Theoretical and Applied Economics
Volume XXV (2018), No. 3(616), Autumn, pp. 25-48

Macroeconomic determinants of the labour share of income: Evidence from OECD economies(1)

Ivan D. TROFIMOV
Kolej Yayasan Saad (KYS) Business School, Malaysia
ivan.trofimov1@gmail.com
Nazaria Md. ARIS
University of Malaysia, Sarawak, Malaysia
nazzoes@gmail.com
Muhammad Khairil Firdaus Bin ROSLI
University of Malaysia, Sarawak, Malaysia
khairil.firdausss@gmail.com

Abstract. *The study investigates the relationships between the labour share of income and several macroeconomic variables – the GDP growth, inflation, unemployment, as well as GDP gap and capacity utilization – in industrialised economies between 1960 and the 2010s. Three complementary hypotheses that relate macroeconomic determinants to the labour share dynamics are considered: 'overhead labour' hypothesis, 'realization theory/wage lag' hypothesis and the 'rising strength of labour' hypothesis. The study employs a sequential procedure: testing for the stationarity properties of the variables, using bounds test to identify the presence of cointegrating relationships, and estimating long-run relationships using ARDL or OLS methods. The results show that all three hypotheses are supported only in a limited number of economies, whilst in the majority of cases only certain relationships are prominent. On the whole, the GDP growth rate, the unemployment rate, and to a smaller extent capacity are found to be the principal determinants of the labour share, while change in the level of prices is of subsidiary importance.*

Keywords: labour share; time series; macroeconomic determinants.

JEL Classification: C22, E25, J30.

1. Introduction

The functional distribution of income between capital, labour and land, its determinants, and the broader and lasting economic implications have long been the central themes of classical economics and have remained an important area of investigation in contemporary economic thought (Kramer, 2011).

The analytical issues pertaining to functional distribution are numerous, including the relationship between factor income and personal income inequality (Ryan, 1996); multiple types of income and the relationship between the analysis of income at national and household levels (Atkinson, 2009: 5-8); the effect of factor income inequality on the social dynamics, and the effect on structural torsions in the society and broader prospects of capitalism (Glyn and Suttcliffe, 1972), the long-term stability or trends in the levels of wages and profitability (Kalecki, 1954; Kaldor, 1961; Blanchard, 2006; Feldstein, 2008), convergence and equalization in wages and profits (Vaona, 2011; Izyumov and Vahaly, 2014).

In the heterodox and Marxist economics, the dynamics of factor income distribution is analysed explicitly as a class conflict, whilst in the neoclassical school it is conceptualized as the variation in and divergence between wages and productivity. Being a salient political and policy issue, the problem of the factor income distribution attracted attention in the 1970s, when the post-war 'grand accord' between labour and capital (whereby organized labour was getting increases in real wages and share in economic prosperity in exchange for political loyalty and cooperation) started to unravel and to undergo a series of modifications, becoming a more liberal and less regulated order. Likewise, the issue became prominent in the post-GFC world, discussed in the context of persistent unemployment, deindustrialization, and the debate around stagnation and the deceleration of growth rates and the revival of profit rate (Brenner, 2006; Dumenil and Levy, 2004).

The majority of theoretical and empirical analyses concerned the structural factors behind the stagnation of real wages and the fall in labour share: the weakening of labour's collective bargaining power (Bassanini, Duval, 2006); privatization and deregulation (Torrini, 2005); globalization, trade openness and capital flow liberalization (Jayadev, 2007); the changing structure of the economy and the fall of labour share across and within sectors (De Serres et al., 2001; Lawless and Whelan, 2007); technological change and factor substitution (Acemoglu, 2003); demographic factors and the ageing population (Schmidt and Vosen, 2013).

Another section of the literature considers labour share in relation to the macroeconomic performance of the economy and specific macroeconomic variables (Weisskopf, 1979; Sherman, 1991). This focuses on empirical analysis in a limited number of economies (USA and Australia), given the economic data constraints and the earlier debates on the cyclicality of the wage and productivity that took place amongst US economists (Bernanke and Powell, 1986). The empirical methods include earlier generation techniques, such as Partial Adjustment Differential Equation Model (PADEM), ordinary least squares (without prior examination of the stationarity properties of the variables), and Johansen cointegration.

The purpose of the paper is to contribute to the analysis of macroeconomic determinants of labour share by introducing certain novelties. Firstly, in contrast to earlier studies that focused on a single economy, this paper considers a reasonably complete set of industrialised economies over a period of several decades, including the recent period after the global recession of 2008-2009. Secondly, more advanced econometric techniques that address the problem of spurious relations and provide robust evidence in small samples are used. Thirdly, several measures of labour share and capacity utilisation are used.

The paper is structured as follows. Section 2 discusses alternative theoretical views and past empirical analyses. Section 3 considers methodological issues, including data sources, model and econometric techniques. Section 4 presents empirical findings and discusses their economic significance. Section 5 provides concluding remarks.

2. Theoretical explanations and past empirical research

It is well known that short-run fluctuations during the business cycle are incorporated into medium-term changes in the economy (periods of high and low growth and stagnation), both being part of economic growth in the long-run (Comin and Gertler, 2006). The three hypotheses, examined below, look at labour share and explanatory macroeconomic variables in the short-run (i.e. during specific stages of the cycle), whilst also intending, directly or indirectly, to provide insights into broader trends in the capitalist economy (e.g. profitability, effective demand, patterns of technical change). Thus, they are closely related to respective economic growth and distribution theories. Whilst recognizing the need to examine behaviour of the labour share around cycle turning points and during its stages (using quarterly data), this paper focuses on establishing relationships between relevant variables in the medium- and long-term.

According to the 'overhead labour' hypothesis (Weisskopf, 1979; Hahnel and Sherman, 1982, Bernanke, 2000, p. 273), low-wage production labour is a function of output produced, whilst high-wage supervisory and managerial labour (overhead labour) is a function of production capacity. The overhead labour costs are variable across the business cycle, in line with the theorizing in neo-Kaleckian growth models (Mohun, 2006, 2014).

During a recession, the level of output and average productivity fall, whilst managerial labour is hoarded, resulting in an increase in the labour income share due to an increase in average compensation levels and the rising percentage of overhead labour to the total labour. In contrast, during expansion periods, the labour share of income falls with productivity levels rising, and the proportion of overhead labour to total labour falls. In the early post-recession period, overhead labour does not increase as much as output and capacity utilization do, resulting in the fall of the labour share. In the early contractionary stages, productivity and output fall, whilst overhead labour is maintained, thus resulting in labour share stabilization. Overall, overhead labour costs and aggregate labour share of income are inversely related to the level of capacity utilization.

In a related 'labour-hoarding' hypothesis (Caballero and Hammour, 1998), all types of labour are hoarded during the recession, resulting in a falling (procyclical) productivity and rising labour share and countercyclical wages and compensation. Hence, the inverse relationship between capacity utilization and the labour share is hypothesized. In a similar vein, the inverse relationship between capacity utilization and labour share is hypothesized by Goldstein (1986, 1996), considering the effect of the increase in capacity utilization and the revival of the economy on the variability of the mark-up and changes in variable costs and respective labour share of income.

