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Decomposing Surplus-Value: An Analysis of Distribution and Unproductive Labour of the UK Economy, 1992-2020

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This article examines the trajectory of the surplus value (SV) rate in the UK economy, in the period 1992–2020, using ONS macroeconomic data (Blue Book) and micro-datasets (*Understanding Society*). We initially define productive and unproductive labour, proposing a "Marxist Productive Labour Classification System", framed in critical context. Standard occupational (SOC) and standard industrial (SIC) codes are uniquely combined, using UK data, to derive empirical estimates of Marxian categories, specifically an aggregate model based on the New Interpretation framework. Then, movements in this rate are examined in terms of absolute and relative SV changes. We find that, prior to the 2008 Crisis, SV extraction is more reliant on production-related drivers, while after this dislocation SV is more reliant on the sphere of distribution, with the pandemic impacting all drivers negatively.

1. Introduction

The UK economy was profoundly impacted both by the Global Financial Crisis (2007-8) and the recent Coronavirus Pandemic (from 2020). More generally, the historical long-run secular growth in productivity has been replaced with stagnation, with an associated challenge for capitalists seeking to maximise profits. Indeed, the Office for National Statistics (ONS), as well as mainstream economic commentators, have observed a productivity puzzle impacting the UK economy (ONS, 2015; Goodridge et al. 2018; Fernández and Palazuelos, 2018). In this article we analyse this using a Marxian framework, exploring productivity alongside other aspects of class conflict, including work time and its intensification.

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Marx (1976 [1867]) saw the concept of SV as a key driver in the analysis of capitalism. Productive labour (PL) was deemed so in a value-creating sense, whereas unproductive labour (UL) was not. The rate of SV is the ratio of SV (profits, interest and rent) to variable capital (VC) (wages paid to productive workers). Marx's historical account examined how the SV rate changed in response to its drivers, including prolongation of the working day, technical change and the intensification of labour (p.327). A Marxian analysis of the contemporary UK economy, which integrates distributive dynamics with an examination of absolute (ASV) and relative SV (RSV) production, is both timely and relevant. Particularly, this Marxian analysis of SV provides a framework for understanding the underlying and real basis for empirical phenomena.

This article examines alternative measures of SV, and therefore class-inequality, including both a general indicator, and an examination of underlying forces, based on the ratio of unproductive to productive labour (UL-PL). Conceptual and empirical work which examines SV includes Morishima (1973, 1976), Wolff (1979, 1988), Weisskopf (1979), Mosley (1985, 1987, 1988), Gouverneur (1983, 1990), Shaikh and Tonak (1994), Mohun (2005, 2006), Cuestas and Philp (2012), Philp and Wheatley (2013), Philp, Slater and Wheatley (2015), Rieu and Park (2018), Rotta (2018, 2022), Colgliano (2018), Qi (2018), Jeong and Jeong (2020), Freitas (2021) and Pauls (2021). These articles have covered various themes in relation to how to calculate SV, its component parts, and its relationship to related Marxian themes, such as accumulation.

Our study represents an important contribution to this literature in that it examines movements in the rate of SV in the UK economy, 1992-2020, concurrently examining ASV and RSV as drivers. It employs a unique method for separating UL and PL, combining Standard Industrial Classification (SIC) and Standard Occupational Classification (SOC) codes to analyse distribution. This uses large-sample micro-datasets — *Understanding Society* and the *British Household Panel Survey* (*BHPS*) — to proxy ratios, prior to decomposing macroeconomic data from the ONS, thereby providing an empirical account of contemporary capitalism in the UK.

2. Productive and Unproductive Labour

2.1. Conceptual Basis

The UL-PL distinction has been a longstanding concern of political economy. Laibman (1992) has attempted to classify classical and Marxian approaches, identifying seven potential ways

to distinguish UL from PL: (i) subjective utility (e.g. Blaug, 1985); (ii) a global definition (O'Connor, 1974); (iii) the Sraffian distinction between basic and non-basic commodities (Sraffa, 1960); (iv) a physicalist approach (Adam Smith, 2010 [1776]); (v) a socioeconomic (Smith, 2010 [1776] and Marx, 1969a); (vi) an evaluative distinction (Marx, 1978[1885]); and (vii) an analytic approach (Marx 1969a; 1969b, 1972). Laibman (1992), in his discrete analysis of the latter three approaches, identifies operational difficulties in unambiguously applying the UL-PL distinction, arguing that the distinction should be abandoned. Several other scholars — e.g. Houston (1997) and Harvie (2005) — also reject the distinction. We propose an integrated application in which the latter three categorisations are integrated, reflecting Marx's intent, and comprising a single three-dimensional approach.

Under Laibman's socioeconomic definition, PL is exchanged for variable capital, and produces SV. In our article, we see this as a logical convergence of the dimension of ownership over the means of production. Marx believed that the UL-PL distinction was essential to the rigorous analysis of capitalism, arguing that productive wage labour is the basis for the existence of capital (Marx, 1976 [1867], p.736). Marx (1969a) frames this in the context of the capitalist mode of production, and ownership over the means of production: 'Productive and unproductive labour is … conceived from the standpoint of the possessor of money, from the standpoint of the capitalist …' (Marx, 1978 [1885], 1969a, p.153). Building on Smith, Marx argues productive labour is labour which is directly exchanged with capital, while 'unproductive labour is not exchanged with capital, but directly with revenue, that is, with wages or profit (including of course the various categories of those who share as co-partners in the capitalist's profit, such as interest and rent)' (Marx, 1969a, p. 157). By logical extension, we argue that state-owned enterprises and organisations (hospitals, schools etc.) do not have ownership that is capitalist in the sense of being capable of producing SV. On that basis, they should not be considered part of the capitalist subsector of a mixed economy. This realisation can explain why private capital strives to privatise those sectors/industries, to include more labour and expand the pool of labour capable of producing value, and therefore SV.

UK data poses more obstacles in distinguishing between UL-PL on the basis of ownership. For instance, the UK Higher Education (HE) industry is treated differently from secondary and primary education due to its private/charitable nature (i.e. private ownership). But, HE's connection to the financial sector through fees is the rationale for us allocating it to the capitalist productive sectors, like privately-funded pre-school education. The NHS, though, is still a

predominantly state-owned organisation, free at the point of delivery, and therefore not allocated into the productive sector. However, employees in private health care providers are treated as productive labour.[2] Our classification of public education and health sectors (as lying outside the productive sector) does not have to do with an underlying assumption that knowledge does not generate surplus (e.g. Rotta, 2018, considering knowledge and information as valueless commodities), but strictly with its current public ownership.

The analytic definition of UL defines labour which does not create value or SV as unproductive. This would include the labour involved in the buying and selling of commodities, e.g. sales staff in shops, and much of the finance sector and trade. This element in the treatment of UL relates to the circuit of capital. Marx's circuit of capital is as follows:

$$M \rightarrow C \ldots P \ldots C' \rightarrow M' \tag{1}$$

As is well-known, there is an initial outlay, M, used to purchase labour power and materials. Through the production process, P, new commodities are produced, C'. These are sold on the market, and the value of these commodities are realised in money form, M'. Laibman (1992) argues that the analytic definition is dysfunctional because it is not possible to clearly separate economic reproduction into spheres of production and circulation. If a commodity is produced in location A, transported through process B, and sold in shop C, it's not clear where the SV creation ends. Based on this, and other arguments, Laibman concludes by arguing against the use of UL categories, to avoid definitional and conceptual confusion.

Shaikh and Tonak (1994) have refuted similar arguments by distinguishing the economy (à la Grundrisse) between production, social consumption (distribution and social maintenance), and personal consumption. Using similar logic, Mohun (1996) argues wage labour is productive if and only if it transforms a quantity of productive capital into a *greater* quantity of commodity capital ($C \ldots P \ldots C'$), and unproductive if and only if, within the circuit of capital, it transforms either money-capital into productive capital ($M \rightarrow C$) or commodity capital into money-capital ($C' \rightarrow M'$). Alternatively, the capital invested to purchase capital is of equal value to the capital purchased ($M = C$), and similarly the commodities produced, once sold,

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[2] Cogliano (2018) includes health and education in unproductive industries, as consumption of SV, whereas Qi (2018) groups these areas in the 'rest of the economy'. Tsoulfidis and Tsaliki (2014), Rotta (2018), Tsoulfidis and Paitaridis (2019) categorise health and education as productive.

are of equal value to the money for which they have been exchanged ($C' = M'$). But, the initial capital and commodities purchased have to produce more value than the final commodity ($C < C'$), regardless of realisation. This quantitative augmentation of capital has also been described by Marx (1978, pp. 225–226), stating:

> [t]he general law is that all circulation costs that arise simply from a change in form of the commodity cannot add any value to it. They are simply costs involved in realizing the value, or transferring it from one form to another. The capital expended in these costs (including the labour it commands) belongs to the *faux frais* of capitalist production. The replacement of these costs must come from the surplus product, and from the standpoint of the capitalist class as a whole it forms a deduction of surplus-value or surplus product, in just the same way as that time that a worker needs to buy his means of subsistence is lost time for him.

Thus, the analytic definition dictates that the circulation and distribution of commodities (e.g. retail and wholesale trades) would be allocated to UL.

In addition to the above, Marx (1969a) adds a further dimension in distinguishing UL-PL, stating: '[p]roductive labour would … be such labour as produces commodities or directly produces, trains, develops, maintains or reproduces labour-power itself' (p.172). But, for Laibman (1992, p.76), this evaluative definition makes a normative judgement about the social usefulness of certain types of labour, independent of the value-creating properties of the labour. This opens the question as to whether specific labours reinforce labour or not. The definition distinguishes between labour that reinforces capitalist relations (e.g. supervisor) and those that do not (e.g. miner). Marx also points out that 'unproductive labourers … who are useful and necessary because of the faulty social relations … owe their existence to social evils (1963, Part I, p. 289). According to Laibman (1992), this is problematic, because it implicitly contrasts UL to a pure communist counterfactual, in defining the UL-PL distinction.

Reinforcing capitalist relations might appear as a normative criterion, but in fact represents the conflict between the forces and relations of production, and this is a separate Marxian category. The amount of labour that is involved in developing the forces of production versus that used in maintaining production relations is of explanatory significance in Marxian accounts. In other words, although the socioeconomic criterion frames the distinction, and the analytic highlights that not all spheres of the economy are productive, within these spheres there is also labour that is not representative of the industry, does not contribute to organising/planning, whose role is

predominantly *reinforcing*. Labour that goes into organising the PL of others is productive, whereas the 'superintendence of others', is not (Marx, 1976, p.505). Even in typically productive sectors (e.g. manufacturing), some labour reinforces the existing relations of production. Our claim is that this "evaluative" definition can be applied to occupation, particularly SOC codes, though there remain complexities (e.g. management occupations might combine a supervisory and a planning role).

