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The Pay and Productivity Dilemma: A Critical Theoretical Review and Empirical Analysis for the UK Economy

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About PIN

The Productivity Insights Network was established in January 2018 and is funded by the Economic and Social Research Council. As a multi-disciplinary network of social science researchers engaged with public, private, and third sector partners, our aim is to change the tone of the productivity debate in theory and practice. It is led by the University of Sheffield, with co-investigators at Cambridge Econometrics, Cardiff University, Durham University, University of Sunderland, SQW, University of Cambridge, University of Essex, University of Glasgow, University of Leeds and University of Stirling. The support of the funder is acknowledged. The views expressed in this report are those of the authors and do not necessarily represent those of the funders.

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Introduction

A key premise underlying the productivity debate in the UK was recently articulated by the Science Minister Amanda Solloway: *“Improving productivity is central to driving forward our long-term economic recovery and ensuring that we level up wages and living standards across every part of the UK”* (UK Government, 2020). This idea, commonly expressed in the literature in different forms, takes for granted the transfer mechanism from labour productivity gains to pay growth. There is, however, growing concern about the observed divergence between these two variables of interest, especially in advanced economies over recent decades (OECD, 2018). While the decoupling between productivity and pay has been acknowledged by competing economic views there is no consensus on the underlying reasons and mechanisms. Despite the growing interest in the nature and implications of the problem, there are conflicting findings both at the aggregated level and in country-specific patterns of productivity growth and its linkages with pay and inequality. Dispute has remained unresolved even over very basic questions such as the existence of the decoupling (Pessoa and Veenen, 2013, Compagnucci et al., 2018) or the direction of the causality between pay and productivity in the long run (Tridico and Pariboni, 2018; Hein and Tasarow, 2010).

This report provides a critical review of alternative theories including classical political economy, Marxist political economy, neoclassical economics, and post-Keynesian economics. Clearly, a range of testable models can be derived from these alternative theories. We have not done so in this short report but rather we have utilised a series of empirical exercises to reveal some crucial features of the interaction between the pay and productivity. Specifically, we employ the Hodrick-Prescott filter to disintegrate the cyclical variations in productivity growth and wage rates from their respective historical trends and analyses the evolution of the wage cycle against the long-term productivity patterns in the UK economy for the period 1856-2016. This exercise is followed by a long-run analysis to estimate structural break dates based on the Bai-Perron (1998, 2003) structural break test. We then utilise an autoregressive distributed lag (ARDL) model to reveal the existence and the nature of the linkage between productivity and pay. Finally, in view of the feedback mechanism between productivity slowdown and growing income inequality, the report focuses on the post-1980 era and provides an alternative outlook of disposable income inequality in the UK economy based on the Palma proposition.

1. Theories on Pay-Productivity Relationship

1.1. Classical Tradition

The link between labour productivity and pay is one of the longest standing topics in the history of economics. As early as 1776, Adam Smith, fully aware of the crucial role of this link in constructing a consistent economic theory, discusses the relationship between division of labour and productivity, through his famous “pin factory example”. He emphasizes the central role of the division of labour in boosting productivity per head:

“those ten persons, therefore, could make among them upwards of forty-eight thousand pins in a day. Each person, therefore, making a tenth part of forty-eight thousand pins, might be considered as making four thousand eight hundred pins in a day. But if they had all wrought separately and independently, and without any of them having been educated to this peculiar business, they certainly could not each of them have made twenty, perhaps not one pin in a day” (Smith, 1776, p. 5)

One could conclude that the great importance attached to the role of division of labour is underpinned by the direct channels through which mechanisation (or technology in a wider sense) and education (whether formal education or on-the-job training or learning by doing) raise labour productivity. It is this generalized argument that has persisted throughout the history of economic thought across different schools, albeit with differing “technicalities” working in the background. We will discuss these differences in the following sections. The second variable of interest, pay, has however always been a source of disagreement. Smith, for example, suggests that share of labour is established through a contract (or negotiation) between different factions of the society, i.e., working class and capitalists, whose interests are antagonistic by nature.

“... what are common wages of labour depends everywhere upon the contract usually made between those two parties, whose interests are by no means the same.... it is not, however, difficult to foresee which of the two parties must, upon all ordinary occasions, have the advantage in the dispute, and force the other into a compliance with their terms.” (Smith, 1776, p. 66)

Smith’s observations on the capitalist mode of production at its early stages provide useful insights into the nature of the system which are the precursor of the labour theory of value. This theory points to the working class as the creator of the surplus value generated through production process, while receiving only a tiny part of it in the form of wages. The labour theory of value has provided the working class with the underlying legitimacy in their constant struggle to get a larger share of output. While the evolution of these social movements falls outside the scope of this study, it is worth noting that classical political economy envisaged an economic sphere that covers production and distribution processes in their entirety and is deeply embedded in social relations.

The following note from Adam Smith throws some light on the link between productivity and pay, especially the causation aspect of the question:

“The liberal reward of labour, as it encourages the propagation, so it increases the industry of the common people. The wages of labour are the encouragement of industry,

which, like every other human quality, improves in proportion to the encouragement it receives. A plentiful subsistence increases the bodily strength of the labourer, and the comfortable hope of bettering his condition, and of ending his days perhaps in ease and plenty, animates him to exert that strength to the utmost. Where wages are high, accordingly, we shall always find the workmen more active, diligent, and expeditious, than where they are low; in England, for example, than in Scotland; in the neighbourhood of great towns, than in remote country places. Some workmen, indeed, when they can earn in four days what will maintain them through the week, will be idle the other three. This, however, is by no means the case with the greater part. Workmen, on the contrary, when they are liberally paid by the piece, are very apt to over-work themselves, and to ruin their health and constitution in a few years.” (Smith, 1776, p. 81-82)

As clearly put by Smith, higher wages can promote labour productivity as workers will work in a more encouraged, motivated, and energetic way. As such, there is a clear positive impact feeding back into productivity levels at the workplace. This is particularly important as the mainstream approach to the problem disregards any bidirectional causality between productivity and pay.

The perspective of the classical tradition on the relationship between labour productivity and pay can be summarized as - Firstly, social relations are influential in the determination of wages as a direct consequence of the dynamic nature of the classes with different, and often conflicting, interests. Secondly, economic level cannot dominate the entire social relations, rather it is deeply embedded in historically determined social relations that are constantly being shaped and changed by political struggles. Finally, there is a bidirectional causality between pay and productivity. A strong positive link from productivity to pay lies in the production process. As an integral part of it, ongoing social conflicts shape the balance of power at any specific moment of time, which ultimately determines the wage levels. Once the income has been distributed, wage levels feed back into the production process, again confirming a positive relationship.

All subsequent economic schools of thought have inspired from the classical tradition in some way. Karl Marx constructed his own theory based on a radical critique of both the classical economists and capitalist mode of production.

1.2. Marxist Political Economy

At the centre of the Marx's analysis of capitalist system is the labour theory of value, which is based on a critical assessment of other classical economists. Marx basically questioned why a product would take the form of commodity. Capitalism, as a system fundamentally based on the generalised, profit-centred production, was, Marx concluded, characterised by constant generation of surplus value and its appropriation by capitalist class. Unlike other schools, Marxian tradition emphasized that it is not other means of production but exclusively labour (power) that adds value to the final output (Fine and Saad-Filho, 2016, pp. 20, 21, 27). Thus, the profits are nothing but the sum of these additional (unpaid) values that accrue in the production process. It is important to stress here that primary motivation of the capitalist is to increase profitability, not productivity.

However, there are two basic mechanisms to increase profitability: (i) substitution of labour (living labour) with capital (**dead** labour), which will lead to labour-saving technical progress, with a definitive boost to productivity; and (ii) cutting wages whenever possible. While the former mechanisation process is widely hailed as the driving force of capitalist development, it is also strongly argued that ever increasing levels of capital intensity end up in a deskilling process through which majority of workers face a devaluation of wage rates, along with a further weakening of resistance mechanisms¹. This process is particularly intensified by an increasingly fierce competition amongst workers and from the unemployed (Botwinick, 2018, pp 86-87). The major tendency in capitalist production is to raise labour productivity to the highest level possible, while keeping wages at the lowest level possible. The inevitable combined effect of this will be the divergence of pay from labour productivity.

However as Marxist political economy shows not only wages, but also other aspects of the labour process such as working hours, benefits, productivity, whether at workplace, sectoral, national or even global levels, are part of the *ongoing* struggle between employers and employees. Ignoring this social dimension may well lead to a misrepresentation of the actual relationships between working conditions, productivity and pay. *“The history of the labour process is a sobering reminder that the length, intensity, and average or marginal productivity of labour are not technologically determined”* (Shaikh, 2016, p.132).

But if wages are determined by power relations in a historically determined context, then what would be the lower and upper limits? The answer is quite straightforward: *“Wages are determined through the antagonistic struggle between capitalist and worker”* (Marx, 1844, p.19) within a corridor, with the lowest limit representing the subsistence wage while the highest limit representing the socialization of the means of production. Subsistence wage here refers to the following: *“If the owner of labour-power works today, tomorrow he must again be able to repeat the same process in the same conditions as regards health and strength. His means of subsistence must therefore be sufficient to maintain him in his normal state as a working individual”* (Marx, 1867, p.275). Socialization of the means of production, on the other side of the spectrum, means

¹ At this juncture, an important reminder is that *“competition pits seller against seller, seller against buyer, and buyer against buyer. It pits capital against capital, capital against labor, and labor against labor. It operates not only on prices and profits but also on wages and rents”* (Shaikh, 2016, p. 260). Therefore, capitalists apply various methods to discipline workers, including mechanization and deskilling, with a view to intensifying production of surplus value. Thus, these mechanisms are not a matter of choice, but of a necessity for their survival.

workers exercising full control over the production process and eliminating capitalist class altogether.

Marxist political economy also offers a crucial point of argument in relation to structural dynamics of the capitalist economy. In their pioneering work, Shaikh and Tonak (1994) offer a novel methodology and approach to measure national product, following classical and Marxian frameworks. In doing so, they revitalize the distinction between production and nonproduction sectors, which encapsulate labour *productive* of capital, and labour *not productive* of capital, respectively. They go on to criticise mainstream framework of measuring national accounts, most particularly by taking objection to the presumption that sectors such as military, bureaucracy and finance create new wealth. The ongoing debate on the merits of a precise taxonomy of the aggregated data based on productive versus unproductive labour is not the subject of our study; however, this line of argument provides an interesting empirical framework which has a potential to shed light on the contemporary questions around “secular stagnation” and “persistent” nature of the divergence between productivity and pay. This methodology might be instrumental in offering an alternative explanation to the UK context where the share of “financial services, business services, rent and real estate” in gross value added has rocketed from around 10% to nearly 40% since 1948 (Thomas and Dimsdale, 2017).