The 'realization failure' and 'wage-lag' hypotheses (Foster, 1987; Sherman, 1991: 160-1) have their origins in the under-consumptionist view of the economy: the growth in wages is seen to lag behind national income growth, resulting in sluggish effective demand, overproduction of goods and services, accumulation of inventories and a fall in labour share (Baran and Sweezy, 1966).

It is assumed that the workers do not own the output produced, the adjustment on the part of workers during the upswing differs from the adjustment during the downturn, productivity gains are substantial during expansion but decline rapidly during contractions, and that wages are sticky. In the expansionary phase of the business cycle, productivity gains are appropriated by the employer and profit share increases at the expense of the labour share. In the contractionary phase, if workers manage to maintain their older wages, the labour share may increase whilst productivity and national income fall. Also, the lower power of labour relative to capital results in wages lagging behind productivity and output prices outpacing compensation rates. As a result, the negative relationship between inflation and output on one side and labour share on the other are hypothesized. Overall, growth in GDP and output prices are seen to decrease the labour share of income.

Views aligning with the realization failure and wage-lag hypotheses were put forward by Bowles and Boyer (1988, 1995), and pointed to the profit-led nature of modern economies and inability of high levels of economic activity to restore wage levels. Likewise, in the long-run, GDP growth and associated labour-saving technical progress would imply rising elasticity of substitution of labour for capital and declining labour share of income.

According to the rising strength of labour hypothesis, labour shortages and declining unemployment during economic upswings (and particularly during the second part of economic expansion) result in increased bargaining power for labour, higher labour costs, and wage rates growing faster than productivity and growth in the latter being brought to a halt (Boddy, Crotty, 1975; Gordon et al., 1987). In contrast, during a downturn (specifically, its second half), bargaining power is reduced, and the intensity of work is increased, leading to an increase in productivity and fall in the labour share. Hence, a positive relationship between labour share and employment levels and a negative relationship between labour share and unemployment rate are postulated. According to

Boddy (2007), collective confidence is a salient variable for stronger labour power, and the level of confidence is a result of the overall level of unemployment and the speed of the decrease in the rate of unemployment. As Sherman (1991: 165) puts it, the lags between changes in unemployment and resulting changes in the wage share are common due to the slack and organizational hurdles behind the increase in labour's bargaining power and militancy.

The earlier empirical analysis by Weisskopf (1979) considered the US non-financial corporate sector over the period of 1949-1979 and found the unemployment rate to be the most significant variable for explaining the movements of labour share, also confirming the salience of realization failure and wage-lag effects. According to Munley (1981), based on the US data from the 1970s, the rising strength of labour hypothesis appears to be confirmed, however accelerating inflation is likely to be a factor offsetting gains in labour share and precluding increases in real wages (in the absence of appropriate income and price policies). Hahnel and Sherman (1982), working with the US data from 1949-1980 and applying correlation analysis and OLS in bivariate and multivariate settings, found support for all three hypotheses, albeit the rising strength of labour hypothesis was the weakest, with unemployment explaining only 9% of the variation in labour share on a bivariate basis.

Metwally and Tamaschke (1986) examined cost structures of GDP in 45 countries and applied the OLS model to the 1977 cross-sectional data, using compensation of employees, gross operating surplus (GOS) and their ratio as dependent variables. A positive relationship between compensation of employees and income per capita was identified, but growth in real GDP was found to be insignificant in explaining compensation of employees, GOS or their ratio. Henley (1987) in a US study pointed to the significance of capacity utilization as an explanatory variable, and relative insignificance of the strength of organized labour, hence confirming the overhead labour hypothesis, but not the rising strength of labour hypothesis. Moseley (1987) did not identify unemployment rate and capacity utilization as significant regressors, but indicated a possible role of an unproductive-productive labour ratio in explaining labour share fluctuations.

According to a study of US labour share and its constituent components, by Raffalovich et al. (1992), the rising strength of labour hypothesis has some partial support (with higher unemployment rate having a negative effect on the labour share, but through the level of employment rather than wage rates and labour costs). The overhead labour hypothesis was also supported, but the effects were experienced through the level of employment and output rather than the compensation levels. With regard to the wage lag hypothesis, the evidence was that revenue rose faster than employment during the periods of economic growth, and hence labour share fell. However, inflation that accelerated during upturns increased employment and thus offset negative effects on the labour share. Overall, the effect of inflation on the labour share was negligible.

Macri, Sinha (1999) was the only examination of the hypotheses in the non-US context. Using quarterly data for Australia over the period of 1966-1997, and performing Augmented Dickey Fuller (ADF) unit root and Johansen cointegration tests, the authors determined that labour share was negatively related to GDP growth rate, capacity utilization and the unemployment rate, but positively correlated with the inflation rate.

Overall, empirical studies give conflicting results, even when analysis is conducted for a single economy. Given the structural breaks that likely characterized developed economies around major political and economic junctures (e.g. in the 1970s or in the late 2000s), and the variation of variables across the periods (e.g. inflation in the 1970s versus the 1990s, or the varying bargaining power of labour), it is necessary to consider sufficiently long samples covering a number of decades, and to include other economies in consideration.

3. Methodology

Following Hahnel and Sherman (1982) and Raffalovich et al. (1992), the multivariate model is estimated, simultaneously testing the above-mentioned hypotheses.

The model in the general form was specified as:

$$LS = f(DGDP, GAP, INFL, UNEMP) \text{ or}$$

$$LS = f(DGDP, CAP, INFL, UNEMP),$$

where LS is the labour share of income, $DGDP$ is the growth rate of the nominal GDP, GAP is the gap between potential and actual GDP, CAP is the capacity utilization measure in the manufacturing sector, $INFL$ is the inflation rate, and $UNEMP$ is the unemployment rate.

In line with the overhead labour, realization failure/wage-lag, and rising strength of labour hypotheses, the following partial relations between independent variables and labour share are expected, *ceteris paribus*:

$$\frac{\partial DGDP}{\partial LS} < 0 \quad \frac{\partial GAP}{\partial LS} < 0 \quad \frac{\partial INFL}{\partial LS} < 0 \text{ and } \frac{\partial UNEMP}{\partial LS} < 0 .$$

Two labour share indicators are used in the model. Firstly, the labour share is defined narrowly as the ratio of the compensation of employees in the total economy to the net revenue in the total economy. The latter is the sum of the compensation of employees and the net operating surplus in the total economy. Secondly, the broadly defined labour share is calculated as the ratio of the compensation of employees to GDP at current factor cost, multiplied by the ratio of employment to employees. The use of two alternative indicators is justified by two complementary views of the distributional problem: the short-term view, implying that the current net revenue, if fully allocated to either capital (in the form of profits and operating surplus) or labour (in the form of salaries and wages); and the long-term view, considering distribution of GDP to capital and labour, as well as allocation to for the purpose of technological renewal (investments in the fixed capital) and to intermediate products (Raffalovich et al., 1992: 246).