2.2. A Marxist Productive Classification System

In our article we formulate an empirical categorisation of PL-UL, drawing insight from several studies (Gough, 1972; Shaikh and Tonak, 1994; Mohun, 1996, 1999, 2002, 2003, 2004, 2005, 2014; Savran and Tonak, 1999; Cockshott et al, 1995). Other contemporary scholars have attempted to formalise this distinction, notably Rotta (2018) who coined the term "Marxist Industry Classification System". Our contribution is to formulate a three-dimensional Marxist Productive Labour Classification System (Figure 1), with the following dimensions:

1. Ownership (the "socioeconomic" definition);
2. Occupational classification (related to the "evaluative" definition);
3. The circuit of capital (described by SOC, connected to the "analytical" definition).

The first dimension is important because, in countries like the US, where health and education are commodified activities, labour employed in these industries would belong to the productive sector (Shaikh and Tonak, 1994). In contrast, in the UK, health is generally provided by public sector institutions, hence should not be classified as productive since they inhabit a space outside of capitalist production (Cockshott et al, 1995).[3] Privatisation is, of course, a threat to the UK NHS. If realised, this institution would enter the sphere of production.

The role of labour which reinforces relations of production is presented on the vertical axis of Figure 1, where labour-type is dichotomous. This is connected to the Standard Occupational Classification (SOC). Superintendence, which would include the role of inspectors and supervisors, is unproductive, and for this reason we ubiquitously treat UK SOC 01 (Managers) as unproductive. As noted above, this is an oversimplification, in that managers may have an

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[3] For this reason there is a concerted attempt by capital to appropriate these activities into the capitalist subsector of what is, properly, a mixed economy.

organisational role in industries which produce SV, but this level of granularity is impractical, and aspects of the productive planning may be captured through SOC 4 (Administrative and Secretarial Support occupations). There are other types of labour which do not create value, which are necessary under capitalism, to reinforce capitalist property relations, for example private sector security.

In Figure 1 the horizontal axis pertains to the role of labour in the *circuit of capital*, or what we call the *analytical* criterion The x-axis reflects the position of the industry in relation to the circuit of capital. For example: SIC Codes 64-68, Financial and Real Estate are the 'lending' part within the $M - C$; SIC Codes 10-32, Manufacturing is within $C - P - C'$; and, SIC Codes 45-47, Wholesale and Retail Trade, or the 'selling' part of $C' - M'$.

In the category mixed income, members of this group may own the means of production, and generally do not employ labour, but their versatile nature requires more refined treatment. Some self-employed more closely resemble the worker category, but may be defined as PL or otherwise, by industry and occupation. Shaikh and Tonak (1994, p.30) emphasise that 'petty commodity production and household labours have different effects on capitalist reproduction even though they both produce use-values'. Although they are the smallest aggregate income category, the self-employed represent a non-trivial component of national income.

There are a variety of ways the self-employed can be treated in relation to the wage share, which is analogous to the problem under consideration here. And, Dunn et al. (2018) identify the following methods:

1. Do not incorporate any mixed income into the wage share;
2. Allocate all mixed income into the wage share;
3. Allocate a fixed proportion of mixed income into the wage share;
4. Inflate the wage share based on the number of self-employed (where self-employed income is assumed equal to the average income of an employee);
5. Allocate mixed income to the wage share based on the factor share of other income categories (following Appleton, 2011).

In the present article we follow Philp et al (2015) — who adopt the same approach as Appleton, albeit it in a Marxian New Interpretation framework — by allocating mixed income to S and V in proportion to the rate of SV, based on profits and wages.

In endeavouring to identify the SV component of mixed income we uniquely categorise the recipient using the Standard Occupation Classification (SOC) and the standard industrial classification (SIC), to identify their occupation and sector, and establish whether it is productive or not. We argue that mixed income in productive employment comprise those who are self-employed in the private sector, in occupational bands that produce new value in productive industries concerned with transforming commodities into new commodities through the production process ($C \dots P \dots C'$). We argue that the wage component of mixed income in unproductive employment is considered a component of surplus, e.g. a self-employed accountant. In contrast, the wage component of mixed income in productive industries is the split between those that are found in productive self-employment, and those who are not. In this sense the only way to separate the productive from the unproductive wage component of mixed income is to categorise activity by occupation (SOC) *and* industry (SIC). While all occupations in unproductive industries are unproductive, not all occupations in productive industries are productive (see Table 1).

Fig. 1. *Marxist Productive Labour Classification System*

Table 1. *SIC-SOC Table Summary in the Marxist Productive Labour Classification System*

SIC codes	Description	1	2	241	242	3	331	352	353	354	4	412	5	6	7	8	9
		Managers and Senior Officials	Professional Occupations	Legal Professionals	Business & Statistical Professionals	Associate Professional and technical occupations	Protective Service occupations	Legal associate professionals	Business and Finance Associate professionals	Sales & related associate professionals	Administrative and secretarial occupations	Administrative occupations finance	Skilled trades occupations	Personal service occupations	Sales & Customer Service occupations	Process, plant and machine operatives	Elementary occupations
01-09	Agriculture, Forestry, Fishing, Mining	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
10 -32	Manufacturing all	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
33	Repair & installation of machinery & equipment	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
35	Electricity, gas, steam and air conditioning supply	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
36-39	Water collection, Sewerage, Waste Collection, Remediation	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
41-43	Construction, Civil Engineering, Special Construction	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
45-47	Wholesale and retail trade	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
49-53	Transport and Courier	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
55-56	Accommodation, Food & Beverage activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
58 - 63	Publishing activities, Motion picture video, Broadcasting, Telecommunications, Computer programming Information Service activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
64-68	Financial & Real Estate	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
69-70	Legal and accounting activities, Management Consultancy	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
71-72&74-75	Architectural & engineering, Scientific Research, Veterinary	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
73	Advertising and market research	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
77-80	Rental & leasing activities, Employment activities, Travel agency, Security & investigation activities	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
81	Services to buildings & landscape activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
82	Office administrative, office support & other business support activities	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
84	Public administration & defence; compulsory social security	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPbL
85-88	Education, Human health activities, Social Services	UPL	PL	PL**	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
90	Creative, arts & entertainment activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
91	Libraries, archives, museums & other cultural activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
92	Gambling & betting activities	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL	UPL
93-94	Sports activities & amusement and recreation activities, Activities of membership organisations	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
95-96	Repair of computers & personal and household goods, Other personal service activities	UPL	PL	UPL	UPL	PL	UPL	UPL	UPL	UPL	PL	UPL	PL	PL	UPL	PL	PL
97-98	Activities of households as employers of domestic personnel, Undifferentiated goods- and services-producing activities of private households for own use	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS	HS
99	Activities of extraterritorial organisations and bodies	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR	EXTR

2.3. Productive and Unproductive Labour: Descriptive analysis

Marx explains movements of UL and PL are, in some sense, independent of one another. Specifically:

> [d]espite the autonomy it has acquired, the movement of commercial capital is never anything more than the movement of industrial capital within the circulation sphere. But by virtue of this autonomy, its movement is, within certain limits, independent of the reproduction process and its barriers, and hence it also drives this process beyond its own barriers. This inner dependence in combination with external autonomy drives commercial capital to a point where the inner connection is forcibly re-established by way of a crisis. [1994, p.419]

Parts of the Marxist literature attribute faster growth in unproductive activity to being an aftermath of an earlier phase of productive stagnation (Baran and Sweezy,1968, Sweezy and Magdoff, 1988, and Harvey, 2003; 2005), whereas other scholarly works argue the converse: productive activity stagnates due to past, more rapid, unproductive growth (Shaikh and Tonak, 1994, Wolff, 1987, Moseley, 1994; 1992; 1985, Mohun, 2014; 2006; 2005, Tsoulfidis and Paitaridis, 2019, Tsoulfidis and Tsaliki (2014), Paitaridis and Tsoulfidis, 2012, Cockshott et al., 1995). Rotta (2022, p.345) summarises the rationale for this hypothesis: 'unproductive activity draws from the value created and added in productive activities and, hence, leaves less of it to be reinvested in productive outlets'.

Shaikh and Tonak (1994) highlight the complexity of separating unproductive and productive activities in the short and long run: increasing unproductive expenditures may increase demand and productive output in the short run, but it reduces the rate of productive growth over the longer run (this pattern was confirmed, more recently, by Rotta, 2022, p.345). Rotta's long-run findings pertain to the post-war period in the US, with the short run considered over a decade. In our analysis of the last three decades, in the UK, distinguishing between UL and PL gives different results for the wage share (by UL and PL), so a more granular approach is needed over the period in question. As we see later in our findings, increased wage expenditure on unproductive labour adversely affects SV rates in short-run periods, especially post-2008.

Contra the trend identified in the previous established literature, our analysis suggests a decline in unproductive labour following decades of growth in unproductive labour in the UK. Unproductive employment fell from 49.7% of total employment in 1992, to 46.1% in 2020 (see Figure 2). This can be contrasted with the case in the post-war period in the US (e.g. Tsoulfidis