As a final note on the causality between productivity and pay, Marx’s approach appears to be consistent with other classical political economists, i.e., there is a mutual interaction between these two variables. But Marx is strongly against the objectification of labour power not only in economic terms (as the only source of surplus value) but also in the sense that capitalist mode of production causes estrangement and alienation of the labourers to themselves, to wider society, and even to the nature. Therefore, it is only more free time, not more working hours or more intense working hours, that will help workers develop their mental and physical wellbeing and better working conditions.

1.3. Neoclassical School: Marginal Productivity Theory of Income Distribution

In view of the fact that contemporary approaches to the relationship between productivity and pay are mostly dominated by neoclassical theory of marginal theory of distribution, we aim to review the underpinnings of this tradition only so far as is relevant to our central point of interest.

“As soon as we begin seriously to regard economic phenomena as a whole and to seek for the conditions of the welfare of the whole, consideration for the interests of the proletariat must emerge; and from thence to the proclamation of equal rights for all is only a short step. The very concept of political economy, therefore, or the existence of a science with such a name, implies, strictly speaking, a thoroughly revolutionary programme.” (Wicksell, 1977, p. 4)

The above passage provides a good summary of why *economics* needed to drift away from *political economy* beginning from the second half of 19th century. Having effectively replaced labour theory of value with utility theory of value, neoclassical economics, at the time, held sway over the economic theory in general. In doing so, it also changed the central problem of the economic thinking into efficient allocation of available resources. Then the law governing this efficient allocation was declared to be “marginal principle”, *whose application extends far beyond the actual province of the exchange of goods into the fields of production, distribution, and capital. In other words, it governs every part of political economy* (Wicksell, 1977, p.14).

The neoclassical school departs on its theoretical journey with a political choice based on an avoidance of the central argument of classical political economy: capitalist society is a historically determined production system shaped by class conflict and regulated by competition for profit maximization and capital accumulation. Conversely, individuals (and society being depicted as an arithmetic sum of individuals) are portrayed rational agents who are self-consciously pursuing their own interests at every moment of economic activity. Once capitalist society is described as a harmonic total of individuals whose utmost objective is to maximise their utility, then the core problem of economics may well be reduced to the problem of choice. In a universe where all inputs are envisaged to be homogenous and perfectly substitutable, perfectly informed economic agents must be able to make optimal choices in the face of certain constraints (Screpanti and Zamagni, 2005).

Under this theoretical setting income distribution as well as wage determination is formulated as a wage theory. Prominent neoclassical economist John Hicks aimed to reformulate the micro dynamics of wage determination using a general equilibrium framework during the Great Depression of 1929: *“The theory of the determination of wages in a free market is simply a special case of the general theory of value. Wages are the price of labour; and thus, in the absence of control, they are determined, like all prices, by supply and demand.”* (Hicks, 2011, p.1). At the equilibrium wage rate is shown to be equal to the value of the marginal product of last labourer employed (or last hour worked). In other words, real wage, which is supposed to reflect both marginal worker’s contribution to production, i.e. marginal productivity of the labour unit at the margin, and the share of production that is paid to the worker.

“...the distribution of the income of society is controlled by a natural law, and this law, if it worked without friction, would give to every agent of production the amount of wealth which that agent creates.” (Clark, 1908, p. 5). In short, productivity improvements should translate into real wage gains in the long term, with the self-driven causality mechanism running from productivity to pay. Nevertheless, this very same mechanism reduces the distribution of income to merely a technical matter, exclusively determined in an economic planet where classes and power relations are explicitly excluded (Yeldan 2009, p. 173). Indeed, an increase in real wages can be reasonably expected only if their skills and hard work are sufficient to help raise productivity (Shaikh, 2016 p. 640).

A final point to highlight is the obstinate character of this presumed technical relationship between productivity and pay. In the long run there is always an equilibrium that effectively “regulates” the links between the production and distribution. While allowed that there may be deviations from equilibrium in the short term; however, all kinds of short-term irregularities are assumed to be smoothened in the long run through the “free market competition”. (Hicks, 1932, p. 86). For example, whenever wages fall below the marginal productivity firms would hire, and in the contrary case fire, more workers to achieve their unique goal of maximising profits (López-Villavicencio and Silva, 2011). The latter scenario, defined as real wage gap, where real wages exceed full employment marginal productivity of labour, explains the existence and size of unemployment in that workers getting above their fair share will eventually be wiped out.

1.4. Efficiency Wage and Insider-Outsider Theories on the Productivity-Pay Relationship

Efficiency wage theory may be viewed as an attempt to explain the contradictory dynamics between persistent involuntary unemployment, falling rates of profit, productivity, and wages. The main presumption is that setting the wage rate above the equilibrium can lift up worker motivation, and thereby labour productivity as part of firm's profit maximization strategy. This will also allow a firm to maintain its reputation and avoid adverse selection (Solow, 1979). Therefore, wages above market-clearing rate can provide a competitive advantage through productivity gains and reduced turnovers costs (Yellen, 1984). Furthermore, ability to attract and maintain a more favourable pool of workers, will presumably lower unit labour costs (Botwinick, 2018, p.59). Another channel through which productivity is thought to be boosted by wage rise is that workers will be kept at the utmost levels of “*discipline and loyalty*”, while this is to be imposed in a “*‘politically correct’ and civilised way*” (Tsoulfidis, 2010 p. 370).

There are several models branded under efficiency wage theory, each of which is focused on a different aspect of the common framework outlined above. For example, the shirking model suggests that potential losses to be caused by paying in excess of equilibrium rate will be much lower than potential benefits to be gained through reduced shirking and monitoring costs. In the absence of such a tool, the equilibrium unemployment rate would have to be high enough to prevent shirking as on-the-job performance of workers would not be monitored properly (Shapiro and Stiglitz, 1984). The relevance of this model to our discussion is that it suggests unemployment benefits (and all welfare benefits in a wider sense) lessen the extent of financial suffering a work-shy labourer would otherwise have to face after being fired. A concomitant policy implication of this reasoning was removal of unemployment-related benefits on these grounds.

In search of an alternative firm-level explanation to the causes and consequences of involuntary unemployment, insider-outsider theory directs its attention to labour turnover costs. According to this theory, incumbent workers (insiders) hold a commanding lead over *involuntarily* unemployed workers (outsiders); mainly because (i) firms are reluctant to cover hiring, induction and firing costs; and (ii) insiders may prefer to discriminate against entrants through cooperation and/or harassment. A striking implication of this theory is that it is workers' resistance mechanisms to protect their jobs which create extra burden on firm's recruitment strategy and thereby a major source of imperfection in the labour market. Workers tend to misuse their market power by manipulating labour turnover costs, with the help of their unions that put additional strain on labour turnover costs by defending job security laws, organising cooperation among insiders, forcing to make redundancies more difficult and to increase firing costs, and so on (Lindbeck and Snower, 1987). One important policy implication of this theory has been scapegoating trade unions for “*the aggressive rent-seeking behaviour of unions that slowed down economic growth*” (Guerrazzi, 2020).

To sum up, efficiency wage theory rests on the assumption that higher pay increases average productivity while reducing average labour unit cost, ultimate outputs being higher profits for firm and a contribution to involuntary unemployment problem. On the other hand, insider-outsider theory attacks incumbent workers' market power, as the source of involuntary unemployment, and offers deregulation of labour markets, notably inactivation of trade unions. We conclude that even though they depart from different aspects of the same problem, their policy proposals have contributed to the world-scale deregulation of 80s and 90s, widely termed

as neoliberalism, at least two features of which are closely related to these theories: *confronting trade union power and attacking all forms of social solidarity, ... and dismantling or rolling back the commitments of the welfare state* (Harvey, 2005 p. 23).

1.5. Post-Keynesian Economics

This tradition approaches the pay-productivity relation from a different perspective; in that structural and institutional dynamics have a crucial role to play, and production process (thus growth) is an integral part of income distribution. As an alternative way of doing economics, it argues that distribution of income is eventually determined by power relations, and the processes such as globalisation and financialisation intrinsically operate against labour's bargaining power (Lavoie and Stockhammer, 2013, p. 7). Another building block of this approach is that the effect of real wage gains on productivity is peremptorily positive.

The roots of this tradition date back to early 20th century. In December 1912, in his defence of the introduction of a minimum wage, Sidney Webb, challenged the opposing arguments of the time highlighting that in sixteen years after the law had first been applied, [growth rate of] wages increased from 12 to 35 percent, the hours worked continuously went down, and the employment considerably improved. He argues that an increase in real wages will not decrease productivity in any shape or form; on the contrary it increases it both immediately and in the long run; and both at sectoral and national level. Pointing to employers' priority to make profits over the amount of output, he particularly blames excessive and irregular working hours, and dangerous and insanitary working conditions as the reasons for "*frequent lowering of productivity*" (Webb, 1912).

In one of its most refined forms of these ideas, it is argued that labour productivity growth is determined by aggregate demand growth and real wage growth. On this basis, lower real wage growth decelerates labour productivity growth in two major ways: (i) directly by hindering technical progress – as the firms will be *de facto* encouraged to prefer using additional labour inputs over labour-saving capital investments; and (ii) indirectly by weakening aggregate demand – as an increase in aggregate demand (therefore output) would have otherwise triggered a wider deepening of the division of labour, and accelerated learning-by-doing. Also, demand growth will give a boost to new investments which will generate higher labour productivity as newer investments will come with a more sophisticated technology than that of older capital stocks (Storm and Naastepad, 2013, p. 104-112).

A more formal model was developed by Sylos Labini (1995). Predicated on a well-grounded critique of the marginalist interpretation of the standard Cobb-Douglas production function, Sylos Labini model brings together the determinants of labour productivity growth. Sylos Labini productivity function encompasses two propositions from classical tradition and one from Keynesian tradition to formalise the sources of labour productivity growth in a dynamic setting. First source of productivity gains is the market expansion based on endogenous technical progress; i.e., as the size of market gets larger and more sophisticated, the enhanced division of labour triggers productivity gains (Smith-Kaldor-Verdoorn effect). Second source of productivity gains is the price of labour (wage) growing faster than the price of capital (price of capital goods), in which case firms will be encouraged to direct new investments to more productive activities (Ricardo effect). Third source of productivity gains is the investment level, which, whether public or private, expands effective demand and employment in the short run. Also, any kind of investment increases both productive capacity and labour productivity (Sylos Labini, 1999). In an extended formalisation, Tridico and Pariboni (2018) incorporate inequality

and financialisation into the Sylos Labini productivity function as additional determinants of labour productivity growth².