Likewise, two alternative indicators to test the overhead labour hypothesis are used: capacity utilization in manufacturing and the GDP gap (defined as the gap between actual and trend GDP at constant prices, expressed in percentage terms). The latter measure is introduced to capture the degree of production factors' utilization in the broader economy (given the de-industrialisation processes taking place in the developed economies and the rise of the tertiary sector).

The paper considered the economies of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the UK and the USA. Due to data constraints and the absence of GDP gap series for Australia, Canada, New Zealand and Norway, and the absence of one of the labour share indicators for Norway and New Zealand, equations with only three independent variables and/or equations with only one of the labour share indicators were estimated for these economies.

The labour share, inflation, unemployment, GDP gap and GDP growth rates annual data for the industrialised economies was obtained from the European Commission AMECO database. The relevant data codes are ALCD2 (broadly defined labour share), UWCD (compensation of employees), UOND (net operating surplus), AVGDPG (output gap), OVGD (real GDP at 2010 constant prices), ZUTN (unemployment rate in the total economy), and ZCPIN (national CPI index with 2010 as a base period). The manufacturing capacity utilization indicator was obtained from multiple sources (with the performed conversion of the quarterly to annual data): the seasonally adjusted quarterly data for Belgium, Germany, France, Italy, Netherlands, Portugal, Spain and the USA from the OECD 'Main Economic Indicators – Complete Database' (OECD, 2017); and the seasonally adjusted quarterly data for Sweden from the Economic Tendency Survey statistical database of the National Institute of Economic Research (NIER). For New Zealand, the seasonally adjusted capacity utilization indicator covers the total production sector of the economy. It is based on the original work by Edwards and Holmes (1994) incorporated into the methodology of the New Zealand Institute of Economic Research (NZIER) Quarterly Survey of Business Opinion.

The series included in the equation with GDP gap span the periods of 1965-2015 and 1961-2015 (in Australia, Canada, Japan, Norway and New Zealand) and 1967-2015 (USA). The capacity utilization series covers 1978-2016 in Belgium, 1976-2016 in France, 1961-2015 in Germany, 1968-2016 in Italy, 1973-2015 in the Netherlands, 1962-2004 in New Zealand, 1977-2015 in Portugal, 1965-2016 in Spain, 1980-2015 in Sweden, and 1967-2016 in the USA.

As a first step, the integration properties of the variables are examined. Twounit root tests are used: the Phillips-Perron (PP) test, which has unit root as a null hypothesis; and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test, which has unit root as the alternative hypothesis (Phillips, Perron, 1988; Kwiatkowski et al., 1992). Whilst the Phillips-Perron (PP) test is superior to the Augmented Dickey Fuller (ADF) test in that it computes a residual variance that is robust to serial correlation, similar to Dickey-Fuller type tests, it accepts the null hypothesis of the unit root too often. On the other hand, whilst the KPSS test tends to over-reject the null hypothesis of the stationarity in the series, it is more suitable for confirmatory analysis, making it possible to distinguish between the series that appear to be stationary, the series that appear to have unit root and the series for which available data is not informative (Kwiatkowski et al., 1992: 176). Therefore, following Amano and van Norden (1992) and Henricsson and Lundback (1995), a combination of KPSS and PP is used to deliver more reliable inference.

The stationarity of all variables would suggest estimation of the relationship between variables using ordinary least squares in levels. The presence of the unit roots in all variables would warrant the use of cointegration tests (e.g. Johansen-Juselius or Engle-Granger cointegration), and if cointegration is detected, the estimation of the long-run cointegrating equation(s) and examination of the short-run dynamics using error correction model (ECM). In the case of more complicated integration patterns (e.g. when several variables are I(0) whilst others are I(1)), application of the bounds test is possible. In the presence of cointegration between the variables, the estimation of the long-run relation and short-run dynamics within the autoregressive distributed lags (ARDL) framework is performed (Pesaran, 1997; Pesaran et al., 2001).

The ARDL model is represented as:

$$\Delta LS_t = \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta LS_{t-i} + \sum_{j=0}^{n} \delta_j \Delta X_{t-j} + \varphi LS_{t-1} + \theta X_{t-1} + \mu_t ,$$

where: LS is the dependent variable, $X_t = [DGDP_t, GAP_t, INFL_t, UNEMP_t]$ is the matrix of independent variables, parameters β_i and δ_j are short-run coefficients, parameters φ and θ are long-run multipliers, Δ is the first-difference operator.

The null hypothesis of no cointegration $H_0 : \varphi = \theta = 0$ is tested against the alternative hypothesis of cointegrating relation $H_a : \varphi \neq 0, \theta \neq 0$ using the F-statistic.

$$LS_t = a + \sum_{i=1}^{p} b_i LS_{t-i} + \sum_{i=0}^{q} c_i X_{t-i} + \varepsilon_t$$

$$LS_t = \gamma a + \gamma \sum_{i=0}^{q} c_i X_t + \gamma \varepsilon_t$$

$$\gamma = \frac{1}{1 - \sum_{i=1}^{p} b_i}$$

There are multiple advantages of using the ARDL framework. In contrast to conventional cointegration tests (Engle and Granger, 1987; Johansen and Juselius, 1990), it has greater power in smaller samples. It also allows a combination of series with different integration properties, e.g. I(0) and I(1), solely I(0) or I(1). It involves the estimation of a single equation rather than a system of equations, and treats long-run and short-run processes simultaneously. It permits a more flexible equation structure by selecting different lags for each variable and distinguishing between dependent and independent variables. Given that the past levels of the factor shares are significant determinants of the current levels (Metwally and Tamaschke, 1983: 781), ARDL is a particularly suitable model that allows incorporation of the lags of the dependent variable. Finally, it resolves the problem of the conflict between unit root tests not requiring pre-testing of the integration order.

The critical values for the bounds test were provided by Pesaran et al. (2001) for large samples. Given the limited sample in the paper, spanning 50-55 years, an alternative set of critical values was provided by Narayan (2004; 2005) for smaller samples (ranging 30-80 observations). The ARDL model implementable in the econometric software allows for five alternative specifications: (1) no constant, no trend; (2) restricted constant, no trend; (3) unrestricted constant, no trend; (4) unrestricted constant, restricted trend; and (5) unrestricted constant, unrestricted trend. Given the non-trending nature of the data and acknowledging that Narayan critical values are not provided for some of the specifications, the models with unrestricted and restricted constant and without trend were estimated, delivering virtually identical results. The estimates from the model with the unrestricted constant are reported in Section 3.

We note that ARDL model assumes that none of the variables is I(2). Therefore, the unit root tests are implemented on the first differences of the respective variable to ensure that the first difference is I(0). Likewise, the potential conflict between the results of the bounds test and the integration order of the dependent variable is noted: it is possible that the bounds test indicates cointegration between the variables, whilst the unit root tests indicate that the dependent variable is I(0). A set of the unit root tests was therefore performed on the labour share variable to establish that in none of the cases is it I(0).