et al. 2019), and in the second half of the twentieth century in the UK. There is a particularly pronounced fall in the proportion of unproductive labour among those in mixed income employment, from 41.2% in 1992, to 27.4% in 2020. The data in Figure 2 suggests the short-run boost to productive employment after the 2008 crisis seems to have been driven by self-employment. We would highlight the growth in the the gig economy, where its employees have a freelancer or partner status, despite being in postal, transportation, delivery and other productive sectors.
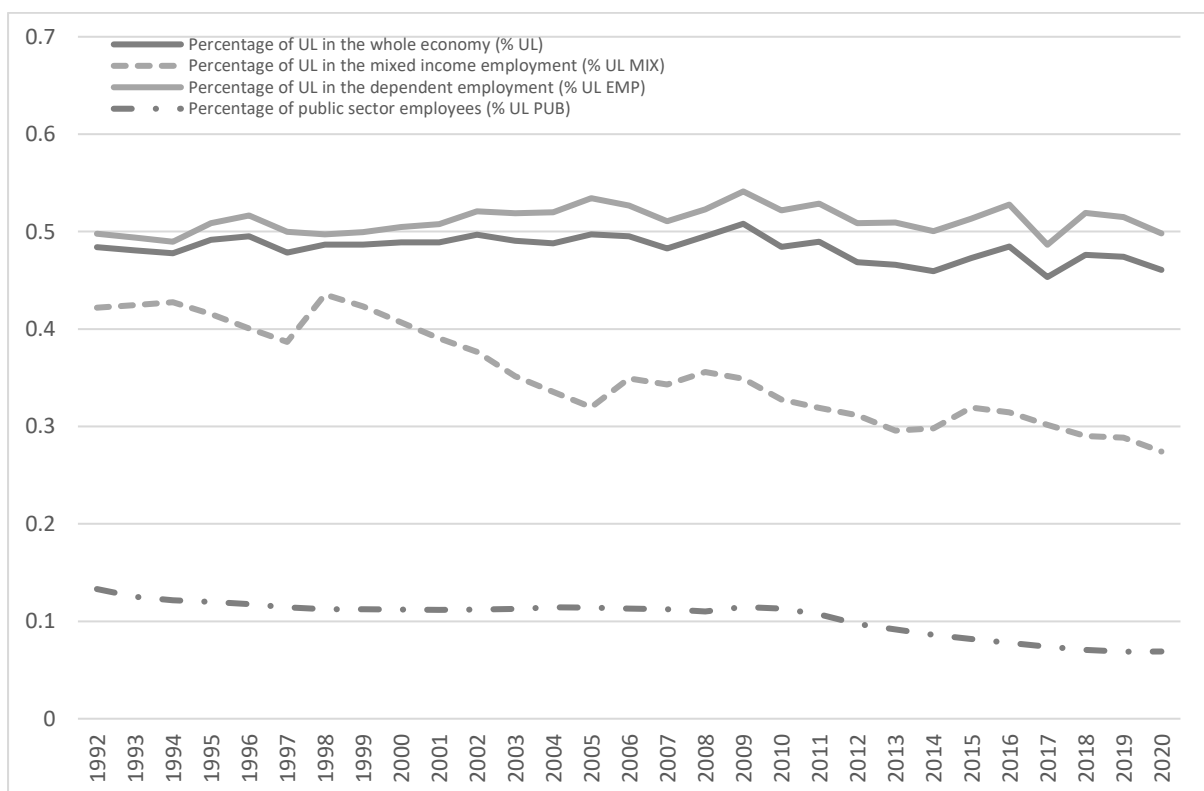
Fig. 2. *Unproductive Employment (Privately employed & Self-employed, Public sector)*

We can also explore this in terms of the ratio of UL to PL. In Figure 3 the bold line plots the pattern in the wage ratio of UL (including public sector labour), relative to PL wages, indexed, with 1992 as the base year. The unproductive wage ratio rises by 34.2% up to 2009, before falling back to 103.0, indexed, by 2020. This suggests that growth in unproductive labour up to the 2008 Crisis created an imbalance in the real economy, which led to a relative decline in UL post-Crisis, with the UL-PL ratio almost reaching 1992 levels by 2020.
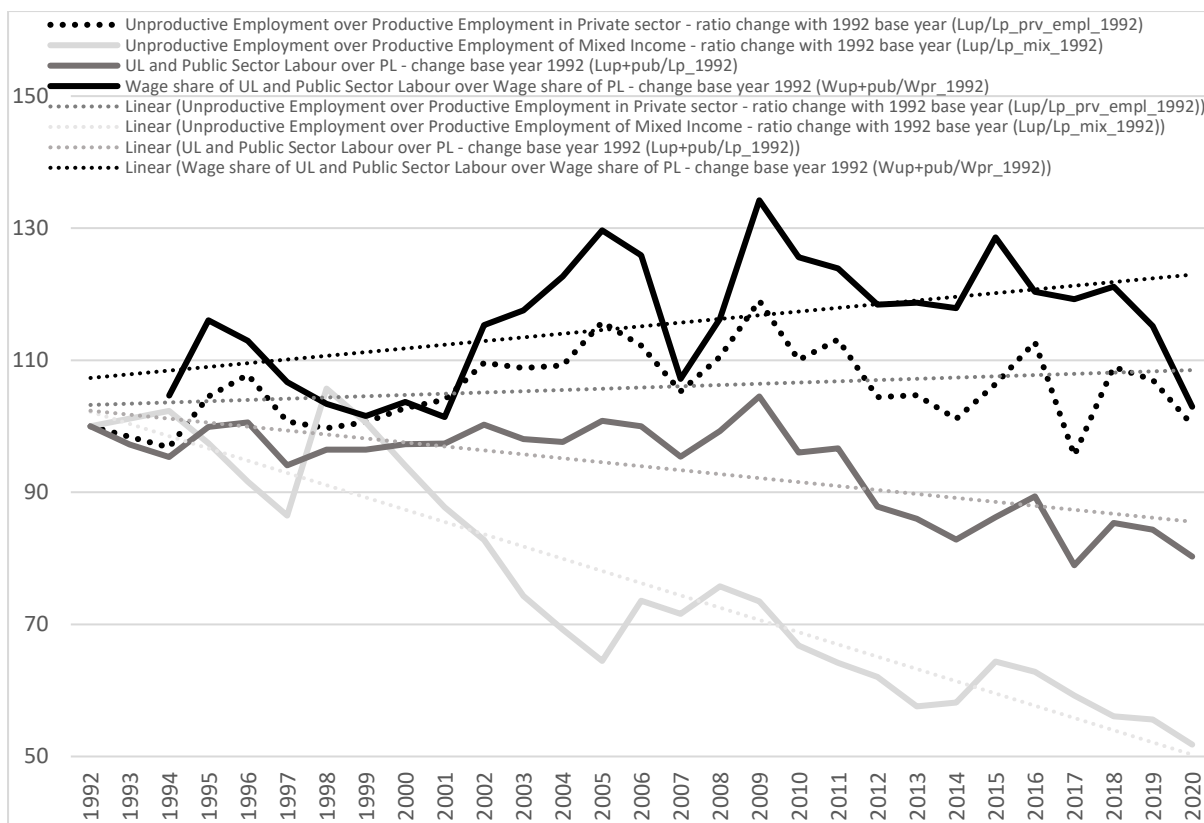
Fig. 3. *Ratios of Privately employed and Self-employed Unproductive over Productive Employment[4]*

3. SV in a New Interpretation Model

3.1. An Aggregate Model

As is well known in Marxian economics, aggregate SV (S) is a manifestation of surplus labour time (SLT), and takes the form of profit, interest and rent, derived from capitalist production. Aggregate variable capital is a further element of production and represents the money "advanced" to labour in the form of wages. The time taken to produce wages is called necessary labour time (NLT), and the ratio of SV to variable capital is the rate of SV (s').

In Marxian economics, there have been controversies over value and SV. Emerging from this, the New Interpretation of Marxian value theory developed, with its analytical focus on net output in the macro-economy, where the expenditure of living labour creates value (see Duménil, 1983-4, Duménil and Levy 1987, Foley, 1982). In this aggregate approach, the relationships between profit, surplus-value and exploitation are translated thus: '(n)et output … is divisible into aggregate wages and aggregate profits; net output as an aggregate of labour-

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[4] In the dataset we used 1993 data for wages is missing, hence the gap in the wage ration data between 1992 and 1994.

times is divisible into aggregate necessary labour and aggregate surplus labour, and as a money-value sum into aggregate variable capital and aggregate surplus value' (Mohun, 1994, p.403). Overall, total profits are shown to be the price form of surplus-value, and the value of the labour-power is defined by the (unallocated) purchasing power of the portion of the net product that workers can buy with their money wages (Dumenil and Foley, 2008).

We provide estimates of SV based on this New Interpretation framework by taking the observed prices, output, and PL as given variables, seeking to recover abstract labour time embodied in commodities produced in each line of production, and other value categories (e.g. value per necessary of life, value of labour power). At the centre of our analysis is the monetary expression of labour time (*melt*). In our article we use the ratio of national income (Y) to aggregate annual hours worked (H) to calculate the *melt*:

$$melt = \frac{Y}{H} \tag{2}$$

We distinguish between PL and UL as follows: superscript P denotes productive activity, and superscript U represents unproductive activity. A refined *melt* is then calculable for productive workers ($melt^P$), which uses H^P as the denominator, i.e. aggregate annual hours worked by productive workers alone. We also add the self-employed (identified by superscript M), recognising that "mixed-income" includes both a "surplus" and a "wage" component. We thus refine the *melt* as follows:

$$melt^P = \frac{Y}{H^P + H^{MP}} \tag{3}$$

Net output (net product) is the sum of prices (p) multiplied by quantities produced (q), summed across the i sectors of the economy, i.e. $\sum p_i q_i$. Empirically, we proxy this "expenditure" measure of output using "factor incomes". We can also disaggregate productive hours in each sector by the average hours per worker (h) multiplied by the number of workers employed in each sector (n). This can be distinguished by the employed and self-employed:

$$melt^P = \frac{\sum p_i q_i}{\sum h_i^P n_i^P + \sum h_i^{MP} n_i^{MP}} \tag{4}$$

It is then possible to elaborate on the components of the rate of SV (defined, as we do, incorporating mixed-income), by multiplying the wage rate of productive employees (w^P) by

aggregate hours worked ($\sum h_i^P n_i^P$), and the wage component of mixed income (w^{MP}) by the aggregate hours worked by the self-employed ($\sum h_i^{MP} n_i^{MP}$).

$$S = \sum p_i q_i - (w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}) \tag{5a}$$

Alternatively, we can express this in terms of the factor income components of national income. Aggregate profit (Π) comprises profit, interest and rent, as well as the profit component of mixed-income. In addition, the wages of unproductive employees and the wage component of the unproductive self-employed are an element of aggregate SV, i.e.

$$S = \Pi + (w^U \sum h_i^U n_i^U + w^{MU} \sum h_i^{MU} n_i^{MU}) \tag{5b}$$

Variable capital comprises the wages of productive employees and the wage component of the productive self-employed:

$$V = w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP} \tag{6}$$

We then define the rate of SV, which can be decomposed by equations (6) and (7):

$$s' = \frac{S}{V} = \frac{\Pi + (w^U \sum h_i^U n_i^U + w^{MU} \sum h_i^{MU} n_i^{MU})}{w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}} \tag{7}$$

Finally, in our model the value of labour power (vlp) — which is the productive wage divided by the *melt* for a given time period — can be defined thus:[5]

$$vlp^P = \frac{w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}}{melt^P} \tag{8}$$

vlp measures the productive wage share of net output, for an hour of collective labour-power.

We also construct λ, the value per necessary of life (as per Gouverneur, 1983), taking the consumer price index (CPI) and dividing it by the different measures of the *melt*.