As a crucial addition to this line of argument, the structure of the economic regime shapes the dynamics between medium-to-long term growth and distribution patterns, thereby the relationship between productivity and pay. For example, if the structure of an economy is defined as wage-led based on the empirical regularities, then higher real wage growth would strongly influence productivity-enhancing investments and eventually lead to faster productivity growth. In contrast, in the case of a profit-led regime, productivity would be sensitive to wage cuts, with lower wage shares causing higher productivity growth (Lavoie and Stockhammer, 2013, p. 19).

It is worth noting that alternative policy implications of this tradition, adopted by a policy suggestion by ILO under the brand “wage-led growth strategy” or “equitable growth” (ILO, 2012), stand as a direct opposite to the neoliberal policies adopted across the globe since the early 1980s. Indeed, it is suggested that deregulation of labour markets, pro-capital taxation on earnings, weaker unions and flexible working arrangements have not contributed to productivity growth in vast majority of economies (Lavoie, 2014, p.437). Quite the contrary, this set of policies is one of the major reasons responsible for lower productivity gains and lower wage rises, even for reversal of these trends to negative in many economies.

1.6. Summary of Alternative Theories

Our review of alternative theories provides several insights: First, most of the contemporary research embraces neoclassical growth theory with underlying marginal productivity principle as a law of “modern economics” or “standard economics”. However, we have shown that alternative theories do exist, and each offers a different vision of the linkages between productivity and pay. Second, according to mainstream understanding of the question on the table, pay is a technical reflection of marginal productivity of labour. However, we have shown that pay is not exclusively determined by productivity. Instead power relations, historically determined structures, institutions and political struggles all have important roles to play. Third, the direction of causality is not necessarily one-way, running from productivity to pay. Indeed, following the comparative statics “way of thinking” and logically speaking there may be four ways of causation: i) Productivity growth may affect pay growth positively; (ii) Productivity growth may affect pay growth negatively; (iii) Pay growth may affect productivity growth positively; and (iv) Pay growth may affect productivity growth negatively. One can find supporting arguments and empirical evidence for each of these hypotheses, from a different theoretical approach. For example, hypothesis (iii) is the central piece of efficiency wage models and Post-Keynesian growth theory, the underlying assumptions nevertheless being completely different. Another interesting example is about hypothesis (ii) which suggests material and mental wellbeing of workers can be negatively impacted by increasing productivity. This may seem an atypical representation of the phenomenon, but it is worth nothing that this argument has been increasingly popularized by ecological economic literature and degrowth/postgrowth thesis (Elkomy et al., 2020; Isham et al., 2020). So, we conclude that direction and severity of causation may well be contextual, meaning in some period first scenario may be dominant whereas in the subsequent term the way of causation may seem reversed.

² Wages being a positive determinant of productivity does not imply that wage growth would boost productivity as an endless expansion. As Kaldor (1985) highlighted, to ensure “*the highest rates of economic growth it is necessary that wages should rise faster than productivity, but not so much faster as to negate the possibility of rising profit*”.

2. Empirical Literature

The observed divergence between growth rate of pay and that of productivity is relatively a new one. Based on the empirical regularities of the time, Kaldor (1961) summarised six “*characteristic features of the economic process as recorded by experience*”. Widely cited as “stylized facts” of capitalist economy, these included steady growth rate of labour productivity and a steady share of income between wages and profits, among others.

The inability of pay to stay in tune with productivity has become increasingly prominent over the recent decades. The rate of growth of labour productivity has diverged from the rate of growth of real median compensation in most OECD countries, with a significant decrease in labour shares on the one hand, and a decline of the median to average wages on the other (Schwellnus et al., 2017; Sharpe and Ugucioni, 2017; Compagnucci et al., 2018). According to ILO (2018), average labour productivity growth (17%) outperformed real wage growth (13%) for the period 1999-2017 in 52 rich countries. Despite some signs of recovery on average, labour share remained considerably below their levels in early 90s. Also, a general tendency of the labour share of income to fall in many countries is now a widely accepted phenomena (Autor et al., 2020; Karabarbounis and Neiman, 2014).

In the recent decades, the recorded labour productivity has shown a strong tendency to slow down in most advanced economies, with growth rate of labour productivity having fallen approximately by half since 1995-2005 period (Goldin et al., 2020). In another recent study utilising Hodrick-Prescott filter method to test recent productivity slowdown in the UK economy against previous crises based on cumulative 10-year ahead measure proposed by ONS, Crafts and Mills (2020) find that the departure of recorded productivity level from pre-2008 trend by nearly 20% is unprecedented in the last 250 years! The key message from this body of literature highlights that this tendency started before the Great Recession of 2008-9 and has worsened since then. Also, comparative exercises tend to agree that despite its generalised nature among most advanced economies, the UK productivity growth has fallen behind its peers (Mason et al., 2018; Teneyro, 2018). Indeed, the UK economy is now characterised by an unprecedentedly poor performance of labour productivity growth (Oulton, 2019), stagnating real wages (Bell and Blanchflower, 2018) and increasing inequality (Arestis, 2020a). However, the causes of the current slowdown of productivity and of its divergence from wages and labour share of income have remained controversial.

One strand of the research has focused on the decomposition of potential drivers leading to the observed gap between productivity growth and pay growth: wage inequality, labour’s terms of trade, employer social contributions and labour’s share of national income. Utilising this decomposition technique, Sharpe and Ugucioni (2017) investigate the key neoclassical proposition that productivity growth must translate to real wage growth against the data from 11 OECD economies over the period 1986-2013. They find that divergence exists in 8 of 11 cases (with Spain, Norway and Ireland being exceptions), and no common driver for the gap across the board. For the UK economy, the authors find, the largest contribution come from the rising inequality with 0.49 percentage points per year. Employing a similar methodology on the drivers of the gap, Schwellnus et al. (2017) find that most OECD countries have suffered from decoupling of wages from labour productivity, with major causes being falls in labour share and rising wage inequality. An interesting finding of this study is that it is not the stagnating median wages, but excessive wage rises at the highest (1%) percentile of the wage distribution that is responsible for wage inequality.

On the non-existence of an unusually broken association between productivity and pay, Feldstein (2008) and Pessoa and Van Reenen (2013) are critical of the literature from a shared perspective. They argue that economists are confused by two measurement problems, leading them to find an empirical divergence between productivity and pay in the US and UK economies. First, taking take-home wages, net of fringe benefits and noncash payments, as the main wage indicator to compare with labour productivity would lead to an overestimation of the gap. This is because in-kind contributions in most developed economies grew disproportionately fast. Second issue is about how to convert output and compensation figures into real terms. As opposed to common tendency to use CPI and PPI to deflate wages and output respectively, a common deflator should be used (PPI or GDP deflator), they advocate. These authors conclude that when these two sources of overestimation are taken out of the calculations, there is no divergence between productivity and pay over the long term (typically starting from 1970s) in the UK and the USA.

On the reciprocal feedback mechanism between the current slowdown of productivity and declining labour share, from neoclassical perspective, Grossman et al. (2017) argue that productivity slowdown is the main driver behind a slowdown in the accumulation of human capital, leading to long-term decline of the labour share. The rationale is that in the face of productivity falls individuals, who are free to make their *arbitrary* choices, would head towards investing in their skills, which come into existence in the form of capital utilisation. This contributes to a reduction of capital-labour ratio and a redistribution of income from labour to capital.

Another strand of literature, however, offers quite a different story of the interplay between productivity, wages, and inequality, in that productivity is “*the key determinant of how demand can grow without inflation, thereby reducing inequality of income, wealth and opportunity*” (Arestis, 2020b), while productivity itself is strongly influenced by real wages and the levels of inequality. Hein and Tasarow (2010) investigate the effects of output growth and distributional variables on productivity growth based on the data from 6 countries: Austria, France, Germany, the Netherlands, the UK and the USA. For the period from 1960 to 2007, they find a significantly positive effect of real wages on labour productivity, while elasticities differ between countries, with the UK having the lowest (0.25%). Another finding of this paper is that profit share negatively impacted on productivity growth for the UK and US over the whole period. This finding is in keeping with a range of empirical studies summarised in (Storm and Naastepad, 2011) that measure the impact of investment demand growth, wage growth and labour market deregulation on productivity growth. It is reported that investment demand growth and wage growth have a positive impact on labour productivity growth, with an average estimated coefficient of 0.46 and 0.38 respectively for OECD countries. Yet, the results for the effect of labour market deregulation on productivity growth are mixed.

Another important dimension is structural changes associated with the divergence between productivity and pay. Compagnucci et al. (2018) investigate the roots of ‘jobless growth’ and the divergence between productivity and pay in six advanced countries including UK. They integrate both observed phenomena and find a structural break in both relationships: productivity and labour utilisation; and productivity and wages in the second half of the 1990s. They find that productivity growth outpaced aggregate demand growth in all countries except the US, implying that the nature of the recent structural change characterized by rapid technical progress is all but labour-saving.

To investigate the unemployment/underemployment nexus in relation to wage dynamics in the UK economy, Bell and Blanchflower (2018) construct a UK underemployment index and they suggest underemployment is more important than unemployment in explaining the weakness of wage growth in the UK economy. They find a flattening of UK Phillips curve causing a downward shift of UK NAIRU. Given the fact that UK “productivity puzzle” is characterised by steady decline of productivity growth, coupled with record high rates of employment and stagnating real wages, they conclude “... *productivity growth has also been flat even though employment growth has been strong. Flat productivity led to flat wage growth. Flat wage growth led to low productivity. The newly hired low wage workers had low productivity. The combination of elevated underemployment and a flattened Phillips curve means that wage growth is not going to take off any time soon*”. Elsewhere, this sort of flattening is described as an implication of the deterioration of the workers’ “reactive strength”, where unemployment levels would drive further decline in pay growth vis-a-vis productivity growth (Shaikh 2016, p. 649).