The bounds test statistics are interpreted as follows. Firstly, if they fall below I(0) bound, it is concluded that all the variables in question are stationary and hence there is no cointegrating relation by definition. The relationship between the variables is then estimated by OLS with variables converted to the first differences. OLS results are interpreted as a one-unit change in the differenced labour share following a one unit change in the differenced independent variables (i.e. as accelerations in the dependent and independent variables). Secondly, if the bounds test statistics exceed I(1) bound, the cointegration is present and long-run and ECM representations are obtained in ARDL model. Thirdly, if the statistics fall within the bounds, the bounds test is seen as inconclusive. In this case, the presence or absence of cointegration is determined based on the significance of the error-correction term (Kremers et al., 1992; Bahmani-Oskooee and Nasir, 2004). Fourthly, if none of the variables in the cointegrating equation are statistically significant despite the bounds test statistics exceeding I(1) and significant error-correction term, the series are considered to be co-moving but not explaining each other, and OLS in first differences as an alternative model is tried. Finally, if there is conflict between models with unrestricted and restricted constants (whereby one model suggests cointegration, whilst the other indicates its absence), both OLS in differences and ARDL models are tried.

Given that the results of the bounds test are sensitive to lag selection, the automatic lag selection is performed based on Schwarz Information Criterion with a maximum of four lags. If diagnostic problems are detected, Akaike Information Criterion is used with up to six lags (in order to prevent under-estimation of the lag numbers), or fixed lags are set for dependent and independent variables. The usual diagnostic tests are performed (normality, serial correlation, stability, functional form, and heteroscedasticity), with particular emphasis put on preventing serial correlation. Specifically, Section 3 reports results of the Jarque-Bera test for normality, Breusch-Pagan LM test for serial correlation, White or Breusch-Pagan heteroscedasticity tests, and the RESET test for functional form.

4. Empirical results

As a first step, unit root testing was performed. PP and KPSS tests with constant and no trend were applied to the first differences of each of the six series in the 19 economies in question, in order to ensure that none of the variables is I(2). The null hypothesis of the unit root was rejected in most cases, at a 5% significance level. Based on the PP test, the null hypothesis was rejected for the unemployment series in Finland at a 10% significance level. In the KPSS test, the null hypothesis of stationarity was accepted at a 1% level for the GDP growth series in Canada, Denmark and the UK, inflation rate series in the USA, and for GDP gap series in Germany and Sweden.

In addition, PP and KPSS tests were applied to the labour share series in levels to ensure that the dependent variable was not stationary (Table 2 in Appendix). Based on the PP test, the alternative of stationarity was rejected in all cases at a 5% significance level (except for the broadly defined labour share in Germany, Netherlands and Sweden, where it was rejected at a 1% level). The KPSS test identifies stationarity in a greater number of cases: for the narrowly-defined labour share – in Belgium and the UK; and for the broadly-defined labour share – in Australia, Austria, Finland, Germany, Italy, Netherlands, New Zealand, Portugal and Sweden. In these instances, DF-GLS and ERS tests are used to confirm the presence of the unit root.

Table 1. *Unit root test results (first difference of the variables)*

Country	DGDP		GAP		INFL		UNEMP		LS1		LS2	
	PP	KPSS	PP	KPSS	PP	KPSS	PP	KPSS	PP	KPSS	PP	KPSS
Australia	-37.29	0.39	NA	NA	-6.87	0.16	-5.63	0.16	-7.84	0.15	-7.68	0.15
Austria	-19.81	0.08	-9.75	0.13	-7.57	0.05	-6.28	0.07	-7.73	0.09	-6.85	0.19
Belgium	-28.45	0.22	-11.42	0.11	-6.30	0.10	-3.75	0.22	-5.06	0.28	-5.16	0.22
Canada	-29.85	0.50	NA	NA	-6.57	0.18	-5.01	0.08	-7.16	0.11	-6.94	0.12
Denmark	-35.41	0.50	-6.60	0.10	-8.51	0.09	-4.82	0.11	-7.49	0.13	-9.15	0.32
Finland	-14.49	0.19	-6.67	0.11	-6.15	0.09	*-2.69*	0.13	-6.49	0.23	-5.45	0.13
France	-22.11	0.22	-6.28	0.08	-6.27	0.16	-4.71	0.18	-5.24	0.14	-4.94	0.11
Germany	-23.05	0.26	-15.70	0.50	-4.83	0.05	-3.53	0.45	-5.68	0.12	-5.39	0.23
Greece	-9.27	0.03	-5.66	0.14	-6.72	0.25	-3.04	0.18	-6.67	0.21	-6.51	0.06
Italy	-31.37	0.12	-9.57	0.25	-6.62	0.14	-4.42	0.07	-6.44	0.17	-5.86	0.13
Japan	-14.49	0.04	NA	NA	-9.78	0.08	-4.67	0.14	-5.52	0.08	-6.11	0.32
Netherlands	-10.98	0.19	-6.43	0.12	-7.57	0.06	-4.72	0.15	-7.38	0.17	-7.33	0.21
New Zealand	-24.39	0.14	NA	NA	-8.71	0.23	-4.57	0.10	NA	NA	-6.62	0.17
Norway	-27.39	0.28	NA	NA	-11.42	0.16	-4.50	0.05	-7.14	0.16	NA	NA
Portugal	-10.97	0.21	-3.74	0.10	-8.25	0.20	-3.98	0.07	-3.96	0.12	-5.00	0.12
Spain	-8.18	0.10	-4.09	0.05	-7.26	0.06	-3.75	0.08	-6.11	0.11	-4.83	0.21
Sweden	-18.19	0.25	-13.62	0.50	-9.01	0.16	-3.51	0.08	-5.78	0.08	-6.11	0.08
UK	-24.37	0.50	-8.96	0.32	-7.76	0.24	-3.30	0.24	-5.42	0.16	-4.77	0.10
USA	-18.62	0.22	-10.57	0.30	-9.67	0.50	-4.53	0.15	-6.17	0.07	-5.77	0.30

Note: PP test (constant, no trend) 1%, 5% and 10% critical values are -3.560, -2.917 and -2.597; KPSS test (constant, no trend) 1%, 5% and 10% critical values are 0.739, 0.463 and 0.347. Stationarity at 1% level is indicated in bold; at 10% level in italicized bold.

Secondly, a bounds test of cointegration was performed. The results of the bounds tests performed on the narrowly and broadly defined labour shares are shown in Tables 3 and 4 respectively. Each of the tables contains bounds test's F-statistics and the t-ratio for the error-correction term obtained from the ARDL model without restricted constant. The model with restricted constant was also estimated and delivered similar results. The lag structure and the selection criterion are indicated, as are the dummy variables to ensure the stability of the model. The last column of the tables contains the overall conclusion on the presence of cointegration.