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[5] In Mohun (1994), there is an alternative way of approaching the value of labour power: $VLP = \lambda b / L$, where b is the vector of "subsistence" commodities, λ is the vector of values, L is the total number of hours.

Ceteris paribus, there are two ways to increase the rate of SV (equation 7): (i) by extending the length of the working day whilst the level of NLT remains unchanged (ASV); (ii) through reducing the period of NLT (RSV). In the sphere of production, the latter can be achieved through technological change (the division of labour, cooperation and machinery, that increase productivity), or by labour intensification, thereby reducing the amount of NLT, changing the numerator and denominator of the SV rate, while the length of the working day remains unchanged. Alternatively, RSV extraction can be achieved in the sphere of distribution through a reduction in wages (as an outcome of class struggle). In empirically examining ASV and RSV, these two processes interact dynamically to determine changes in the rate of SV.

Although there is some controversy over the way intensification is treated in the Marxian literature (see Mavroudeas and Ioannides, 2011), because of the way that national statistics are constructed it is impractical to distinguish SV increase through productivity increase, from that associated with intensification. Although Marxian economics focuses on production, one must note that, in a macroeconomic model, the sphere of distribution is important. This will impact SV since it changes the balance of class forces in the sphere of distribution (Mavroudeas and Ioannides, 2011). In a dynamic production model, the manifestation of these societal factors may be a reduction in NLT, which we model here as RSV production.

4. Empirical Model

There are a number of empirical challenges in estimating the model identified in equation (7). In this article we use ONS (Blue Book) data but derive uniquely Marxian categories by apportioning aggregate values using sample micro-data from the *British Household Panel Survey* (BHPS) and *Understanding Society* databases. These allow us to uniquely contribute to the Marxian analysis of the UK economy by estimating wage rates and working hours of productive and unproductive employees, as well as the working hours of the productive and unproductive self-employed.

To examine the effect of changes in working hours on the rate of SV we take a base year of 1992 and define SV as the sum of the gross operating surpluses of financial, public limited and private limited companies in the UK economy (Office for National Statistics ID numbers NQNV+NRJT+NRJK). In addition, we include a portion of mixed income to profits which is the residual from the wage share of mixed income, calculated by the method used by Appleton

(2011) and Philp et al (2015). This ensures that all of the main income-based GDP categories are incorporated into our model. GDP — when measured by category of income — is equal to gross operating surplus plus gross mixed income, plus compensation of employees. For completeness, we undertake a procedure to apportion mixed income between productive and unproductive activity.

The rate of SV (s') is then defined (in aggregate) as the ratio of corporate profits plus the profit component of self-employed income, divided by the aggregate wage component of mixed income plus private sector (employee) wages. To calculate the latter we use the wage data in the *BHPS* and *Understanding Society* to estimate the private sector employee wage share, and multiply this by aggregate compensation of employees (ONS code HAEA), taken from the ONS Blue Book. The Marxian variables we analyse are *s'*, *melt*, *vlp*, *V*, *S* and *h*, which are summarised in Table 2. In our empirical analysis we compare variables using an unadjusted definition, which incorporates mixed income, but assumes all labour is productive, from a refined definition underpinned by the UL-PL distinction outlined in Section 2. The different rates of SV are both insightful since one acts as an inequality, 'class distributive' (unadjusted for UL-PL) indicator, and the other as an analytical description of profit extraction, i.e. a refined indicator (adjusted for UL-PL).

Table 2. *Definition of Key Variables*

Variable	Unadjusted (No PL-UL)	Refined (PL-UL)
s'	$\dfrac{\Pi}{w \sum h_i n_i + w^M \sum h_i^M n_i^M}$	$\dfrac{\Pi + (w^U \sum h_i^U n_i^U + w^{MU} \sum h_i^{MU} n_i^{MU})}{w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}}$
melt	$\dfrac{\sum p_i q_i}{\sum h_i n_i + \sum h_i^M n_i^M}$	$\dfrac{\sum p_i q_i}{\sum h_i^P n_i^P + \sum h_i^{MP} n_i^{MP}}$
vlp	$\dfrac{w \sum h_i n_i + w^M \sum h_i^M n_i^M}{melt}$	$\dfrac{w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}}{melt^P}$
V	$\sum h_i n_i + w^M \sum h_i^M n_i^M$	$w^P \sum h_i^P n_i^P + w^{MP} \sum h_i^{MP} n_i^{MP}$
h	$\dfrac{H + H^M}{\sum n_i + \sum n_i^M}$	$\dfrac{H^P + H^{MP}}{\sum n_i^P + \sum n_i^{MP}}$

5. Results and Discussion

5.1. SV Under Different Definitions: Dimensions, Patterns, and Growth

The rate of SV and its trajectory in the UK economy, 1992-2020, is estimated using the method outlined earlier in the article (recalling that $\sum p_i q_i$ is proxied using a factor income approach). The SV rate is indexed relative to 1992, and presented in time series, based on Gouverneur's method (1983). As can be observed in Table 2, the rate of SV calculated by assuming all labour is productive provides estimates considerably below those derived from our "refined" approach estimated using our UL classification. Regarding treating all labour as productive, Foley argues 'this way of looking at things gravely underestimates both the productivity reached by the capitalist system and the surplus value it can achieve' (1986, p 124). In the present article, we include the wages of public sector workers in the numerator of the SV rate, since they are unproductive from the perspective of capital. The different indicators are shown in Table 4.

An interesting finding is that where we apply the UL-PL distinction there is a small drop in SV prior to 2008, with profound changes from 2007. This reinforces a Marxian view of capitalist crises as crises of production, rather than being driven by circulation or finance (see Fig. 4). In our analysis the unadjusted rate drops significantly in the period 1997-2001, in a phase associated with a Labour Government. However, in Labour's subsequent term (from 2001) the gains for workers diminish, such that by 2008 the rate of SV was 79.2% (against its 2001 low of 77.6%). When applying the UL classification we find that the rate of SV is higher, fluctuating between 296% and 373%. Falls in SV predated the election of the Labour Government (in 1997), from a peak of 337% in 1995, to a low of 301% in 2001, at the end of their first term. By 2005 it increased to 356% (up 55 percentage points), before reaching 373% in 2009.

Behind these movements are a variety of factors, as detailed in Tables 3 and 4 (correlations and regression analysis), and Figure 5 and 6 (Time Series Graph). Appendix 1 and 2 contain the scatterplot matrices for the unadjusted model (which treats all labour as productive), and the refined model, which applies our unique methodology, decomposing macroeconomic indicators based on sample data, SIC and SOC codes.
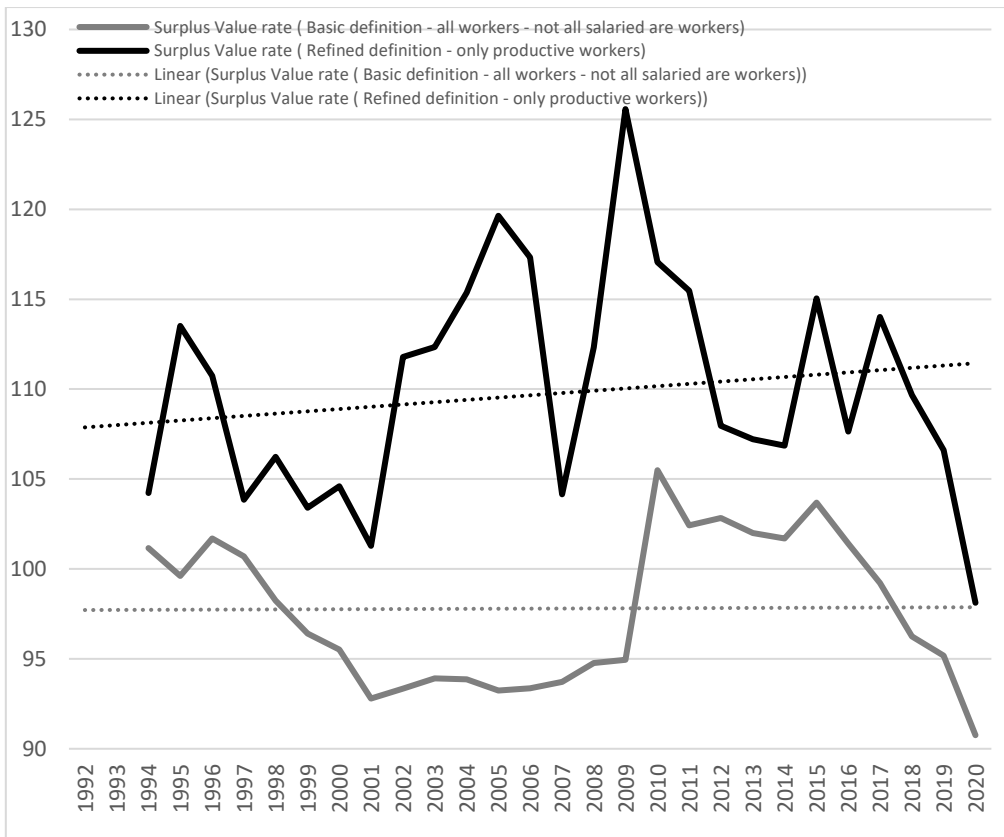
Fig. 4. Unadjusted and refined (PL-UL) SV rates (Indexed, 1992)
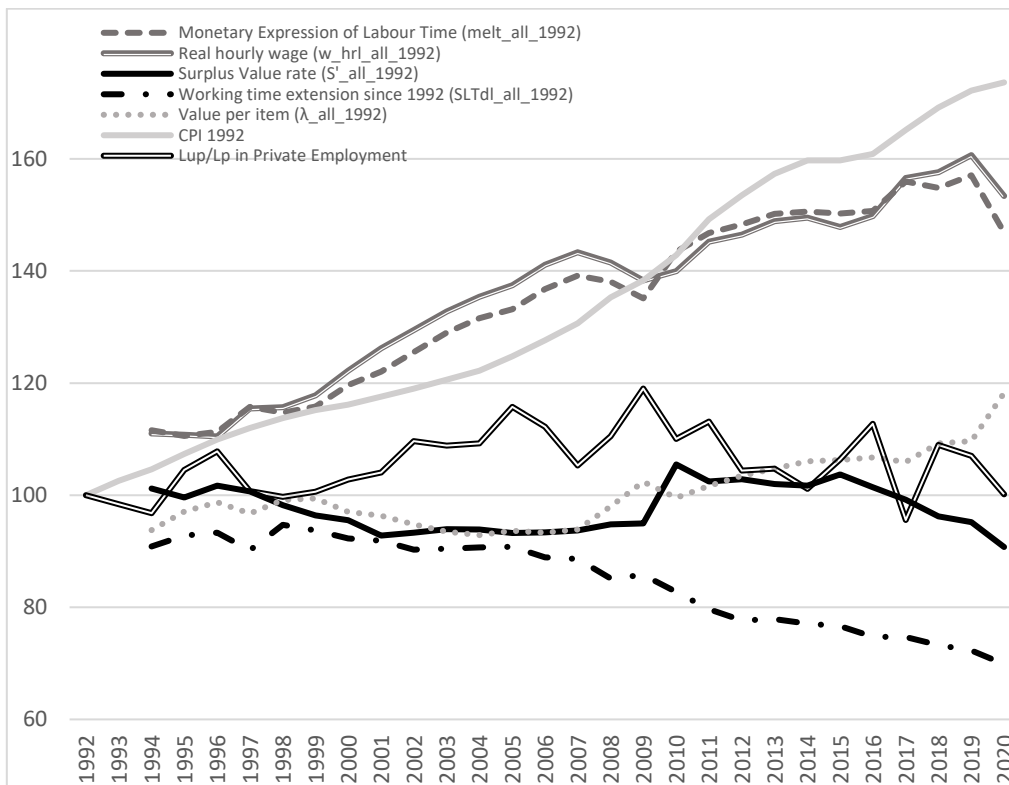
Fig. 5. *Unadjusted SV and its drivers ("all labour is productive")*
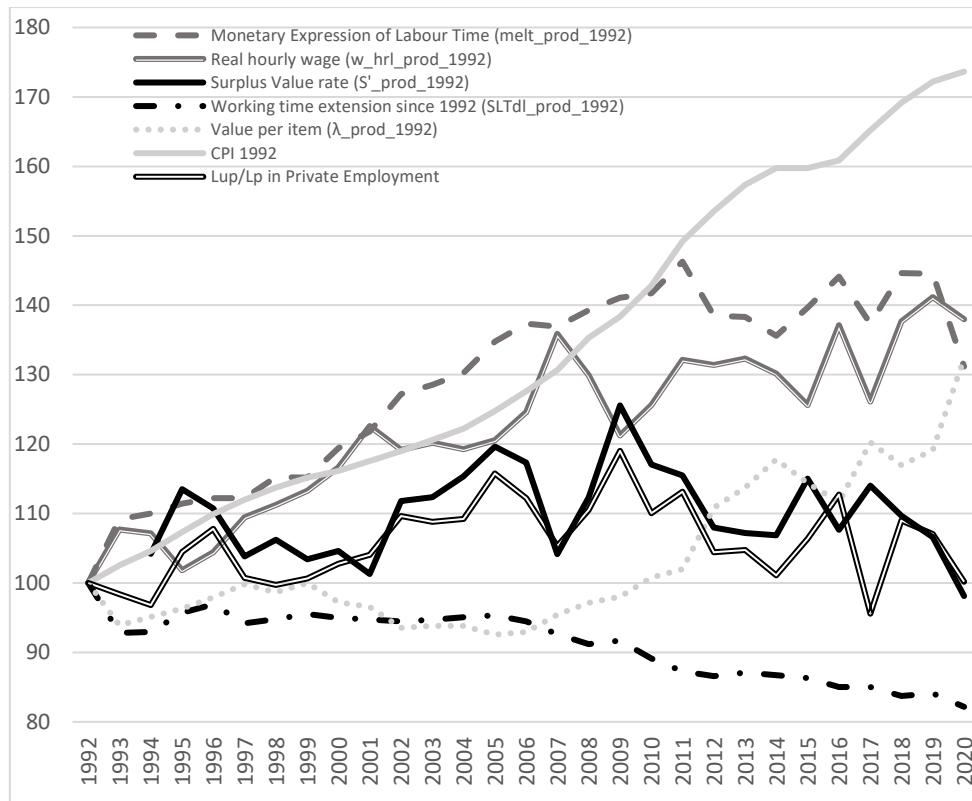
Fig. 6. *Refined SV and its drivers (productive-unproductive labour distinction)*