Financialisation is emphasised as another structural aspect of the problem (Pariboni and Tridico, 2019). On the one hand, financialisation deteriorates labour productivity by discouraging long-term productive investments in favour of short-term speculative investments, and by facilitating and deepening deindustrialisation process, along with an alarming “*shift towards financial activities by non-financial firms*”. On the other hand, financialisation leads to a systematic decrease in labour share as the profit share and executive salaries are in effect augmented by the ‘downsize and distribute’ principle. Based on a panel data analysis on 28 OECD economies, they show that financialisation, globalisation and dividend share significantly lower labour share, while stronger labour market regulations and institutions and higher levels of employment in manufacturing tend to increase labour share. Following a similar perspective Barradas (2019) operationalizes financialisation and neoliberalism with four additional variables: financial activity, general government activity, shareholder value orientation, and the trade union density rate, in order to test their disruptive impacts on labour share of income. On a panel-data analysis of EU countries (EU-27), he concludes regardless of local variances in terms of national setting, neoliberalism and financialisation have been doing harm to the labour share across the board over the past two decades.

Tridico and Pariboni (2018) revisit and extend Sylos Labini productivity function where labour productivity growth is determined by rate of growth of GDP, wage share, inequality (proxied by Gini coefficient) and financialisation (proxied by market capitalisation as a percentage of GDP). On a panel-data analysis of 26 OECD countries covering the period 1990-2013, they find that labour productivity growth is influenced positively by increases in wage share and GDP and drops in financialisation and inequality. Carnevali et al. (2020) apply a revised version of Sylos Labini productivity function to analyse empirically the differences in labour productivity dynamics across core and periphery European countries. Their results suggest that changes in labour productivity growth in manufacturing industries are strongly and positively correlated with output expansion (Smith effect), the relative cheapness of labour vis-à-vis machinery (Ricardo effect), the absolute cost of labour (organization effect) and investment from previous periods.

Overall, leaving aside the technical and automatic determination of income distribution proposed by the mainstream economics, a number of structural and institutional changes have been highlighted to explain the causes and consequences of the divergence between productivity and pay including financialisation, globalisation, declining share of investment, increasing inequality, rechanneling of new investments to unproductive sectors such as finance and

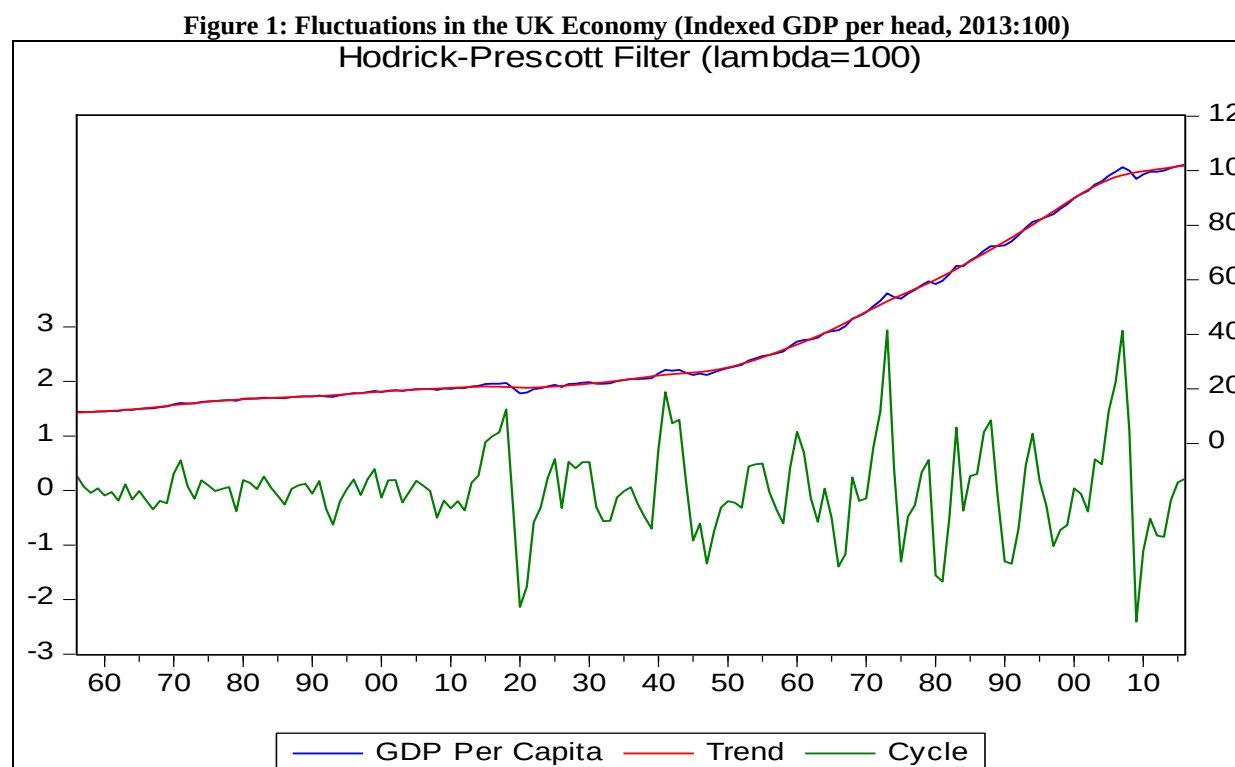
property, welfare state retrenchment, weakening of labour market regulations, and structural change in labour markets (Stockhammer, 2013, p. 40-48; Arestis, 2020a).

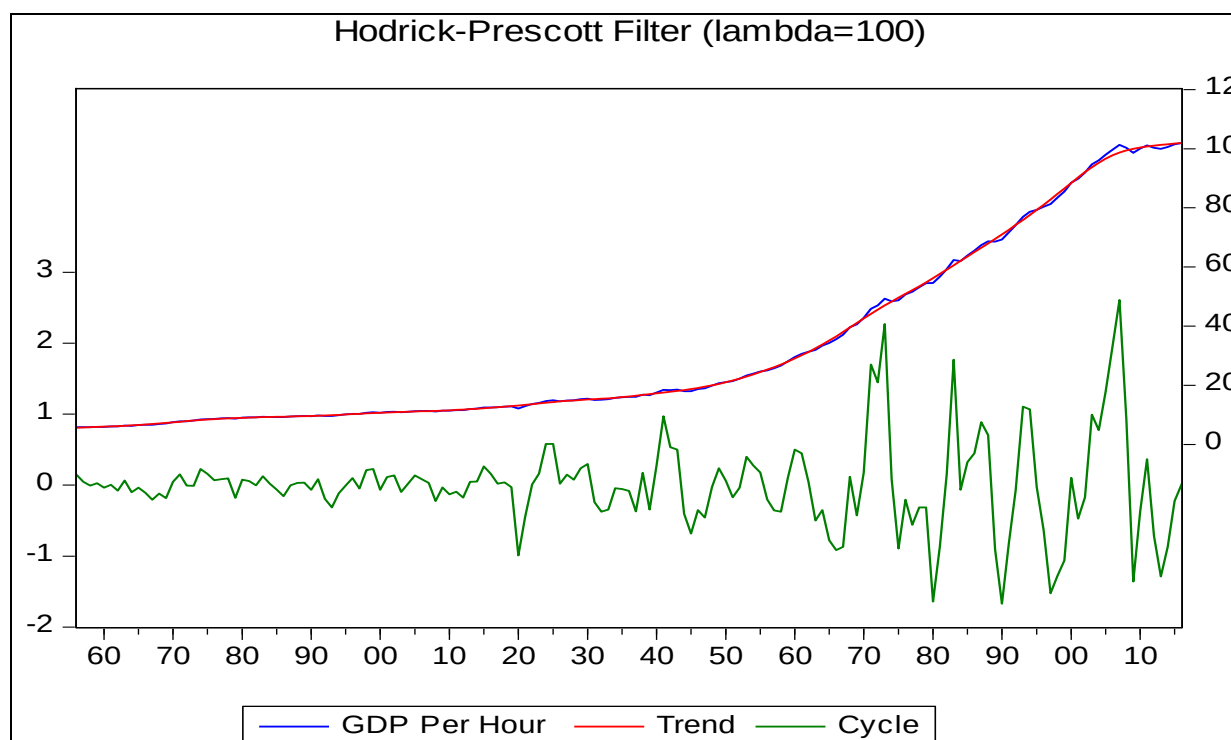
In the following section, we go on to analyse empirically some important dimensions of the linkage between pay and productivity in the UK economy. First, we apply a long-run structural analysis between productivity and pay to obtain actual and underlying growth rates and then to estimate structural break dates. Then, we utilise a cointegration test on long-term data for productivity and pay to reveal if there is a long-run association and provide empirical evidence on its nature. Finally, we focus on post-1980 era and provide an interesting outlook of disposable income inequality in the UK economy based on Palma proposition.

3. An Empirical Analysis on the Pay-Productivity Nexus for the UK Economy

3.1. A Long-Term Structural Analysis

One way to analyse long-run developments in a time series is to utilise Hodrick-Prescott (HP) filter technique. This allows us to decompose trend component from cyclical component and focus on underlying changes. Figure 1a and 1b illustrate fluctuations in GDP per head and GDP per hours worked respectively for the period 1856-2016. The cycle in Figure 1a shows how actual GDP per head fluctuates around trend line. The trend component is conventionally defined as potential GDP per head. In this sense, HP filter exercise clearly indicates that the long-run trend followed almost a horizontal path from 1856 to 1945 and turned up in the aftermath of the Second World War. This tendency, however, experienced a gradual slowdown from late 90s and has eventually flattened over the last decade. Depicting the severity of deviations from the trend, wave lengths on the cycle line are observed to be higher and more volatile for the periods 1918-25, 1939-45, and the entire post-1970 period. With the impact of 2008-09 Great Recession, trend and cycle components displayed significant drops, and both actual and potential GDP per head have plateaued since then.