In the case of the model with the narrowly defined labour share, the bounds test identified cointegration relationships in Denmark, Finland, France, Germany, Japan, the UK and the USA. For Belgium, Netherland and Portugal, some form of co-movement among the series was present in the absence of an equilibrium relationship and common stochastic trend. No cointegration relation was detected amongst the series in Australia, Austria, Canada, Italy, Spain and Sweden. For Greece and Norway, the results of the bounds test were inconclusive, as F-statistics were located between the lower and upper bounds. However, the statistically significant error-correction term may indicate that cointegration is nonetheless present (Kremers et al., 1992). The relevant dummy variables corresponded to salient political and economic events and developments in the respective countries.

Table 3. *Bounds test results (narrowly defined labour share)*

Country	F-statistics	ECT t-ratio	Model - URC	Dummies	Outcome
Australia	2.497	-5.584	(1,1,0,0) S	1974 2008	No cointegration
Austria	2.755	-5.379	(4,0,3,1,0) A	1970 1982	No cointegration
Belgium	5.731	-5.917	(1,2,2,0,0) A	NA	No cointegration (*)
Canada	2.679	-2.413	(1,0,0,0) S	NA	No cointegration
Denmark	10.501	-5.699	(1,0,1,3,0) S	2000	Cointegration
Finland	5.311	-6.155	(4,1,2,0,0) S	1975	Cointegration
France	8.121	-6.724	(1,0,0,0,0) S	NA	Cointegration
Germany	5.727	-5.201	(3,4,1,0,0) A	NA	Cointegration
Greece	3.857	-4.554	(3,0,1,0,1) S	NA	Inconclusive (**)
Italy	1.456	-1.963	(1,0,1,0,0) S	NA	No cointegration
Japan	18.032	-8.771	(1,1,1,2) S	NA	Cointegration
Netherlands	5.057	-5.293	(1,1,2,2,1) S	NA	No cointegration (*)
Norway	3.793	-3.558	(1,0,0,0) S	2000	Inconclusive (**)
Portugal	4.466	-5.641	(3,1) Fixed	1983-4	No cointegration (*)
Spain	1.829	-3.225	(4,3,0,1,1) S	NA	No cointegration
Sweden	1.877	-3.224	(2,0,3,2,4) A	NA	No cointegration
UK	6.021	-3.081	(2,0,0,0,0) S	NA	Cointegration
USA	5.069	-5.438	(5,5,1,1,4) A	NA	Cointegration

Note: (*) represents comovement in the absence of cointegration.
(**) represents possibility of cointegration, if ECT t-test is used as decision rule.

Critical values for F-statistics (T = 55) at the 5% level (Narayan, 2004).

# of regressors	k=4		k=3	
Bounds	I(0)	I(1)	I(0)	I(1)
Unrestricted constant, no trend	3.068	4.334	3.408	4.623

Critical values for F-statistics pertain to the sample size T=55. k represent the number of regressors.

A and S represent Akaike and Schwartz information criteria respectively. URC stands for model with unrestricted constant.

T-statistics critical values for n=50 are 2.678 (1% level), 2.009 (5% level) and 1.676 (10% level).

For Australia and Finland, the dummy represented the mid-1970s recession; for Portugal the 1983-4 dummy stood for the EC accession and accompanying economic reforms; for Norway, the 2000 dummy represented the decline in oil prices in the international market; and for Denmark, the 2000 dummy indicated the economic slowdown associated with increases in interest rates, decline in private consumption and transition from domestic- to foreign-demand-driven growth. We note that for smaller European economies, short-term fluctuations and outliers did not always correspond to broader international or European cycle movements (Andersen, 2001).

For the model with broadly defined labour share as a dependent variable, the bounds test indicated the presence of cointegration in Belgium, Denmark, Finland, Portugal, the UK and the USA. The series in Australia, Austria, Japan, Spain and Sweden were characterized by the absence of a common stochastic trend, whilst the relationships in Canada, France and Greece were undefined (with possible cointegration if ECT t-ratio were used as a decision rule). Comovement among the series without any long-run relation was likely in Germany and Netherlands. In Italy and New Zealand, the models with unrestricted and restricted constants gave conflicting results, requiring consideration of both OLS and ARDL models (as shown in Table 6). In the case of Italy, the ARDL model was found unstable; hence, only OLS results were retained.

Table 4. *Bounds test results (broadly defined labour share)*

Country	F-statistics	ECT t-ratio	Model - URC	Dummies	Outcome
Australia	3.264	-4.027	(1,1,0,0) S	2008	No cointegration
Austria	1.297	-2.664	(3,0,3,0,0) S	NA	No cointegration
Belgium	15.431	-6.745	(1,0,0,0,0) S	NA	Cointegration
Canada	3.792	-3.642	(1,1,1,0) S	NA	Inconclusive (**)
Denmark	5.229	-6.468	(4,4,3,3,0) A	2000, 2011	Cointegration
Finland	21.402	-6.235	(4,1,0,0,0) S	NA	Cointegration
France	3.395	-5.252	(4,1) Fixed	1983	Inconclusive (**)
Germany	6.095	-5.877	(4,2) Fixed	NA	No cointegration (*)
Greece	3.506	-4.783	(3,1,0,0,1) S	1989, 2002	Inconclusive (**)
Italy	2.885	-4.008	(2,1,4,0,2) S	NA	Conflicting results (***)
Japan	2.459	-6.036	(2,0) Fixed	NA	No cointegration
Netherlands	6.896	-6.181	(1,1,2,2,1) S	NA	No cointegration (*)
New Zealand	3.547	-4.579	(1,0,0,0) S	1974, 1976	Conflicting results (***)
Portugal	5.816	-7.422	(4,0,0,2,0) S	1983-4	Cointegration
Spain	2.366	-4.675	(4,0,0,0,1) S	NA	No cointegration
Sweden	2.853	-3.517	(3,1,0,2,4) S	NA	No cointegration
UK	8.465	-3.691	(1,0,0,0,0) S	NA	Cointegration
USA	6.076	-5.516	(3,0,3,1,0) A	NA	Cointegration

Note: As per Table 3.
(***) represents different results (cointegration vs. no cointegration) under URC and RC (restricted constant) models.

The estimates from the ARDL and OLS models are presented in Tables 5 and 6. It is shown that in all economies except Australia and New Zealand (Tables 5 and 6), at least one of the macroeconomic variables in question had a negative effect on labour share, in line with the stated hypotheses. The two economies which saw no effects are both characterized by a substantial primary sector (mining in Australia, agriculture in New Zealand) and hence were facing volatile international prices: a factor that could distort aggregate business sector indicators.