The patterns in Figures 5 and 6, and results from Table 3, are discussed in the themes below. We use a correlation and regression analysis to examine the contribution of the different SV drivers to SV's patterns, and to detect relationships among the drivers too. Using a first-difference OLS time series analysis, we see how ASV (extension of the working day), *melt* (capturing RSV related to productivity), and hourly wage (as RSV relating to its distribution) have shaped the SV rate for three decades, before and after the 2008 crisis. We also capture that increased unproductive wage expenditure relative to productive wage expenditure (Wup&pub/Wpr Wage share) is only significant post-2008, and only for the whole economy class distributive SV (which assumes all labour is productive). The sections below provide detailed discussion of Table 3, Figure 6 and Appendix 1, for each SV driver.

Table 3. *First differences OLS – Dependent and Independent variables as indicators with 1992 base year: SV (Dependent variable)*

	1992-2020		1992-2007		2008-2020	
	All Labour	**PROD. Labour**	**All Labour**	**PROD. Labour**	**All Labour**	**PROD. Labour**
Surplus Value rate (SV) **(Dependent variable)**				Coefficients		
Melt	0.067	0.753***	0.650**	1.136***		0.565**
ASV_{1992}	1.584***	0.672**	1.207***		2.156***	1.097*
CPI_{1992}	0.219	0.034	0.589	-0.042	0.596*	0.231
w(hr)	0.030	-0.929***		-1.122***	-0.163	-0.832***
UL/PL in Private Employment	-0.026	0.088*	0.073	0.124	0.050	0.157
UL/PL in Mixed Income Employment	-0.066	0.023	-0.037	0.034	0.221	0.019
Wup&pub/Wpr Wage share			-0.025		-0.156**	
Intercept	-0.338	0.440	-2.803**	0.204	-0.190	0.090
Obs	26	26	13	13	12	12
VIF	1.290	3.190	3.490	2.310	2.260	5.090
Hettest	0.133	0.652	0.726	0.513	0.940	0.617
Hettest, rhs	0.090	0.368	0.808	0.279	0.915	0.821
Estat imtest	0.224	0.288	0.393	0.592	0.534	0.601
Ovtest	0.054	0.901	0.286	0.323	0.313	0.434
R-square	0.795	0.981	0.872	0.992	0.983	0.984
Adj. R-square	0.730	0.975	0.745	0.986	0.961	0.966

Note: Significance levels: 10% (*), 5% (**) and 1% (***). All variables in first differences and Indexed with 1992 base year. OLS models.

5.1. ASV Extraction: Working Time Extension as a Driver of the SV Rate

ASV extraction for the UK was always relatively significant compared to other EU counterparts (Philp and Wheatley, 2013). During the period of the Conservative government, in the early to mid-1990s, we observe an increase in the length of working week (ASV), followed by a sustained drop during the Labour government (from 1997). Scholarly work has attributed this drop predominantly, to policy initiatives, like the EU Working Time Directive (e.g. Philp et al. 2015). Overall, in the period under investigation, ASV demonstrates a divergent pattern before and after the 2008 crisis (Figure 5 and 6). In fact, utilising the unadjusted definition ("all labour is productive"), ASV makes a substantial positive contribution to SV (coefficient 1.584). The effect is the same in the period 1992-2007 (albeit with a lower coefficient of 1.207) and greater after 2008 (coefficient 2.156). Applying our UL-PL distinction we have a positive effect over the period 1992-2020, albeit with a coefficient of 0.672.

Table 4. *Correlations of SLT with other SV drivers*

	ALL Labour (Unadjusted definition)			Productive-Unproductive Labour (Refined definition)		
	1992-2020	1992-2007	2008-2020	1992-2020	1992-2007	2008-2020
Melt	-0.834	0.045	-0.425	-0.541	0.045	0.286
Vlp	-0.372	-0.910	-0.793	-0.365	-0.728	-0.881
w(hr)	-0.894	-0.957	-0.760	-0.766	-0.306	-0.799
λ	-0.685	0.778	-0.888	-0.913	-0.246	-0.912
UL/PL in Private	-0.168	-0.651	0.384	0.238	0.616	0.623
UL/PL in Mixed	0.829	0.786	0.660	0.680	-0.260	0.916
W(up&pub)/W(pr)	-0.284	-0.525	0.704	0.000	0.647	0.778

Despite working time regulation, changes in SV have, on average, been strongly reliant on ASV, and these were especially reinforced after the 2008 crisis (with both definitions). We suggest this is attributable to business responses to the crisis, through laying some workers off while make the existing workforce work longer, as well as increased contract deregulation (zero-hour contracts, gig labour etc.). This reliance on ASV might well be a response to stagnant labour productivity, which we also observe below.
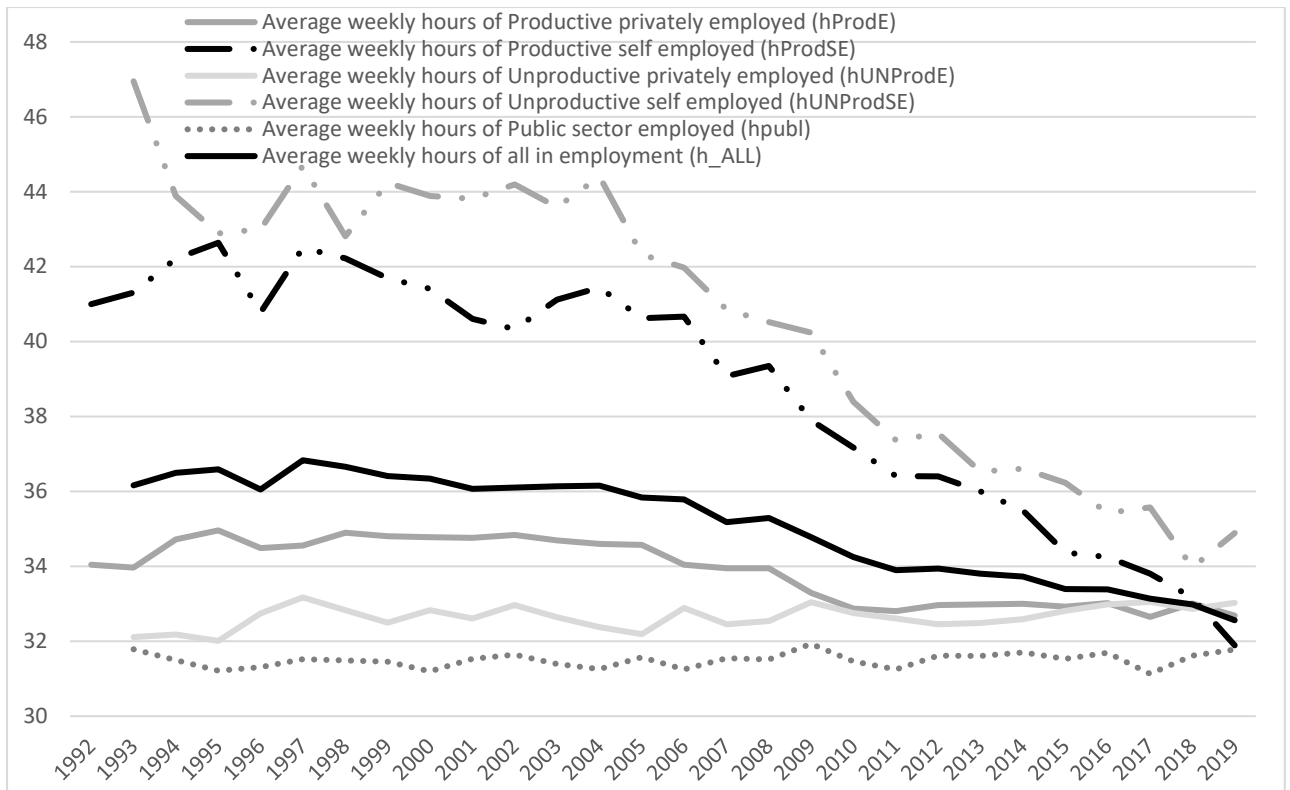
Fig. 7. *Working week for Unproductive and Productive Labour dependent employment, self-employed and public sector*