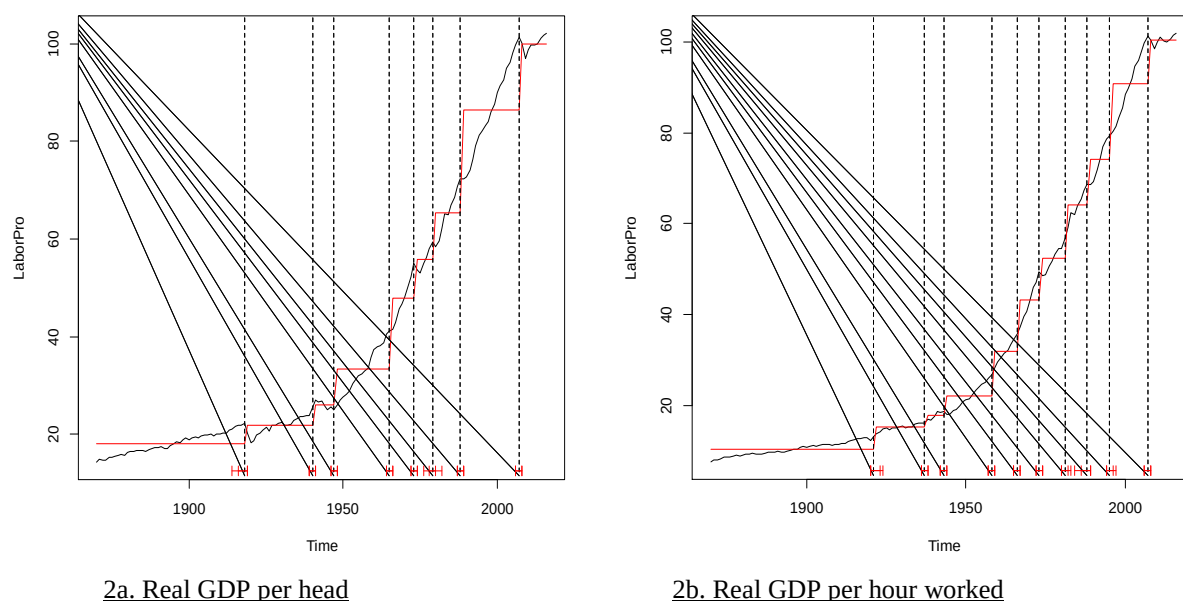
We now proceed to analyse structural changes (breaks) in long-term productivity and real wage series using the Bai-Perron (1998, 2003) test. This test is based on regressing the time series on intercept and trend. The Bai-Perron test considers “the *sup F* type test of no structural break($m=0$) versus alternative hypothesis that there are $m=k$ breaks” (Bai and Perron, 2003). Considering the years of WWI and WWII, we allow the minimum time intervals between break points to be six years, and then determine the optimum number of breaks points from potential ones by utilizing the Bayesian Information Criterion. We tend to interpret break points as “turning points”, which could be the result of various internal and external economic and social factors rather than “structural transformations” that are widely used in political economy.

Figure 2 illustrates the results of the Bai-Perron structural break test that we applied to both measures of labour productivity. Unsurprisingly, structural break dates for two measures are quite similar. It should be noted that these dates also overlap to a great extent with turning points of the cyclical component in Figure 1.

Productivity growth averaged 2.2% between 1946-2016. In the period of 1946-1973 which is called the golden age of capitalism, the average productivity growth rate was 3.63%, significantly higher than the period of 1974-2016. In the latter period, the productivity growth was lower, 1.52%, and more volatile (standard deviation is 1.91 versus 1.20 in the golden age). The productivity growth averaged at 3.54%, 4.33%, 5.26%, and 4.64% during the expansion phases of 1946-51, 1952-58, 1959-66, and 1967-75 cycles, respectively. As it is shown in Figure 2 and Figure 3, 1970s were subject to structural breaks, implying a turning point in the development of the UK economy. Real wage growth was 2.73%, 3.00%, 3.56%, and 3.61% in the periods of 1959-1960, 1961-1966, 1967-1973, and 1974-1975, respectively. As Shaikh (2016, p.651) pointed out “...the case in which firms are completely unable to offset the consequences of an increase in the real wage, so that wage share rises and the profit rate falls, which lowers the rate of growth of output...”. The UK economy experienced a faster real wage growth than productivity growth over the period 1974-76, especially during the recession phase of 1967-75 cycle, in which the productivity growth turned to negative for the first time in the post WWII era.

The 1975-76 expansion failed to generate enough productivity growth to reverse the trend. However, in the following periods, the rate of growth of labour productivity started to accelerate from 1977, peaking in 1983 with 10.6% unemployment rate, which kept the growth rate of real wages below productivity growth. The following periods, except 1991-93 expansion, saw a gradual deceleration, leading up to the persistent slowdown after the Great Recession of 2007-8.³

Figure 2: Structural breaks in growth rate of GDP and Productivity, 1870-2016



Structural Break Dates: 1918, 1940, 1947, 1965, 1973, 1979, 1988, 2007

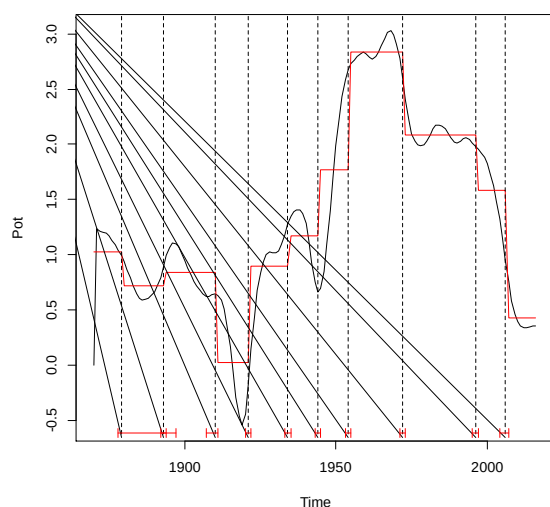
Structural Break Dates: 1921, 1937, 1943, 1966, 1973, 1981, 1988, 1995, 2007

Figure 3 summarizes the results of structural break test on trend growth rates. We allowed the time interval between two break dates to be 10 years. Even though selection of time interval is somehow arbitrary, the decision was based on a preliminary assessment of the data. Figure 3a indicates the breaks in trend growth rate of GDP per head, and break dates are reported just below the related figure⁴. Results imply that the trend growth rate of GDP per head recorded a significant increase between 1945 and 1954. Then it followed a cycle of decline and flattening until early 2000s. Then since the Great Recession of 2007-08, it has seen very low levels comparable to early 1950s. Figure 3b illustrates the results of the Bai-Perron test and show the structural shifts in the trend growth rate of GDP per hour worked. Break dates are reported below the graph.

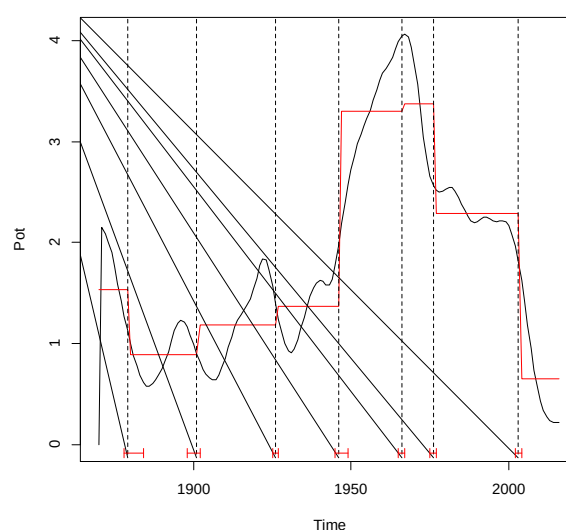
³ When we regress the time series over intercept and trend between break dates, the results suggest that productivity growth collapsed over 1941-47. The subsequent Golden Age (roughly from 1948 to 1974) manifests in our results in two sub-periods. During the first sub-period from 1948-65 the estimated trend coefficient is 0.8, while the following 1966-73 sub-period saw a much higher trend coefficient with 1.8. Overall, it is important to underline that after the Second World War, Golden Age stands out as a period during which labour productivity steadily grew.

⁴ If 6 years is chosen as the time interval between any two breaks, then the estimated break dates become as follows: 1875, 1892, 1912, 1918, 1924, 1938, 1944, 1953, 1972, 1999, 2009

Figure 3: Structural breaks in trend growth rate of GDP and productivity, 1870-2016



3a. Real GDP per head



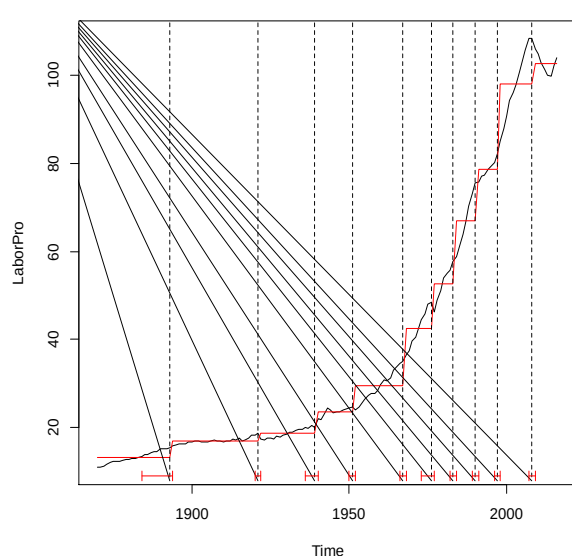
3b. Real GDP per hour worked

Structural Break Dates: 1879, 1893, 1910, 1921, 1934, 1944, 1954, 1972, 1996, 2006

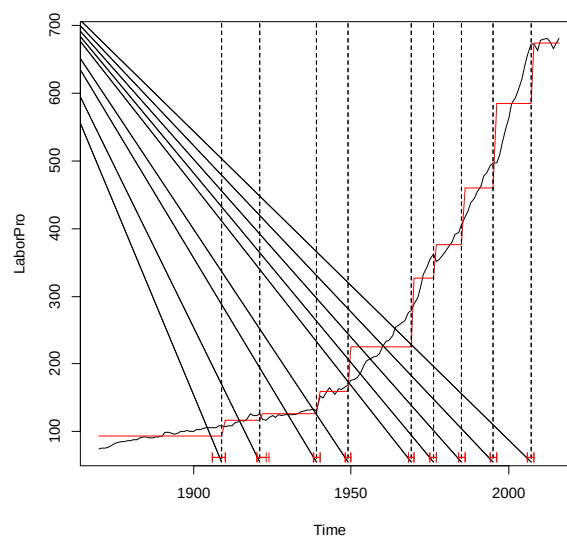
Structural Break Dates: 1879, 1901, 1926, 1946, 1966, 1976, 2003

We now turn to testing long-run developments in real wage series. Figure 4a and Figure 5a show the results of Bai-Perron structural test on actual growth rate and trend growth rate of real wage, respectively. Trends and cycles of the series were first decomposed using HP filter, which is followed by structural break tests on each series. According to Figure 4a, which presents the results regarding growth rate of real consumption wage, this series displayed a steady growth during the periods 1952-67, 1968-76 and 1984-90, while 1991-97 points to a period of significant decline. The following period 1998-2008 saw a moderate recovery, which was then followed by a dramatic decrease over the period 2009-16. Breaks in underlying growth rate of real consumption wage, illustrated in Figure 5a, suggest that the fastest growth was recorded throughout the period 1948-65. Gradual but persistent tendency to fall has become prominent since then, except for the period between 1990 and 2002, during which a very modest recovery was recorded.

