further strengthens the doubts on the empirical validity of SDT discussed in the paper. For the equilibrium values, the centres of the WSER cycles, around which the wage share and the rate of employment fluctuate, vary significantly over time, and there is a pronounced long-run decline in the operatives' wage share in production industries, as illustrated in Figure A9.

Concerning the data sources for Figures A8 and A9:

The wage share is Wages and Salaries of Operatives in Production Industries (mining and quarrying; manufacturing; and electricity, gas and water supply) divided by Gross Value Added in Production Industries, both from Business Monitor (Census of Production), PA1002, Table 2, Annual Years [1]. (Employers' National Insurance Contributions are not included in Wages and Salaries of Operatives.)

The employment rate and trend is the same as in the main paper.

Trends and deviations from trend are derived in the same way as in the main paper (from a Hodrick-Prescott filter using the default Eviews specification for annual data).

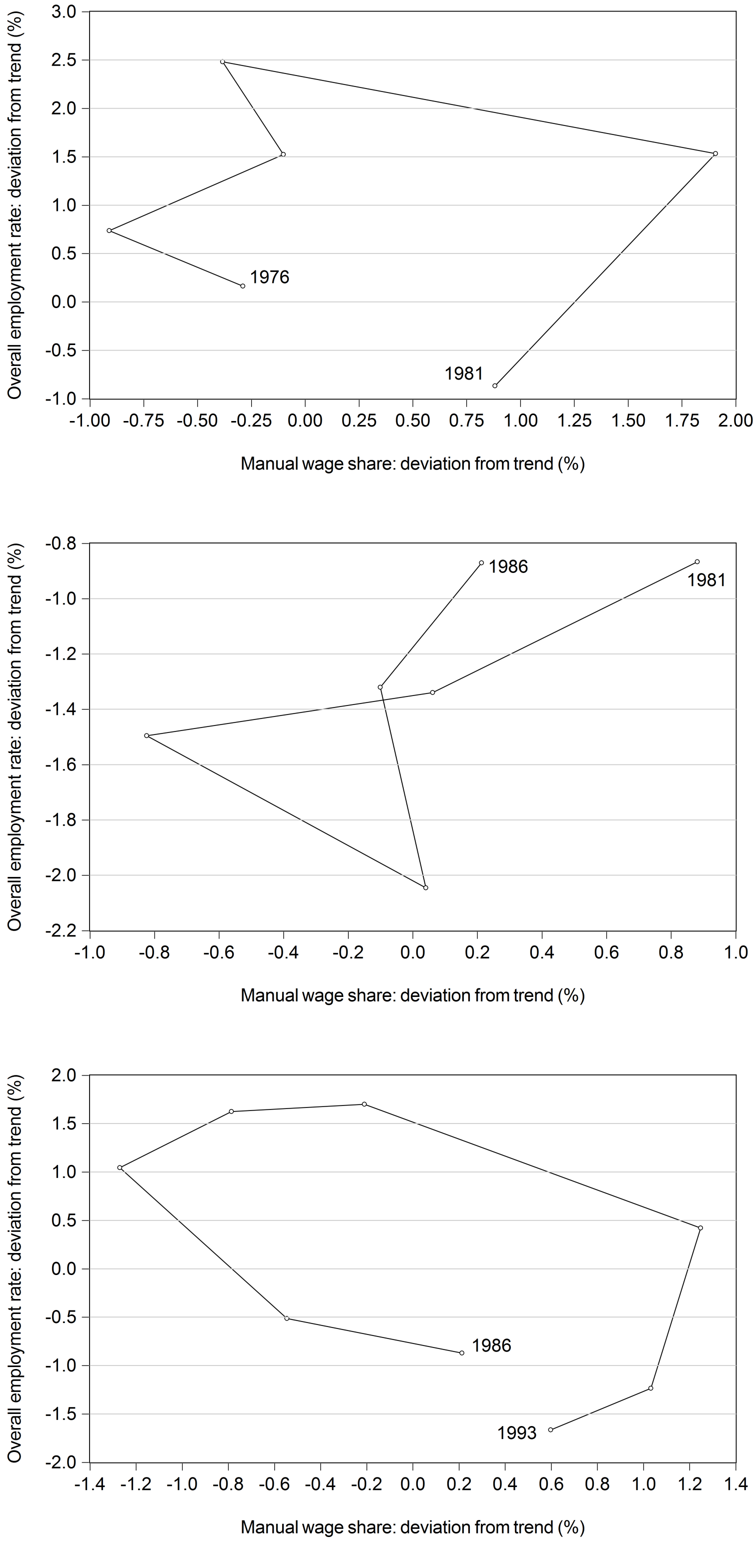





Figure A 8: *Three WSER Cycles, UK Operatives, 1976-1993.*

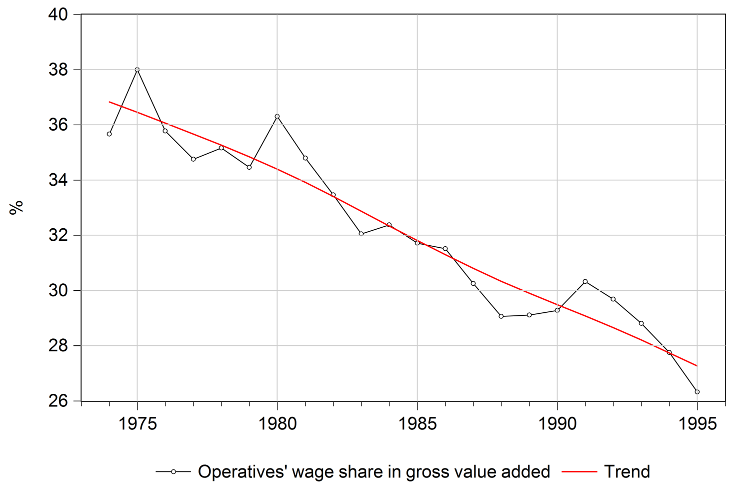



Figure A 9: *Production Industries: Operatives' Wage Share (Raw Data and Trend), UK, 1974-1995*

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