During the pandemic it was mainly in the unproductive mixed income category where we saw hours increase (Fig.7). With the refined UL-PL measure, pre-2008, an increase in the UL-PL ratio would relate positively to working hours' extension, but the same ratio for mixed income was impacted negatively in 1992-2007. Generally, examining the UL/PL ratios and their relationship with ASV, we find our results are consistent with those of other scholars who have, based on longer time horizons, distinguished between the short- and long-run movements of UL-PL (in US context see Shaikh and Tonak, 1994, and Rotta, 2022). Overall, work time reductions are particularly prominent among the mixed income workers, as evidenced by employment statuses (Fig.7). Such employment is also characterised as highly deregulated labour — both in UL and PL sectors (see Table 4).

5.2. Relative SV and the Sphere of Production

There are many scholarly and empirical works examining the UK's productivity puzzle. Although most differ in terminology and methodology, they still tend to concur on the productivity deficiencies of the economy. Labour productivity growth appears to stagnate in the post-crisis years (Figure 5 and 6). The *melt_prod* demonstrates more subtle productivity growth over the years, compared to the unadjusted *melt*. The period of *melt_prod* stagnation

corresponds to the beginning of the UK Productivity Puzzle (ONS, 2015; Goodridge et al. 2018; Fernández and Palazuelos, 2018). Several of these studies associate this with a decline in manufacturing. Smith (2020) attributes the productivity problem to the fact that manufacturing occupations that produce value and profit can easily be automated, but less so in services, particularly with a growing proportion of labour devoted to unproductive supervisory or circulatory activities. Therefore, with the UK increasingly dominated by supervisory and circulatory activities, its productivity is not expected to advance. This negative relationship between unproductive employment and labour productivity is also manifest here, particularly with the negative relationship between the *melt* and unproductive mixed income employment (Table 5).

Table 5. *Correlations of melt with other SV drivers (Indices)*

	ALL Labour			Productive-Unproductive Labour		
	1992-2020	1992-2007	2008-2020	1992-2020	1992-2007	2008-2020
Vlp	-0.071	0.834	-0.147	-0.395	-0.452	-0.486
w(hr)	0.988	0.997	0.900	0.894	0.906	0.145
SLT	-0.834	-0.944	-0.425	-0.541	0.045	0.286
Λ	0.612	-0.793	0.507	0.407	-0.790	-0.510
UL/PL in Private	0.266	0.707	-0.596	0.557	0.767	0.673
UL/PL in Mixed	-0.941	-0.872	-0.800	-0.872	-0.866	0.263
W(up&pub)/W(pr)	0.565	0.618	-0.327	0.711	0.664	0.536

Higher unproductive activity for those in dependent employment relates positively to labour productivity (*melt_prod*), and in limited cases, and to a weaker degree, it increases the SV rate. The same pattern post-2008 is detected for those in mixed employment. However, only in 1992-2007 does high unproductive activity in mixed employment negatively affected productivity. Rotta (2022) also finds that unproductive activities have a net positive effect on economic growth and labour productivity, but a negative one on income inequality, although Rotta does not include any of the 'knowledge' activities in PL.

From Table 3, there seems to be a strong positive contribution between labour productivity and SV extraction — especially with the refined definition. We find coefficients of 0.753 (1992-2020), 1.136 (1992-2007) and 0.565 (2008-2020). This shows, irrespective of political party in power, policies have been implemented that favour RSV. Overall, it seems that while the 1990s were characterised by a longer working week, ASV was not the sole driver, as RSV through labour productivity increase was also a highly contributing factor. It is worth noting that the

productivity measures can be masked by intensification, therefore what appears as increased labour productivity might actually be increased workload. Evidence from other studies (e.g. Green, 2004, 2006) shows that labour intensification has indeed experienced growth, and labour productivity growth might be even smaller, historically, than previously thought.

At the same time, the value per necessary of life, λ (CPI divided by the *melt*), representing the consumption bundle of the working class, falls until 2007 in the unadjusted (all labour is productive) case. Only in the first years of the Labour government does the drop in λ seem to have contributed to lower SV extraction (Figure 5 and 6). Policies that made workers' lives affordable, reducing the SV rate, may partially explain Labour's pre-2003 popularity. Again, the λ_prod indicator captures more subtle increases in productivity over the whole period, when compared to λ until 2006. After the 2008-9 crisis both indicators (λ_prod and λ) show an upward path, associated with productivity weakness.

5.3. Relative SV and the Sphere of Distribution

Mainstream economists have overwhelmingly attributed the growth (or drop) in wages to changes in labour productivity. Comparing the real hourly wage with the *melt* uncovers a near-linear relationship with the unadjusted definition (Appendix 1), in contrast to the pattern using the refined definition (Appendix 2). However, the real hourly wage does not seem to be a determinant of SV in the unadjusted data, in contrast to the refined model where we observe a strong effect. As evidenced earlier, from Table 3, wage increases decrease SV with coefficients of -0.929 (1992-2020), -1.122 (1992-2007) and -0.832 (2008-2020). In other words, the changes in SV post-2008 seem to be less reliant on RSV due to distribution, and more reliant on the sphere of production.

Our results also show that despite the positive, almost linear relationship, between the real hourly wage of all employees and the *melt* (as evidenced in Appendix 1, 2 and the regression analysis in Table 6), we see the latter as only one of the determinants of wages, and only significantly so for the period 1992-2007. Generally, for all three decades (1992-2020), the real wage is positively affected by the value per necessary of life (λ), and negatively by the SV and ASV rates when we view all labour as productive. This provides evidence of the role that distribution plays in wage determination.

Table 6. *First differences OLS – Dependent and Independent variables as indicators with 1992 base year: Real Hourly Wage (Dependent variable)*

Real Hourly Wage [w(hr)] (Dependent variable)	1992-2020		1992-2007		2008-2020	
	ALL	PRODUCTIVE	ALL	PRODUCTIVE	ALL	
			Coefficients			
SV	-0.591***	-0.877***	-0.546***	-0.779***	-0.647***	-0.856***
Melt		0.795***	1.066***			
ASV_{1992}	0.097**	0.244	0.020	-1.308**	-0.101	0.271
CPI_{1992}	0.969***	0.003	0.003	-0.445	0.883***	0.778*
Λ	-1.323***				-1.372***	-0.744***
Lup/Lp in Private Employment	0.004		0.029**	0.552**	-0.012*	0.217*
Lup/Lp in Mixed Income Employment	-0.008	0.097*	0.002	0.141**	-0.044*	-0.008
Wup&pub/Wpr Wage share	-0.007	0.017	-0.011*		0.016	
Intercept	0.128	0.448	-0.106	3.040**	0.058	-0.272
Obs	26	26	13	13	12	12
VIF	1.460	1.720	4.870	3.440	4.830	2.350
Hettest	0.981	0.584	0.131	0.440	0.587	0.945
Hettest, rhs	0.953	0.382	0.784	0.440	0.417	0.887
Estat imtest	0.315	0.265	0.498	0.511	0.329	0.606
Ovtest	0.705	0.291	0.013	0.564	0.169	0.303
R-square	0.995	0.975	1.000	0.960	1.000	0.977
Adj. R-square	0.992	0.967	0.999	0.931	0.999	0.950

Note: Significance levels: 10% (*), 5% (**) and 1% (***). All variables in first differences and Indexed with 1992 base year. OLS models.

6. Conclusion

This article has employed a unique method for separating UL from PL, combining SIC and SOC data from the ONS, and micro-data from *Understanding Society* and *BHPS*, generating novel empirical insights. This article has used the above data to examine the rate of SV as: (i) an inequality "class distributive" indicator (unadjusted for UL); and, (ii) as a refined analytical description of profit extraction (adjusted to take account of UL), for the period 1992-2020. The literature and data suggest the SV rate (with both measurements) is driven by key economic forces, namely working time changes, labour productivity, labour intensification and the socio-historical component of the price of labour power. Following an indicator approach, with 1992 as the base year, the results are clear and interesting.

The initial years associated with the 1997-2010 Labour Government coincided with a period when there were gains for workers in the form of diminished surplus-value rates (see Figure 6). However, in the longer run, when applying the UL categorisation, the indexed SV rate rose by about 10% between 1992-2017, indicating relative gains for capital and unproductive workers. By the end of 2020 the SV index was 2% lower compared to 1992. The refined definition shows a large drop in SV in 2007, which lends weight to the hypothesis that the 2008 Crisis developed first in the sphere of production.

From 1996 there were modest falls in the average duration of work time for UK workers (*ceteris paribus* negatively impacting SV). Working time reductions have been observed under Labour and Conservative administrations, but only in the 1996-2001 period was a lower SV rate manifest (see Figures 5, 6 and Table 3). Despite that, for all workers there is a sustained and substantial negative effect on the SV rate from falling hours over the period, with SV falling by about 30%, driven by a fall in working hours of 14%.

Productivity problems are evident throughout the period of our study, both with the *melt* indicator and the trend in the value of the means of subsistence, particularly post 2008. The indicators that incorporate the UL-PL distinction signal a more modest contribution to SV from productivity. In our analysis, when using the class-distributive definition of the *melt* (GDP/hour), stagnation in productivity can be seen to start in 2008. However, with the UL-PL distinction applied, labour productivity peaks in 2011, and in the decade since has fallen.