Figure 4: Structural breaks in growth rate of real wage, 1870-2016



4a. Real Consumption Wage



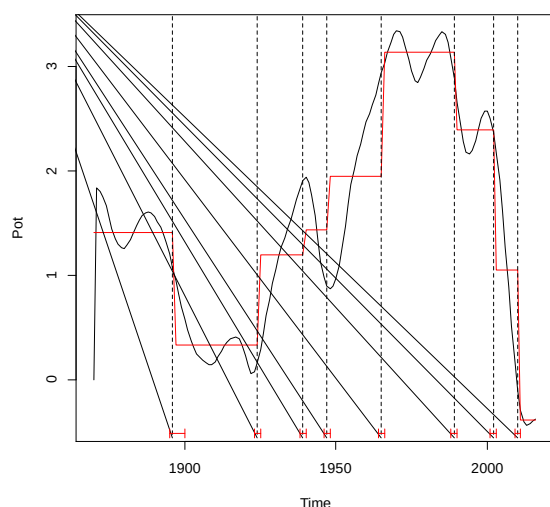
4b. Spliced measure of real product wage

Structural Break Dates: 1893, 1921, 1939, 1951, 1967, 1976, 1983, 1990, 1997, 2008

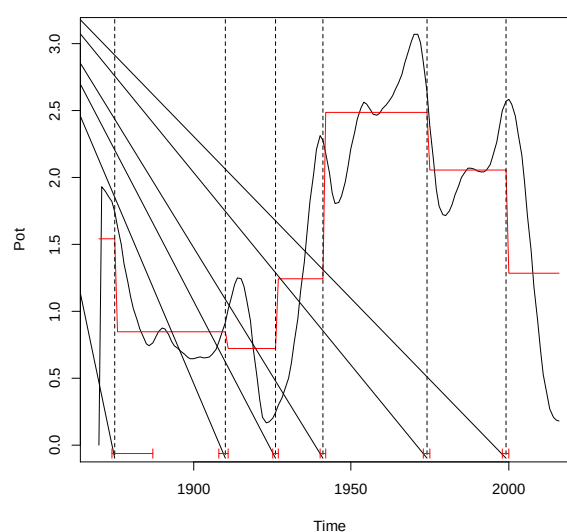
Structural Break Dates: 1909, 1921, 1939, 1949, 1969, 1976, 1985, 1995, 2007

Figure 4b and 5b show the results of structural break tests on actual and trend growth rates of spliced measure of real product wage, respectively. Results highlight that actual growth rate consistently rose after 1950, with the highest growth was recorded over the period 1970-76, while it has drastically decreased since 2008. Changes in the trend growth rate of this measure point out that it reached its peak in 1974, while the subsequent periods have seen gradual and permanent drops in the trend growth rate of real product wage, eventually turning to negative.

Figure 5: Structural breaks in trend growth rate of real wage, 1870-2016



5a. Real consumption wage



5b. Spliced measure of real product wage

Structural Break Dates: 1896, 1924, 1939, 1947, 1965, 1989, 2002, 2010

Structural Break Dates: 1875, 1910, 1926, 1941, 1974, 1999

Overall, structural break tests provide useful insights into the impact of developments leading to structural changes (crises, technical revolutions, institutional shifts, comprehensive changes in trade regimes, etc.) on the variables of interest. The findings from the above exercises shed light on how productivity and wage series underwent structural changes. Breaks in both actual series and trend growth suggest that the period starting from the end of 1970s indicates that real wages experienced a significant structural downfall in both measures and the post-2000 period points to a sharp fall, with no signs of recovery.

Piecing together the results of structural break tests for productivity and pay suggest that growth tendency of both variables structurally broke around similar points in time. These dates also reflect significant events or turning points in the UK economy and globally.

Leaving aside the obvious devastating impacts of general wars, our results allow us to sketch out a periodisation of the UK economy in terms of productivity and pay: During the period 1946-73, both labour productivity and pay grew steadily, which suggests that these two variables of interest are in an interaction rather than a one-way determination. It might have been the case that real wage growth prompted the overall economy both through increased demand and by encouraging firms to scale up their investment. Higher rates of trade union membership and density supported this mechanism by enabling workers to keep their share stable. The growth rate of real wage either deflated by CPI or GDP deflator was less than the productivity growth. The period from 1974 to 1979 signifies the end of post-war expansion and global oil crisis. The subsequent 1980-89 witnessed a modest recovery, in that labour productivity grew by 2.33%, and the growth performance of pay was 0.69 (when measured as real consumption wage) or 2.72% (when measured as nominal wage divided by GDP deflator at market prices). However, underlying growth rate of both variables, which are reflected by the structural break tests on trend growth, remained flat at best, with estimated trend coefficient for productivity being -0.02 for 1977-2003 and -0.11 for 2004-16. The estimated trend coefficient for pay (real consumption wage, nominal wage deflated by CPI) is 0.009 for 1990-2002, -0.33 for 2003-10, and -0.011 for 2011-16.

3.2. Productivity-Pay Gap and ARDL Bound Test

To analyse the existence of a long-run relationship between productivity and pay, an autoregressive distributed lag (ARDL) model was estimated using two different series, and then the existence of cointegration was tested by employing Bound-F test. The long-run form of estimated ARDL model is as follows:

$$\Delta W = \beta_0 + \sum_{i=1}^n \beta_i \Delta W_{t-i} + \sum_{i=1}^n \delta_i \Delta Pro_i + \varphi_1 W_{t-1} + \varphi_2 Pro_{t-1} + \mu_t$$

where β_i and δ_i denote short run coefficients; φ_1 and φ_2 represent long-run ARDL coefficients; μ_t stands for disturbance term (white noise). Before estimating ARDL models, series were tested for stationarity. For unit root analysis, ADF and Phillips-Perron (PP) tests were employed. Results of unit root tests are reported in Appendix.

ARDL bound test for a millennium macroeconomic data set

In this section, GDP per head is used as a proxy of labour productivity (PRO). Three different variables were used to capture real wage (RW), each of which was tested against its long-run association with labour productivity through F-Bound test. For the model under which a long-

run cointegration was identified, the characteristics of long-run relationship and short-run dynamics are reported.

Table 1: Results from Bound Tests			
Dependant Variable	Lags	F-Statistics	Decision
RW1: Real Consumption Wage	4	2.62	No Cointegration
RW2: Spliced Measure of Real Product Wage	3	10.86	Cointegration
RW3: Nominal Wage Divided by GDP Deflator	2	8.53	Cointegration

As reported in Table 1, the F-Bound Test failed to detect a long-run cointegration relation between real consumption wage (RW1) and labour productivity (PRO); thus, results from ARDL model estimation regarding the nature of cointegration are not reported. However, according to the F-Bound Test, we could find a long-run cointegration relation between spliced measure of real product wage (RW2) and labour productivity (PRO) – the results are stated in Table 2. Long-run coefficient between productivity and pay equals to 1. Additionally, error correction coefficient is negative and -0.13. This result implies that a short run deviation from the equilibrium would disappear only over a period of 7 years.

Table 2: Levels Equation, Long-Run Form Estimation (<i>Model 2, 2</i>)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PRO	1.03	0.01	60.23	0.0000
Error Correction Coefficient	-0.13	0.02	-4.71	0.0000

As a final step, we summarise our findings regarding the long-run relationship between Nominal Wage Divided by GDP Deflator (RW3) and labour productivity in Table 3. As the results of the ARDL (1,1) estimation, any deviation from the hypothesised association between productivity and pay would recover only gradually. And this process is estimated to take over 10 years. Diagnostic test results for ARDL (1,1) and ARDL (2,2) models are given in Appendix.

Table 3: Levels Equation, Long-Run Form Estimation (<i>Model 1, 1</i>)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PRO	1.04	0.02	36.77	0.0000
Error Correction Coefficient	-0.09	0.02	-4.72	0.0000

We should note that we also applied the F-Bound by using GDP per hour as an independent productivity variable, and we estimated ARDL to analyse the long-run relationship between GDP per hour and real wage. We found similar results, but we do not report them for reasons of brevity. However, assuming a constant long-run coefficient for such a long period of the time raises some concerns. As we showed in section 3.1. both productivity series and real wage series are subject to various structural breaks, therefore it is highly possible that the long-run coefficient could be different in subperiods. To overcome this methodological problem, we divide the sample in two subperiods: 1856-1939 and 1946-2016. We applied the F-Bound to test the existence of long-run cointegration relation between PRO and RW2. According to test results, we found strong cointegration relation (at 1% significance level) for the period 1856-1939; however, for the

period 1946-2016 test results indicate cointegration at 10% significance level. We decided to pursue ARDL model estimation for both periods. According to ARDL(3,3) model for the period 1856-1939, the long-run coefficient is 0.88 (significant at 1% level) less than unity and error correction term is negative and -0.17, indicating that the impact of a shock lasts almost 6 years. According to ARDL (2,2) model for the period 1946-2016, the long-run coefficient is 1.01 and error correction term is -0.16, similarly suggesting a 6-year adjustment period to the long-run equilibrium.

The relationship between the long-run coefficient (unity) and error correction coefficient (implying a 6 to 7-year period of adjustment) under ARDL model seems to be confirming the core assumption of marginal productivity theory of income distribution. However, these findings can also be read through another lens. Once a shock has occurred, wages catch up with labour productivity over a period of 6-7 years, implying higher profitability vis-à-vis wage rates, thus faster capital accumulation. If these profits are re-directed to financial markets, the outcome is likely to be an increase in the capital share of income and worsening of the income distribution. Also, whether the productivity gains translate to wage gains subject to the feedback mechanisms inherent to the operation of the capitalist system. For example, during an expansion cycle the demand for labour increases, which in turn puts pressure on wage levels. In case of weaker resistance mechanisms on the side of workers, the gap between productivity and pay deepens as a result, with even worsening impacts on income inequality.