Table 5. *Estimates of the long-run relationships (narrowly defined labour share as dependent variable)*

Country	DGDP	GAP	INFL	UNEMP	Model	R^2_{adj}	JB	LM	RESET	Hetero.
Australia	-0.001		0.003	-0.001	OLS	0.55	0.61	0.70	0.75	0.29^
	(-1.23)		(2.90)	(-0.57)			(0.74)			
Austria	-0.001	0.001	0.000	0.006	OLS	0.23	6.85	0.11	0.32	0.55*
	(-3.08)	(0.68)	(-0.19)	(1.52)			(0.03)			
Belgium	0.001	-0.004	0.001	0.000	OLS	0.22	1.82	0.14	0.67	0.18*
	(1.66)	(-3.55)	(1.38)	(0.20)			(0.40)			
Canada	*-0.001*		0.000	0.004	OLS	0.18	0.38	0.90	0.26	0.18*
	(-1.85)		(0.12)	(2.21)			(0.83)			
Denmark	0.006	0.001	0.005	-0.005	ARDL	0.94	0.77	0.90	0.60	0.20^
	(1.07)	(0.50)	(5.26)	(-2.10)			(0.68)			
Finland	*-0.027*	-0.004	-0.002	-0.022	ARDL	0.97	0.72	0.22	0.31	0.68^
	(-2.01)	(-0.57)	(-0.36)	(-3.13)			(0.70)			
France	-0.009	-0.009	0.006	-0.010	ARDL	0.98	1.34	0.41	0.46	0.60*
	(-2.83)	(-5.27)	(6.28)	(-5.12)			(0.51)			
Germany	0.008	-0.027	-0.015	-0.026	ARDL	0.98	1.09	0.44	0.70	0.50^
	(0.46)	(-1.09)	(-1.03)	(-2.13)			(0.58)			
Greece	-0.014	-0.009	-0.006	-0.013	ARDL	0.81	1.51	0.66	0.33	0.96^
	(-2.61)	(-4.15)	(-3.61)	(-4.18)			(0.47)			
Italy	-0.001	0.000	0.000	-0.003	OLS	0.35	4.24	0.87	0.52	0.98*
	(-4.48)	(-0.31)	(0.27)	(-1.63)			(0.12)			
Japan	-0.014		0.013	-0.036	ARDL	0.98	0.51	0.92	0.49	0.48*
	(-3.06)		(4.00)	(-2.91)			(0.77)			
Netherlands	0.000	-0.006	0.000	-0.003	OLS	0.24	0.27	0.19	0.86	HW
	(0.43)	(-4.91)	(-0.31)	(-1.06)			(0.88)			
Norway	-0.001		-0.001	-0.040	ARDL	0.90	1.26	0.44	0.32	0.14*
	(-0.08)		(-0.08)	(-2.10)			(0.53)			
Portugal	0.002	-0.012	0.000	-0.014	OLS	0.55	2.63	0.19	0.06	0.31*
	(2.39)	(-6.83)	(-0.37)	(-4.17)			(0.27)			
Spain	0.000	-0.004	-0.001	-0.003	OLS	0.17	0.77	0.06	0.50	0.63*
	(0.74)	(-2.70)	(-1.28)	(-2.59)			(0.68)			
Sweden	-0.002	0.001	0.000	-0.002	OLS	0.18	1.05	0.08	0.09	0.54*
	(-2.78)	(1.00)	(-0.36)	(-0.69)			(0.59)			
UK	-0.011	0.000	0.000	-0.005	ARDL	0.84	4.15	0.48	0.58	0.18*
	(-2.27)	(-0.06)	(0.42)	(-3.08)			(0.13)			
USA	0.022	0.018	-0.005	0.005	ARDL	0.96	0.87	0.19	0.59	0.53^
	(8.59)	(5.06)	(-3.04)	(2.68)			(0.65)			

Note. T-statistics are indicated in parentheses. T-statistics critical values for n=50 are 2.678 (1% level), 2.009 (5% level) and 1.676 (10% level). Statistically significant variables with correct sign are shown in italics (5% significance level) or italicized bold (10% significance level). LM is the Lagrange Multiplier test of error term serial correlation. JB is Jarque-Bera test for normality in residuals (p-values in parentheses). RESET is the functional form test (p-values). Hetero. is White $^{(*)}$ or Breusch-Pagan $^{(\wedge)}$ test of heteroscedasticity. HW represents Huber-White heteroskedasticity-robust standard errors.

Regarding realization failure and wage-lag hypotheses, a negative relationship between GDP growth and labour share was identified in Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, Portugal, Sweden and the UK, and between inflation and labour share in Greece and the US. The negative coefficients for GDP growth appear to be consistent with the assumption of the labour-saving technical change and rising elasticity of substitution of labour for capital. The GDP growth coefficients in several economies (Germany, Greece, Portugal, Spain and the US) may be attributed to the labour-augmenting technical change that was documented in certain cases (Amaral and Nunes, 2009, in Spain and Portugal; Kohli, 2011, and Lawrence, 2015, in the USA).

The negative coefficient for the inflation variable in Greece is puzzling, given the strong power of the Greek collective labour and wages growth in excess of productivity growth in the 1990s and the early 2000s (Manasse, 2015). The negative effect may be related mostly to the 1960-70s period when output growth was accompanied by wage repression, resulting in the decline of labour share from 90% in 1960 to 60% in 1970 (European Commission, 2007: 240), and to the fall in real wages in the post-GFC period (Stuchlik, 2015; Gallant, 2016: 279).

Table 6. *Estimates of the long-run relationships (broadly defined labour share as dependent variable)*