If we assume all labour is productive the data suggests that real wages have a similar pattern to the *melt* (GDP per hr), i.e. wages follow productivity. But, if we apply our UL categorisation the apparent correlation breaks down. In particular, our regression analysis suggests that productivity is related to workers' salaries in particular periods, while other factors related to the sphere of distribution have stronger effects (e.g. SV, the value per necessary of life, and CPI). Overall, the ramifications for productive workers were substantial as the real hourly wage index (relative to 1992) for productive workers was 131 in 2008, and only 137% in 2020. In this sense CPI, which has risen by 73% in the period 1992-2020, has squeezed workers' incomes. For workers as a whole, real hourly wages slightly rose in the period 2008-2017, from and index of 138 to 142 (relative to 1992 levels). Overall, our analysis shows that unproductive workers did better, in terms of hourly wages, than did productive workers, manifesting a distributive impact.

When applied, the UL-PL produces different patterns which can be used to garner insights into the sphere of production and exchange. Hitherto, the UK economy has been under-researched since the available data does not lend itself to Marxian economic categorisation, inclusive of UL and PL. Our novel approach (to use sample data to partition macroeconomic variable) has yielded analytical insights about the patterns in exploitation and the rate of SV. Our findings resonate with other scholars' works, with data from other countries (such as the US). Our results support the hypothesis that UL does not reflect mismanagement of capitalism, but it is an essential part in capital accumulation and SV extraction.

There are political forces which may ameliorate the impact of capitalist accumulation, and without the UL-PL distinction there were reductions in the SV rate in the early period of Labour administration. But, with the distinction, we see SV increases markedly from the beginning of the new millennium. Despite the dramatic increase in SV (measure by both indicators) since 2008-9, the SV rate has fallen significantly. Accounting for the stagnation in real wages since 2008, extracting further SV seems quite impossible in the UK. Finally, our analysis points to difficulties in increasingly the SV rate because of productivity stagnation, echoing other scholarly work. This is especially manifest when applying the UL-PL distinction.

References

Appleton, J. (2011). Revised methodology for unit wage costs and unit labour costs: explanation and impact. *Economic & Labour Market Review*, vol. 5, no. 10, 57-65.

Baran, P. and Sweezy, P. (1968). *Monopoly Capital: An Essay on the American Economic and Social Order.* New York, Monthly Review Press.

Blaug, M. (1985). *Economic Theory in Retrospect*. Cambridge, Cambridge University Press.

Brown, V. and Mohun, S., (2011). The rate of profit in the UK, 1920–1938. *Cambridge journal of economics*, vol. *35*, no. 6, 1035-1059.

Cipolla, F. P. (2018). The Mechanism of Relative SV. *Review of Radical Political Economics*, vol. *50*, no. 1, 116-135.

Cogliano, J. (2018). SV Production and Realization in Marxian Theory – Applications to the U.S., 1990–2015. *Review of Political Economy*, vol. 30, no. 4, 505-533.

Cockshott, P., Cottrell, A. and Michaelson, G., (1995). Testing Marx: some new results from UK data. *Capital & Class*, vol. *19*, no. 1, 103-130.

Cuestas, J. and Philp, B. (2012). Economic Class and the Distribution of Income: A Time-Series Analysis of the UK Economy, 1955-2010, *International Review of Applied Economics*, vol. 26, no. 5, 565-578.

Duménil, G. (1983-4). Beyond the Transformation Riddle: A Labor Theory of Value. *Science and Society*, vol. 47, no. 4, 427-450.

Duménil, G. and Foley, D., (2008). The Marxian transformation problem. *The New Palgrave: A Dictionary of Economics.* Basingstoke, Palgrave Macmillan.

Duménil, G. and Lévy, D., (1987). Value and natural prices trapped in joint production pitfalls. *Journal of Economics*, vol. *47*, no. 1, 15-46.

Dunn, M., Heys, R., Sidhu, S. (2018). Estimating the impact of the self-employed in the labour share. Newport: ONS, 1-19.

Fernández, R., and Palazuelos, E. (2018). Measuring the role of manufacturing in the productivity growth of the European economies (1993–2007). *Structural Change and Economic Dynamics*, vol. 46, 1-12.

Fine, B. & Saad-Filho, A. (2004). *Marx's Capital*. London, Pluto Press.

Freitas, A. (2021). The Rate of SV in Brazil, 1996–2016. Review of Radical Political Economics, vol. 53, no. 3, 398-422.

Foley, D. (1986). *Understanding Capital: Marx's Economic Theory*, Cambridge, Mass., Harvard University Press

Goodridge, P., Haskel, J., & Wallis, G. (2018). Accounting for the UK productivity puzzle: a decomposition and predictions. *Economica*, vol. *85*, no. 339, 581-605.

Gough, I., (1972). Marx's theory of productive and unproductive labour. *New Left Review*, vol. *1*, 47-72.

Gouverneur, J., (1983). *Contemporary capitalism and Marxist economics*. Rowman & Littlefield.

Gouverneur, J. (1990). Productive labour, price/value ratio and rate of SV: theoretical viewpoints and empirical evidence, *Cambridge Journal of Economics*, vol. 14, 1-27

Green, F. (2004). Work Intensification, Discretion, and the Decline in Well-Being at Work. *Eastern Economic Journal*, vol. 30, no. 4, 615-25.

Green, F. (2006). *Demanding Work. The Paradox of Job Quality in the Affluent Society*. Princeton, Princeton University Press.

Harvey, D. (2003). *The New Imperialism.* New York, Oxford University Press.

Harvey, D. (2005). *A Brief History of Neoliberalism.* New York, Oxford University Press.

Harvie, D. (2005). All labour produces value for capital and we all struggle against value, *The Commoner* vol. 10, 132-171.

Houston, D., (1997). Productive-unproductive labor: Rest in peace. *Review of Radical Political Economics*, vol. *29*, no. 1, 131-139.

Jeong, G., and Jeong, S. (2020). Trends of Marxian Ratios in South Korea, 1980-2014. Journal of Contemporary Asia, vol. 50, no. 2, 260-283.

Laibman, D. (1992). *Value, Technical Change and Crisis: Explorations in Marxist Economic Theory*, New York, M. E. Sharpe.

Laibman, D., (1999). Productive and unproductive labor: A comment. *Review of Radical Political Economics*, vol. *31*, no. 2, 61-73.

Lebowitz, M., (2010). Trapped inside the box? Five questions for Ben Fine. *Historical Materialism*, vol. *18*, no. 1, 131-49.

Marx K., (1969a). *Theories on SV PART I*. Moscow, Progress Publishers.

Marx K., (1969b). *Theories on SV PART II*. London, Lawrence & Wishart.

Marx K., (1972). *Theories on SV PART III*. London, Lawrence & Wishart.

Marx, K., (1976 [1867]). *Capital Volume I.* Harmondsworth, Penguin.

Marx, K., (1978 [1885]). *Capital Volume II*. Harmondsworth, Penguin.

Marx, K., (1981 [1894]). *Capital Volume III.* Harmondsworth, Penguin.

Marx, K., (2005). *Grundrisse: Foundations of the critique of political economy*. Penguin UK.

Mavroudeas, S. and Ioannides, A., (2011). Duration, intensity and productivity of labour and the distinction between absolute and relative SV. *Review of Political Economy*, vol. 23, no. 3, 421-437.

Mohun, S. (1994). A re(in)statement of the labour theory of value, *Cambridge Journal of Economics*, vol.18, no. 4, 391-412.

Mohun, S., (1996). Productive and unproductive labor in the labor theory of value. *Review of Radical Political Economics*, vol. *28*, no. 4, 30-54.

Mohun, S., (1999). Productive and unproductive labor in the US economy: does the distinction matter? A reply to Houston and Laibman. *Review of Radical Political Economics*, vol. *34*, no. 2, 187-201.

Mohun, S., (2002). Productive and unproductive labor: a reply to Houston and Laibman. *Review of Radical Political Economics*, vol. 34, no. 2, 203-220.

Mohun, S., (2003). On the TSSI and the Exploitation Theory of Profit. *Capital & Class*, vol. *27*, no. 3, 85-102.

Mohun, S., (2004). The labour theory of value as foundation for empirical investigations. *Metroeconomica*, vol. *55*, no. 1, 65-95.

Mohun, S., (2005). On measuring the wealth of nations: the US economy, 1964–2001. *Cambridge Journal of Economics*, vol. *29*, no. 5, 799-815.

Mohun, S. (2006). Distributive share in the US economy, 1964-2001, *Cambridge Journal of Economics*, vol. 30, no. 3, 347-370

Mohun, S., (2014). Unproductive labor in the US economy 1964-2010. *Review of Radical Political Economics*, vol. *46*, no. 3, 355-379.

Mohun, S. and Veneziani, R., (2017). Value, price, and exploitation: The logic of the transformation problem. *Journal of Economic Surveys*, vol. *31*, no. 5, 1387-1420.

Morishima, M. (1973). *Marx's Economics.* Cambridge, Cambridge University Press.

Morishima, M., (1976). Positive Profits with Negative SV-A Comment. *The Economic Journal*, vol. *86*, no. 343, 599-603.

Moseley, F. (1985). The rate of SV in the postwar US economy: a critique of Weisskopf's estimates, *Cambridge Journal of Economics*, vol. 9, no. 1, 57-79.

Moseley, F., (1987). The profit share and the rate of SV in the US economy, 1975—85. *Cambridge Journal of Economics*, vol. 11, no. 4, 393-399.

Moseley, F. (1988). The rate of SV, the organic composition, and the general rate of profit in the U.S. economy, 1947-67: a critique and update of Wolff's estimates, *American Economic Review*, vol. 78, no. 1, 298-303.

Moseley, F. (1992). *The Falling Rate of Profit in the Postwar United States Economy*. New York, St. Martin's Press.

Moseley, F., (1994). Unproductive labor and the rate of profit: a reply. *Science & Society*, vol. *58* , no. 1, 84-92.

Moseley, F., (2000). The "new solution" to the transformation problem: A sympathetic critique. *Review of Radical Political Economics*, vol. *32*, no. 2, 282-316.

O'Connor, J. 1974. *The Corporations and the State: Essays in the Theory of Capitalism and Imperialism*. New York: HarperCollins.

ONS, (2015). What is the productivity puzzle? Available at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/whatistheproductivitypuzzle/2015-07-07 [Accessed 21st May, 2021]

Paitaridis, D., & Tsoulfidis, L. (2012). The growth of unproductive activities, the rate of profit, and the phase-change of the US economy. *Review of Radical Political Economics*, vol. *44*, no. 2, 213-233.