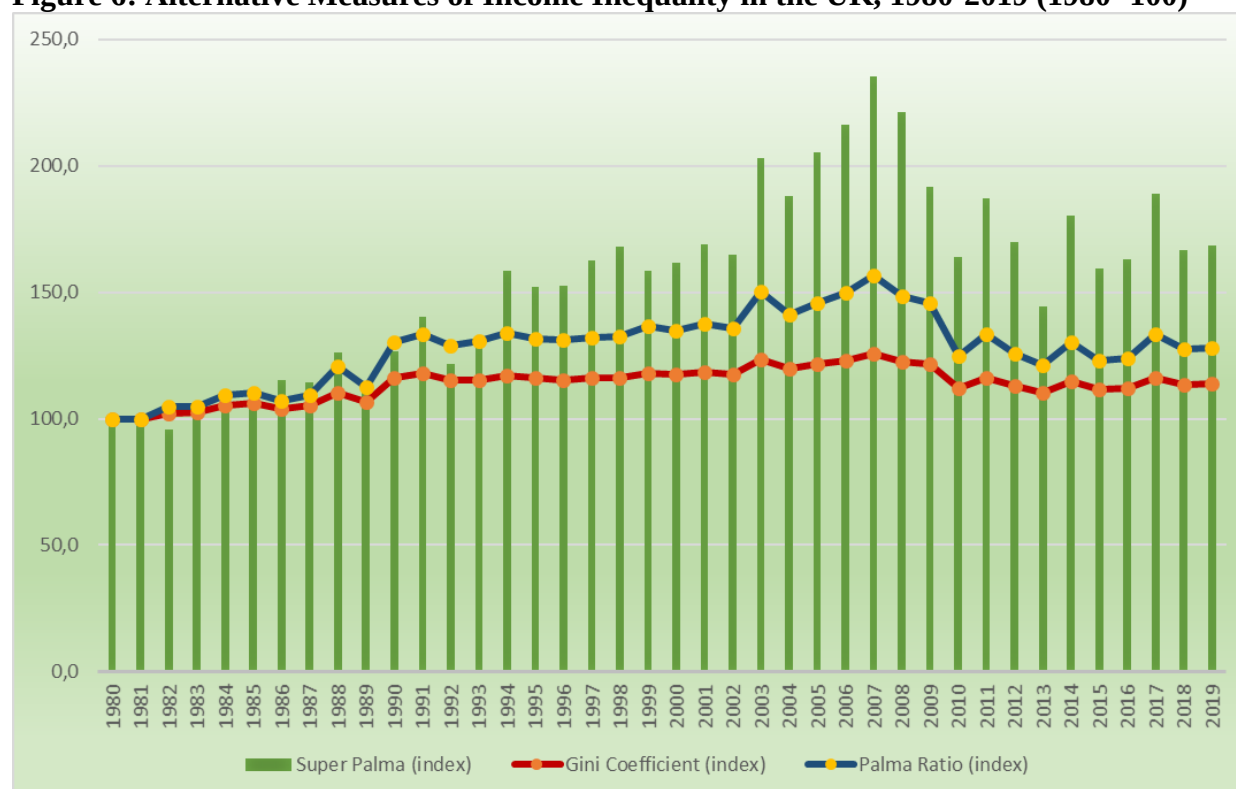
3.3. Neoliberal Era and Palma Ratio

As we discussed in the empirical literature section above, income inequality is considered a driver and consequence of the widening gap between productivity and pay. In this sub-section we attempt to show an interesting outlook of the disposable income inequality in the UK economy over the past four decades.

The Palma proposition is based on an empirical observation of cross-country evidence, which suggests that the middle-income group (P40-P90) gets half of the national income across all countries. However, the other half of the income is distributed unevenly between the top 10% (P90-P100) and the bottom 40% (P0-P40); and this is exactly the source of ever-growing inequality as a world-wide phenomenon (Cobham et al., 2015).

In a recent paper, Palma (2019) goes on to argue that Gini coefficient is, by construction, designed to measure the income inequality among the whole population, superficially melting down the homogeneity within middle and upper-middle income groups and considerable heterogeneity at the tails. Palma ratio, however, aims to highlight the ongoing struggle between the highest and lowest ends of the income distribution. Figure 6 indicates the difference between alternative measures of the disposable income inequality in the UK starting from 1980. It is clear that income inequality is more or less stable when measured by Gini coefficient, while Palma and “Super Palma” ratios reveal a significant escalation in distributional struggle between top 10% and bottom 40%, and between top 1% and bottom 40%, respectively. From 1980 to 2019, Gini coefficient rose from 32 to 36, while Palma ratio from 1.20 to 1.54 and “Super Palma” from 28 to 47.

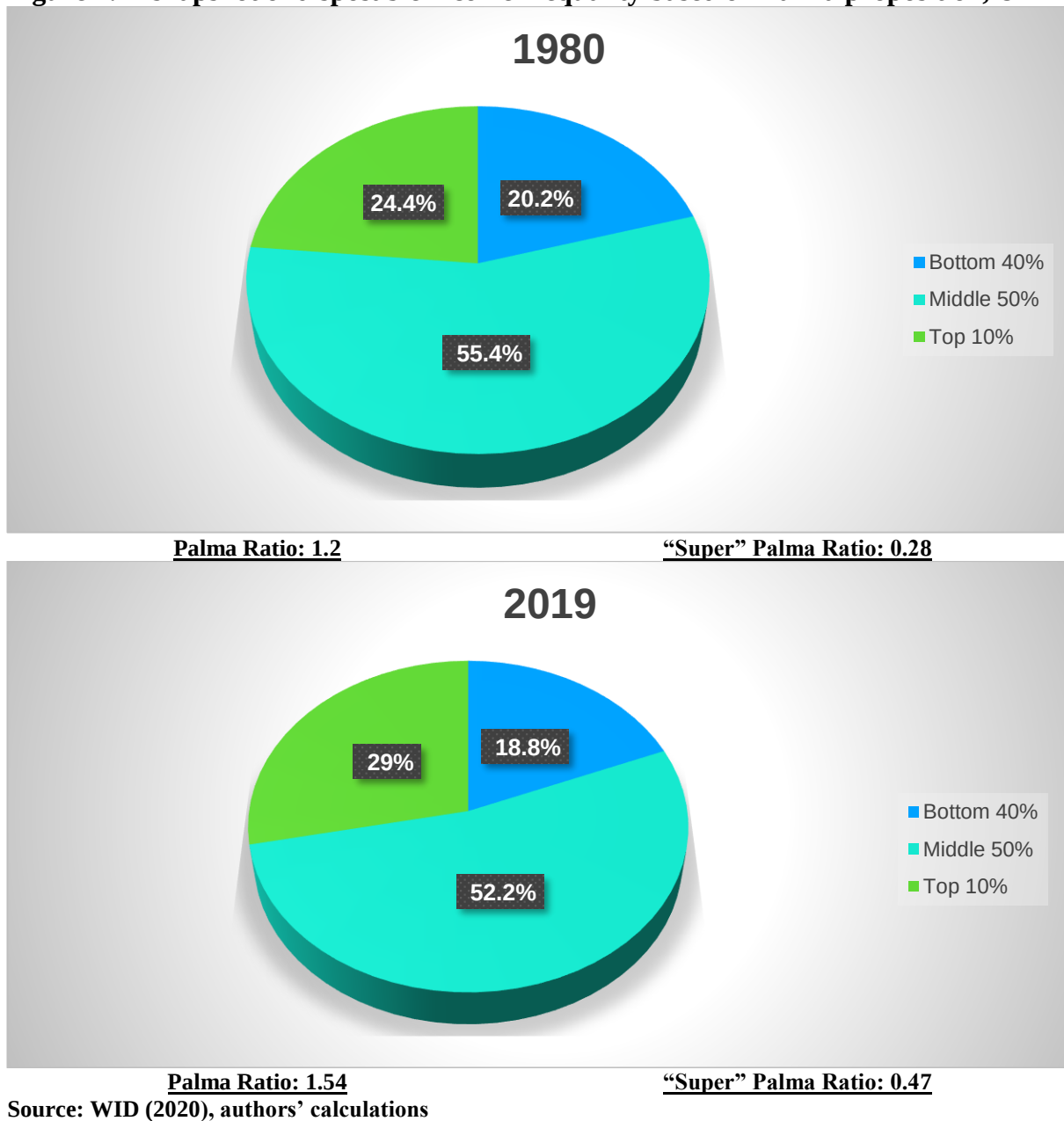
Figure 6: Alternative Measures of Income Inequality in the UK, 1980-2019 (1980=100)



The below pie chart indicates that share of the top 10% decile of the income distribution increased by 4.6 percentage points, from 24.4% in 1980 to 29% in 2019, at the expense of both bottom 40% and middle 50% of the population. In other words, Palma ratio increased from 1.2 to 1.54, meaning the top 10% of the population had 20 per cent more income than the bottom 40% in 1980, while the gap is now 54 per cent. Such a significant rise in Palma ratio over the past four decades also means that UK economy has joined the high inequality league ($1.5 < \text{Palma Ratio} \leq 2$), according to the classification by Palma (2019).

As per the “distributional failure parameter” (“d10+” in the original notation) proposed by Palma (2019), UK’s income distribution failure dramatically worsened. In other words, the extra share causing deviation from the benchmark Palma Ratio of 1 that should be transferred from the top decile to the bottom four deciles, in order to reverse this trend and gain welfare-improving outcomes across the economy, jumped from 2.1% in 1980 to 5.1% in 2019. This means if the share of top decile was reduced by 5.1% (from 29 to 23.9%) and the share of bottom four deciles was increased by the same 5.1% (from 18.8 to 23.9%), then the Palma Ratio would be 1, implying a fair and equitable distribution of income.

Figure 7: A snapshot of disposable income inequality based on Palma proposition, UK



Another interesting feature is that the distribution of the gains within the top is not even. The top 1% of the people got the much higher portion (seven in ten) of the additional flow of income, while the share of the next 9% slightly increased from 18.8% to 20.2% of the total income. This is also evident by the huge difference in coefficient of variation (CV) between these groups reported in Appendix, Table A-4 (CV for top 1%: 0.21; CV for the next 9%: 0.04). This property of the distributional patterns in the UK economy has led us to offer "Super" Palma ratio (with reference to "super-rich") as an additional measure of the excessive concentration of income and struggle at tails. "Super" Palma ratio is the ratio of the disposable income of top 1% to that of bottom 40%. This ratio has increased by 70% since 1980, suggesting that top 1% income earners now get nearly half of the combined disposable income of the poorest 40% of the population.

Conclusion

The review of alternative theories shows that they can be instrumental in explaining drivers and implications of the observed divergence between labour productivity and pay. Further, it argues that the analytical framework offered by the mainstream economics relies on a standard production function which comes with a set of questionable assumptions. The empirical results obtained from this mainstream framework thus could not have been anything other than either (i) there is no divergence; or (ii) the divergence is a technical outcome. Moreover, both outcomes tend to obscure the inherent links between growing inequality, declining labour share and stagnating wages. This report argues that alternative theoretical perspectives, particularly those in Post-Keynesian and Marxian traditions, can accommodate a range of other related factors, enabling a more comprehensive and meaningful explanation of the complex interplay between pay, productivity, and income inequality. Clearly, a range of testable models can be derived from these alternative theories. For example, an adjusted version of Sylos Labini productivity function could provide further insights into the macroeconomic dynamics of the nexus between labour productivity growth, pay growth and income inequality. We have not done so in this short report but rather we utilised empirical exercises to reveal some crucial features of the interaction between the variables of interest, with a view to clearing the way for further studies.