Country	DGDP	GAP	INFL	UNEMP	Model	R^2_{adj}	JB	LM	RESET	Hetero.
Australia	0.000		0.003	-0.002	OLS	0.18	0.28	0.25	0.07	HW
	(-0.84)		(2.14)	(-0.47)			(0.87)			
Austria	-0.001	0.002	0.000	0.012	OLS	0.10	1.05	0.44	0.05	0.60*
	(-1.29)	(1.06)	(-0.08)	(2.16)			(0.59)			
Belgium	*-0.049*	0.030	0.007	-0.031	ARDL	0.94	1.12	0.71	0.12	0.28*
	(-1.94)	(1.75)	(1.49)	(-1.37)			(0.57)			
Canada	-0.052		0.006	-0.060	ARDL	0.80	0.48	0.22	0.43	0.10*
	(-0.69)		(0.56)	(-0.68)			(0.79)			
Denmark	-0.030	0.005	0.000	0.004	ARDL	0.95	0.87	0.11	0.58	0.96^
	(-6.41)	(2.15)	(0.19)	(2.19)			(0.65)			
Finland	-0.043	0.011	0.005	*-0.028*	ARDL	0.93	3.50	0.35	0.81	0.04^
	(-2.63)	(1.14)	(1.22)	(-1.92)			(0.17)			
France	-0.037	*-0.005*	0.003	*-0.007*	ARDL	0.97	1.91	0.43	0.28	0.39^
	(-6.03)	(-1.97)	(3.09)	(-2.05)			(0.39)			
Germany	0.001	-0.007	0.004	-0.006	OLS	0.36	0.56	0.10	0.06	0.10*
	(2.40)	(-5.38)	(2.85)	(-2.56)			(0.76)			
Greece	-0.024	0.002	-0.006	-0.002	ARDL	0.98	1.65	0.14	0.14	0.21^
	(-4.04)	(0.92)	(-2.89)	(-0.49)			(0.44)			
Italy	-0.001	-0.001	0.001	-0.002	OLS	0.22	1.20	0.20	0.23	0.99*
	(-3.01)	(-1.29)	(0.84)	(-0.93)			(0.55)			
Japan	0.000		0.003	0.015	OLS	0.36	0.39	0.43	0.10	0.93*
	(0.51)		(3.66)	(2.56)			(0.83)			
Netherlands	0.001	-0.008	0.000	-0.004	OLS	0.30	0.42	0.22	0.81	HW
	(1.39)	(-6.21)	(-0.21)	(-1.29)			(0.81)			
New Zealand	-0.008		0.007	-0.003	ARDL	0.92	0.92	0.52	0.51	0.04*
	(-2.39)		(4.16)	(-0.87)			(0.63)			
New Zealand	0.000		0.003	0.003	OLS	0.16	6.93	0.66	0.36	0.61*
	(-0.51)		(3.12)	(0.78)			(0.03)			
Portugal	-0.011	-0.011	-0.001	-0.020	ARDL	0.94	0.12	0.44	0.05	0.70^
	(-2.42)	(-2.52)	(-0.45)	(-3.20)			(0.94)			
Spain	0.002	-0.005	0.000	*-0.003*	OLS	0.26	0.73	0.11	0.89	0.81*
	(4.13)	(-3.94)	(-0.10)	(-2.63)			(0.70)			
Sweden	-0.002	0.001	0.000	-0.003	OLS	0.11	0.84	0.07	0.02	0.44*
	(-2.24)	(0.55)	(0.04)	(-0.68)			(0.66)			
UK	*-0.011*	-0.002	0.004	-0.009	ARDL	0.90	2.33	0.17	0.47	0.71*
	(-2.07)	(-0.65)	(3.79)	(-4.28)			(0.31)			
USA	0.021	0.028	*-0.007*	0.010	ARDL	0.90	0.97	0.71	0.64	0.62^
	(3.75)	(2.66)	(-1.95)	(2.27)			(0.62)			

Note: As per Table 5.

In the US, the negative coefficient for the inflation rate is an illustration of the low bargaining power of organized labour in the post-war period and declining real wages. (Western, Healy (1999: 234) demonstrate a decline in manufacturing real wages in the US between 1974 and 1992, in contrast to the slowdown in most other OECD economies. Rosenfeld (2006) discusses the decline in the collective bargaining capacity of labour and in the union membership in the USA.

The positive relationship between inflation rate and labour share (Australia, Denmark, France, Germany, Japan, New Zealand and the UK) appears to support the wage-push hypothesis, which proposes growth in compensation of employees exceeding net revenue growth, or higher wage demands causing greater increases in output prices (Scherer, 1980: 352). Excessive wage growth is documented by Berger, Wolff (2017: 5) in France in the 1998-2017 period, and by Collignon (2016) in Japan, France and Germany during 1995-2015 period, where wages were above equilibrium wages. The Economist Intelligence Unit (2016) likewise indicates pervasive increases in labour costs ahead of productivity in Germany and France in the period of 2010-15.

With regard to the rising strength of labour hypothesis, a significant and negative relationship between the unemployment rate and labour share has been identified in Denmark, Finland, France, Germany, Greece, Italy, Japan, Portugal, Spain and the UK, if a narrowly defined labour share is used, and in Finland, Germany, Greece, Portugal, Spain and the UK, if broadly defined labour share is considered. Significant and positive relationships were identified in Austria, Canada, Denmark, France, Japan and the US. In case of the USA and Japan, a higher unemployment rate is not translated into a lower labour share, due to an increase in the average hours worked by an employee. (OECD (1998: 155) demonstrates that the level of average annual working hours in the US and Japan was consistently higher in the 1960-96 period than in peer OECD economies.) In Austria, Denmark and France, the positive relationship can likely be attributed to an increase in compensation rates (Economist Intelligence Unit, 2016).

Concerning the overhead labour hypothesis, a significant negative relationship between GDP gap and labour share is identified in Belgium, Germany, Greece, France, Netherlands, Portugal and Spain. A positive relationship is shown in Denmark, France and the US. The direct evidence of overhead labour retention and labour-hoarding was scant, as the appropriate level of employment is not observable. Likewise, the majority of studies were confined to the investigation of the hoarding of total labour, rather than overhead labour specifically. In addition, they tended to focus on particular cyclical episodes. Hence, establishing the validity of the above results may be problematic.

Arguably, the negative relationship was observed in a greater number of cases, given the typically wide spread of labour-hoarding. Fay and Medoff (1985) indicate 4% of the blue collar labour hours were being hoarded during the early-1980 recessions in the US. Van den Berge et al. (2014) likewise show disproportionately small layoffs of labour during the 2009 downturn in the Netherlands. On the other hand, all the negative relationships between the GDP gap and labour share that were identified were observed in Europe, thus confirming the earlier result by the OECD (2010) of slow adjustment of total employment to GDP decline in European economies. Why negative relationships were not present in Denmark and France remains a puzzle to be clarified in further research.

As a robustness check and in line with earlier studies, the paper considered the manufacturing capacity utilization ratio as an alternative independent variable. The above-mentioned estimation procedure (bounds test followed by ARDL or OLS estimation) was applied. Whilst results are not comparable with the estimates which have GDP gap as an independent variable (due to their different sample lengths), similar relationships are observed (as shown in Tables 7 and 8 in the Appendix). Additional significant and negative coefficients are obtained for Netherlands (GDP growth rate), New Zealand (manufacturing capacity utilization), Portugal (inflation), Sweden (GDP growth rate) and the US (unemployment).

Overall, a significant and negative coefficient for DGP growth rate was present in 9-10 economies (equations with narrowly and broadly defined labour shares), for GDP gap in 5-6 economies, for unemployment rate in 6-10 economies, and for inflation rate in two economies (Table 9). The estimates for the equation of manufacturing capacity utilization rate do not alter the results dramatically: increases in GDP growth rate decrease labour share in 3-6 economies, whilst increases in unemployment rate decrease labour share in 4-6 economies, respectively. A significant negative relationship between capacity utilisation and labour share is indicated in two and five economies, and between inflation rate and labour share in one economy.

The fact that inflation is an insignificant determinant of labour share in most cases (Greece and the US being the exceptions) requires further investigation into the strength of organized labour in maintaining income share during the inflation periods and the state of income and price policies in the respective economies. In general, the minimal influence of inflation on labour share is consistent with findings by Raffalovich et al. (1992) and Hibbs (1987), and the study of the New Keynesian Phillips Curve in the European economies using sectoral data by Lawless and Whelan (2007). The large number of positive coefficients for inflation is consistent with Metwally and Tamaschke (1983: 781), when it comes to results for Australia, France, Germany and the UK.