Pauls, R. (2022). Capitalist Accumulation, Contradictions and Crisis in China, 1995–2015. *Journal of Contemporary Asia*, vol. *52*, no. 2, 267-295.

Philp, B. and Wheatley, D. (2013). European work time regulation, SV and underemployment among full-time employees: a cross-sectional analysis using the 2009 LFS, *Economic Issues*, vol. 18, no. 1, 57-74.

Philp, B., Slater, G., & Wheatley, D. (2015). New Labour and work-time regulation: a Marxian analysis of the UK economy. *Cambridge journal of economics*, vol. *39*, no. 3, 711-732.

Qi, H. (2018). The Historical Peak of the Rate of SV and the "New Normal" of the Chinese Economy: A political Economy Analysis. *Revista de Economia Contemporânea*, vol. 22, no.1, 1-22.

Rieu, D., (2008). Estimating sectoral rates of SV: Methodological issues. *Metroeconomica*, vol. *59, no.* 4, 557-573.

Rieu, D. M. (2022). *A Mathematical Approach to Marxian Value Theory: Time, Money, and Labor Productivity*. Springer Nature.

Rieu, D., and Park, H. (2018). Unproductive Activities and the Rate of SV at the Industry Level in Korea, 1995–2015. *Department of Economics Working Paper 2018-07*, University of Massachusetts, Amherst.

Rotta, T. N. (2018). Unproductive accumulation in the USA: a new analytical framework. *Cambridge journal of economics*, vol. *42, no.* 5, 1367-1392.

Rotta, T. N. (2022). Information rents, economic growth and inequality: an empirical study of the United States. *Cambridge Journal of Economics*, vol. *46, no.* 2, 341-370.

Savran, S. and Tonak, E.A., (1999). Productive and unproductive labour: an attempt at clarification and classification. *Capital & Class*, vol. *23, no.* 2, 113-152.

Shaikh, A, and Tonak, E. (1994). *Measuring the Wealth of Nations: The Political Economy of National Accounts*, Cambridge, Cambridge University Press.

Smith, A., (2010 [1776]). An Inquiry into the Nature and Causes of the Wealth of Nations. Harriman House Limited.

Smith, J. E. (2020). *Smart machines and service work: automation in an age of stagnation*. Reaktion Books.

Sraffa, P. (1960). *Production of commodities by means of commodities* (Vol. 1). Cambridge: Cambridge University Press.

Magdoff, H., & Sweezy, P. M. (1988). *Irreversible Crisis*. NYU Press.

Tsoulfidis, L., & Paitaridis, D. (2019). Capital intensity, unproductive activities and the Great Recession in the US economy. *Cambridge Journal of Economics*, vol. *43, no.* 3, 623-647.

Tsoulfidis, L. and Tsaliki, P., (2014). Unproductive labour, capital accumulation and profitability crisis in the Greek economy. *International Review of Applied Economics*, vol. *28, no.* 5, 562-585.

Weisskopf, T.E., (1985). The rate of SV in the postwar US economy: a response to Moseley's critique. *Cambridge Journal of Economics*, vol. *9, no.* 1, 81-84.

Wolff, E. (1979). The rate of SV, the organic composition, and the general rate of profit in the U.S. economy, 1947-67, *American Economic Review*, vol. 69, no. 3, 329-41.

Wolff, E. (1988). The Rate of SV, the Organic Composition, and the General Rate of Profit in the US Economy, 1947-67: Reply. *The American Economic Review*, vol. *78, no.* 1, 298-303.

Appendices
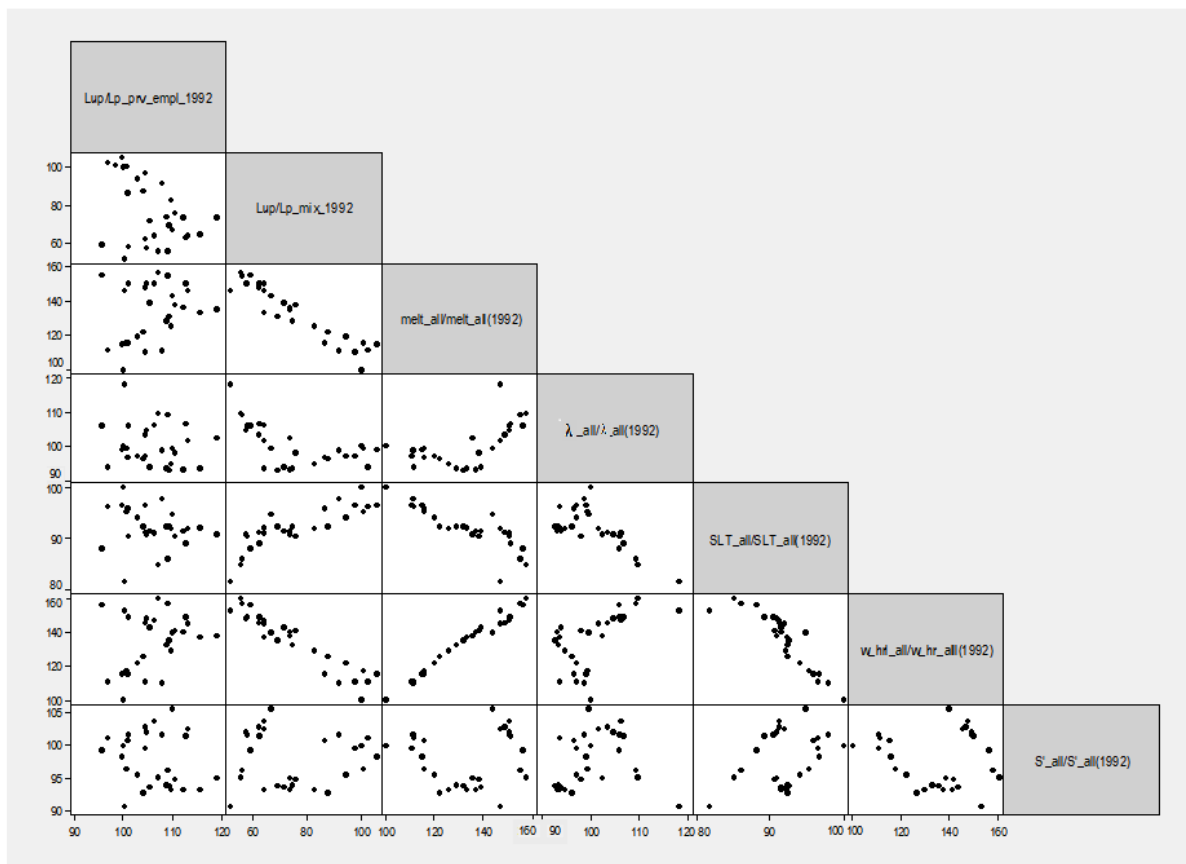
Appendix 1. *Scatter Plot Matrix of SV and its Drivers - Unadjusted Definition*
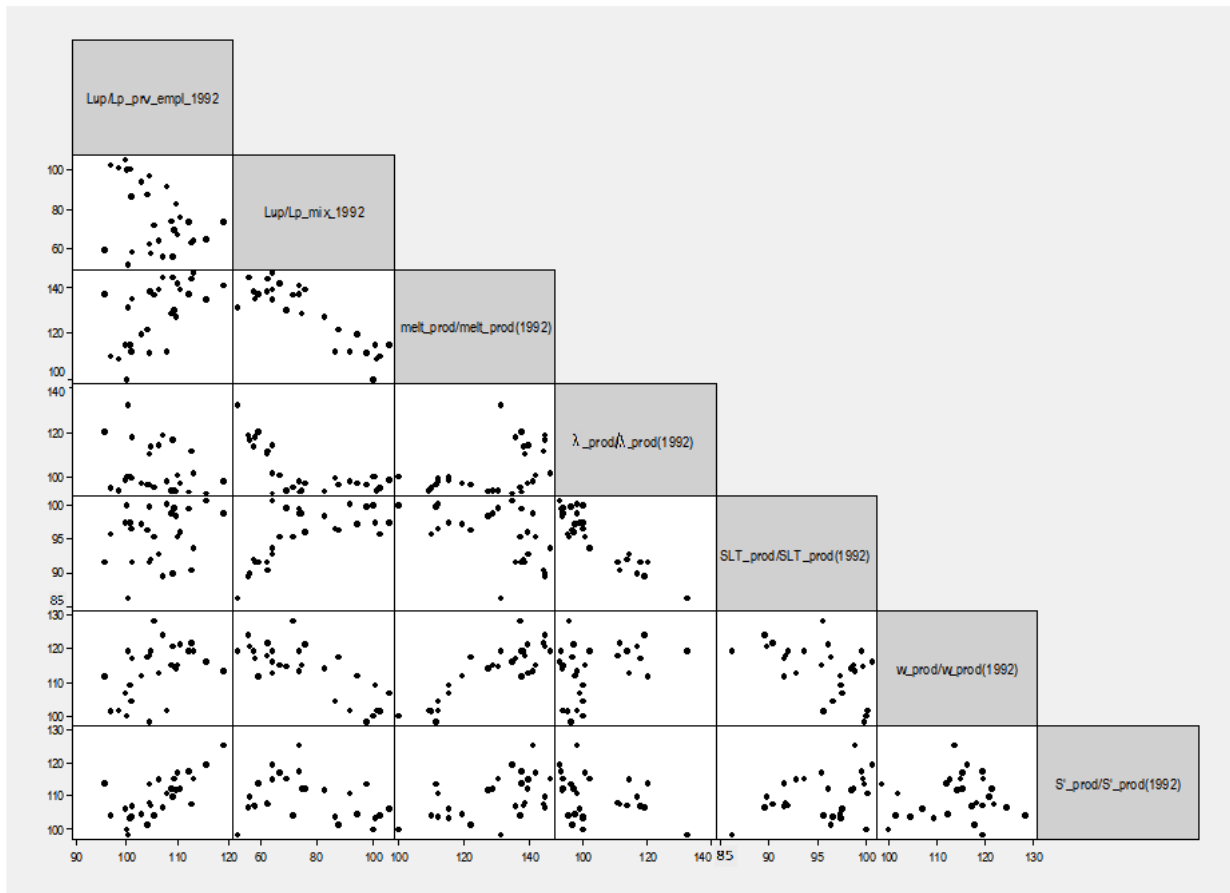
Appendix 2. *Scatter plot Matrix of the relationship among SV and its drivers - Refined Definition*