Assuming the existence and importance of structural changes in the UK economy, structural break tests allowed us to paint a periodised picture of how productivity and pay changed over a long period of time. Focusing on the post-war period, the period 1946-73 witnessed a steady growth in both variables, which is followed by more frequent and intense boom and bust cycles. This caused not only productivity but also pay to fail to record a meaningful recovery, with underlying growth rate of both variables having remained flat at best. On the nature of UK “productivity puzzle”, our findings are consistent with Mellolina and Toth (2019) who find that the weakness of trend growth rate of productivity after 2008-09 is supportive of the secular stagnation argument. Further, we suggest that it is not only the period since the recession of 2008-09 that this “reverse cumulative causation” type interaction has been at play but that it dates back across a longer period, starting from the mid-1970s.

Having shown that both variables are indicative of a half-century downfall, we focused on the nature of the interaction between productivity and pay by utilising ARDL bound test. Our results confirm the long-run co-movement between two variables, not necessarily validating the one-way causation from productivity to pay, as presumed by the neoclassical growth models. Indeed, the wages being more vulnerable to catch up with productivity growth after a shock (indicated by 6-7 years of delayed response) suggests higher profitability in relation to wage growth, resulting in faster accumulation of capital. The increasing dominance of financial markets coupled with persistent weakening of resistance mechanisms on the side of workers over the same period can also help explain the fault lines of suggested reverse cumulative causation in the UK economy.

Repercussions of, as well as feedbacks from, this process can be identified in the patterns of income inequality in the UK economy. Our calculations based on Palma proposition indicate that the faster accumulation of capital, when disproportionately rechannelled to financial markets, resulted in accumulation of income in the top decile (increasingly in the top centesimal) of the income distribution, while further deteriorating overall distribution.

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Appendix

Data sources:

The data used in the section 3.1 and 3.2 are obtained from Thomas and Dimsdale (2017).

The data used in the section 3.3 are obtained from World Inequality Database, which was recently updated in a way to allow us to extend the analysis to 2019. We used post-tax disposable individual income share (equally-split) data for all deciles.

Additional tables and figures regarding section 3.2 are given below.

Table A-1 Unit Root Test Results

Table 1 Unit Root Tests on levels of variables					
Variables		ADF Test		PP Test	
		t-Stat	Prob.	t-Stat	Prob.
PRO	Intercept	3.36	1.00	4.15	1.00
	Intercept & trend	-0.21	0.99	-0.07	1.00
	None	5.51	1.00	7.78	1.00
RW1*	Intercept	2.29	1.00	2.71	1.00
	Intercept & trend	-0.39	0.99	-0.30	0.99
	None	3.74	1.00	5.00	1.00
RW2*		4.18	1.00	4.48	1.00
		0.15	1.00	0.14	1.00
		6.11	1.00	7.71	1.00
RW3*	Intercept	5.68	1.00	4.66	1.00
	Intercept & trend	0.14	1.00	-0.01	1.00
	None	10.11	1.00	8.38	1.00
Critical Value at 5%	Intercept	-2.87		Intercept	-2.88
	Intercept & trend	-3.43		Intercept & trend	-3.44
	None	-1.94		None	-1.94

Table A-2: Breusch-Godfrey Serial Correlation LM Test Results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.546455	Prob. F(2,148)	0.5802
Obs*R-squared	1.158203	Prob. Chi-Square(2)	0.5604

Figure A-1: CUSUM TEST

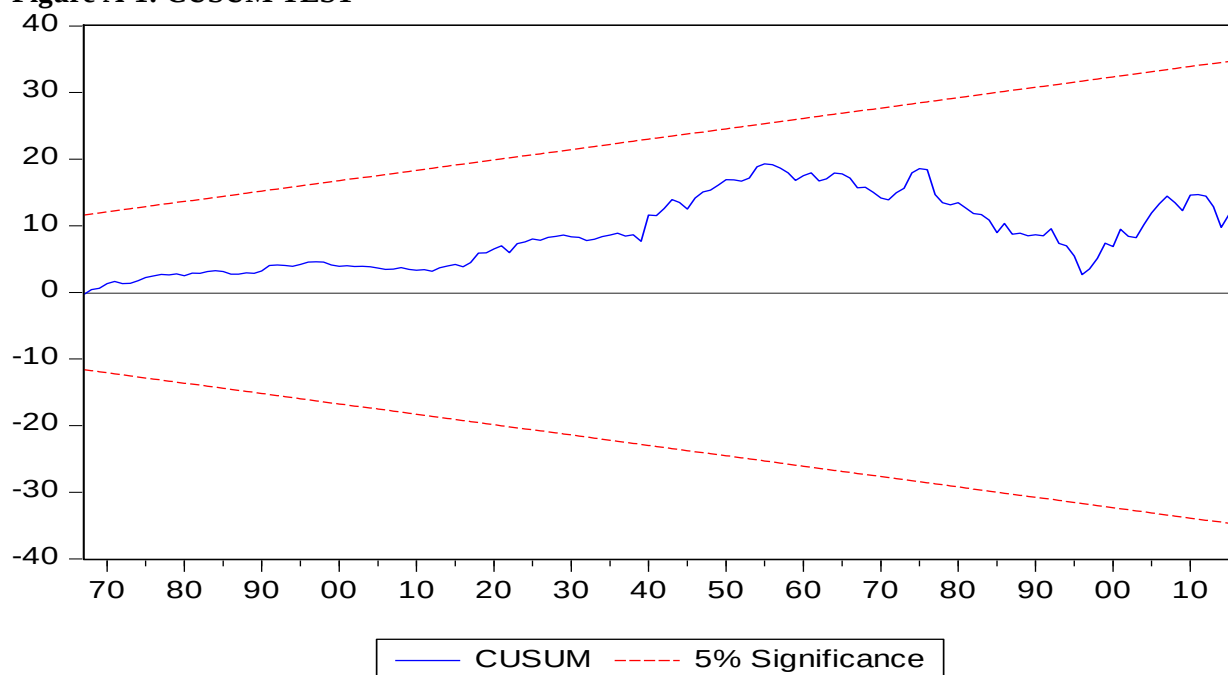


Table A-3: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.009577	Prob. F(2,151)	0.9905
Obs*R-squared	0.020165	Prob. Chi-Square(2)	0.9900

Figure A-2: CUSUM Test

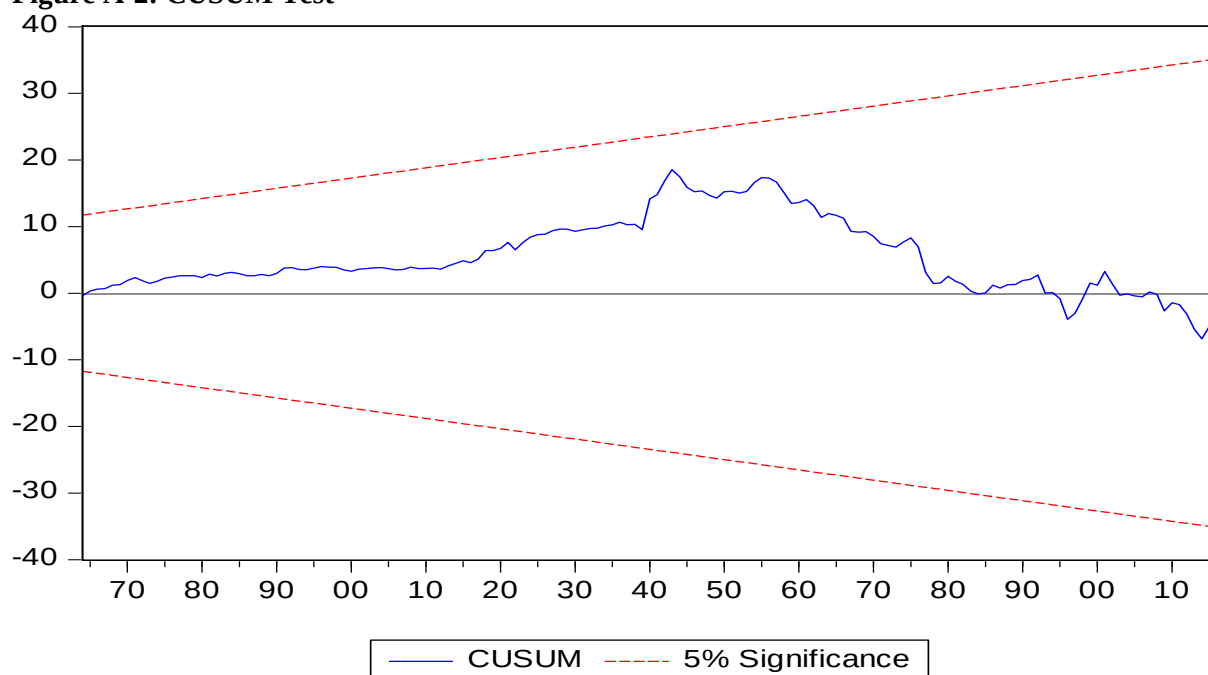


Table A-4: Distribution and variance of income shares by deciles, UK, 1980-2019

	Share in 1980 (%)	Share in 2019 (%)	Change	Mean (%)	Standard Deviation	Coefficient of Variation
C99-C100	5.6	8.8	+3.2	7.9	0.016	0.21
C90-C99	18.8	20.2	+1.4	20.4	0.008	0.04
P90-P100	24.4	29	+4.6	28.3	0.021	0.07
P80-P90	14.9	14.4	-0.5	14.8	0.004	0.03
P70-P80	12.2	11.5	-0.7	11.9	0.003	0.03
P60-P70	10.6	9.9	-0.7	10.1	0.003	0.03
P50-P60	9.4	8.7	-0.7	8.8	0.003	0.04
P40-P50	8.3	7.6	-0.7	7.7	0.003	0.04
P30-P40	7.2	6.7	-0.5	6.6	0.003	0.04
P20-P30	6	5.7	-0.3	5.5	0.003	0.05
P10-P20	4.7	4.4	-0.3	4.3	0.002	0.05
P0-P10	2.3	2	-0.3	2	0.003	0.14
Top 10%	24.4	29	+4.6	28.3	0.021	0.07
Bottom 40%	20.2	18.8	-1.4	18.6	0.009	0.05
Middle 50%	55.4	52.2	-3.2	53.6	0.016	0.03
Source: WID (2020). authors' calculations						