Table 9. *Significant regressors with correct sign*

Country	Models with GDP gap as regressor		Models with manufacturing capacity as regressor	
	Dependent variable		Dependent variable	
	LS1	LS2	LS1	LS2
Australia	NONE	NONE		
Austria	DGDP	NONE		
Belgium	GAP	DGDP	DGDP	UNEMP
Canada	DGDP	NONE		
Denmark	UNEMP	DGDP		
Finland	DGDP, UNEMP	DGDP, UNEMP		
France	DGDP, GAP, UNEMP	DGDP, GAP, UNEMP	DGDP	DGDP, CAP, UNEMP
Germany	UNEMP	GAP, UNEMP	CAP, UNEMP	CAP, UNEMP
Greece	DGDP, GAP, INFL, UNEMP	DGDP, INFL		
Italy	DGDP	DGDP	DGDP, UNEMP	DGDP, CAP
Japan	DGDP, UNEMP	NONE		
Netherlands	GAP	GAP	DGDP	NONE
New Zealand		DGDP or NONE		CAP
Norway	UNEMP			
Portugal	GAP, UNEMP	DGDP, GAP, UNEMP	INFL, UNEMP	INFL
Spain	GAP, UNEMP	GAP, UNEMP	CAP, UNEMP	CAP
Sweden	DGDP	DGDP	DGDP, UNEMP	DGDP, UNEMP
UK	DGDP, UNEMP	DGDP, UNEMP		
USA	INFL	INFL	DGDP, UNEMP	NONE
Summary of cases				
DGDP	9	10	6	3
GAP/CAP	6	5	2	5
INFL	2	2	1	1
UNEMP	10	6	6	4

On the other hand, our results contravene the estimates by Alcala-Agullo and Sancho (2000), who identified positive and significant inflation coefficients in 13 OECD economies. However, different studies are conducted on varied samples, hence direct comparison of results may be unwarranted. For Australia, significant coefficients (albeit with an incorrect sign) were obtained only for inflation. This contravenes results by Macri and Sinha, who found support for all three hypotheses. In the US's case, significant coefficients with the correct sign were obtained for inflation rate and GDP gap, thus giving certain support to the 'overhead labour' and 'wage lag' hypotheses, in line with earlier studies.

5. Conclusion

This paper investigated the effect of principal macroeconomic determinants on labour share in OECD economies. The fluctuations in the two labour share indicators (the ratio of labour compensation to national income, and labour share adjusted for mixed income and depreciation) were examined in relation to change in prices, unemployment rate, GDP growth rate, capacity utilization in manufacturing, and GDP gap. Three hypotheses were tested (the realization failure/wage gap, overhead labour, and relative strength of labour). The former two explain labour share in terms of capacity utilization, output and price level, and postulate a fall in labour share during expansions. The latter explains labour share in terms of unemployment and argues that labour share rises in late expansions. A combination of econometric methods was employed: unit root testing, the bounds test for cointegration, the ARDL method to establish short- and long-run relationships, and the conventional OLS method.

The results suggest that in all cases except Australia and Norway, macroeconomic performance conditions functional income distribution, with at least one of the hypotheses finding support. Country-specific patterns in labour share determinants were prominent, thereby precluding broader generalizations. GDP growth rate and unemployment appeared to be the dominant factors, whilst GDP gap, manufacturing capacity utilization and inflation were of lesser importance. Thus, rising strength of labour and wage-lag hypotheses found most support. On the other hand, the results of the study point to the suggestion that in too many cases, macroeconomic factors leave the evolution of labour share unexplained, indicating that the political-economic and structural determinants identified in the literature are likely to be remain salient factors.

The estimates provided do not constitute final confirmation or rejection of the hypotheses. Firstly, given the deep transformation of the national and global economies in past decades, as well as multitude of driving forces of the labour share in addition to those discussed in the paper (privatization, greater openness, the strength of collective labour, amongst others), a more formal procedure may be needed to explicitly incorporate structural breaks (e.g. the Bai-Perron procedure, or unit root tests with structural breaks) into the estimation. Likewise, a separate analysis of the hypotheses (preferably based on the quarterly data) may be required for each sub-period. Secondly, the definition of the overhead labour has to be finessed, e.g. by incorporating the ratio of unproductive supervisory to productive labour, as an intervening variable, in line with Moseley's (1987) suggestion. Thirdly, other variables that could explain labour share – population size, government consumption, manufacturing output and degree of industrialization, gross fixed capital formation – may be considered, as suggested by Metwally and Tamashke (1986). Finally, a decomposition of labour share may be performed to investigate the specific mechanisms through which macroeconomic variables affect labour share (e.g. through changes in the level of employment, or the level of labour compensation or net revenue).

Note

(1) Authors acknowledge the support by University of Malaysia, Sarawak (UNIMAS Special Short Term Grant - F01/SpSTG/1574/2017).

References

Acemoglu, D., 2003. Labor- and Capital-Augmenting Technical Change, *Journal of the European Economic Association*, 1 (1), pp. 1-37.

Alcala-Agullo, F. and Sancho F.I., 2000. Inflation and Factor Shares, UFAE and IAE Working Papers, 460.00, Unitat de Fonaments de l'Anàlisi Econòmica (UAB) e Institut d'Anàlisi Econòmica (CSIC).

Amano, R.A. and van Norden, S., 1992. Unit Root Tests and the Burden of Proof, Bank of Canada, *Working Paper* No. 92-7.

Amaral, L. and Nunes, L., 2009. Two Paths to High Growth and Slowdown: Portugal and Spain, 1950-2007, Proceedings of the Fourth Iberian Economic History Conference, Universidade Nova de Lisboa.

Andersen, T.M., 2001. *The Danish Economy: An International Perspective*. Copenhagen: DJOF Publishing.

Atkinson, A.B., 2009. Factor Shares: The Principal Problem of Political Economy? *Oxford Review of Economic Policy*, 25 (1), pp. 3-16.

Bahmani-Oskooee, M. and Nasir, A.B., 2004. ARDL Approach to Test the Productivity Bias Hypothesis, *Review of Development Economics*, 8 (3), pp. 483-488.

Baran, P. and Sweezy, P., 1966. *Monopoly Capital*. New York: Monthly Review Press.

Bassanini, A. and Duval, R., 2006. Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions, *OECD Economics Department Working Paper* No. 486.

Berger, B. and Wolff, G., 2017. The Global Decline in the Labour Income Share: Is Capital the Answer to Germany's Current Account Surplus?, Bruegel Policy Contribution, Issue No. 12.

Bernanke, B. and Powell, J.L., 1986. The Cyclical Behavior of Industrial Labor Markets: A Comparison of the Prewar and Postwar Eras. In Gordon, R.J. (Ed.) *The American Business Cycle: Continuity and Change*. Chicago: University of Chicago Press.

Bernanke, B., 2000. *Essays on the Great Depression*. Princeton: Princeton University Press.

Blanchard, O., 2006. European Unemployment: The Evolution of Facts and Ideas, *Economic Policy*, 21 (45), pp. 7-59.

Boddy, R., 2007. Cyclical Labor Shares under Keynesian and Neoliberal Regimes, University of Massachussets, Amherst, Political Economy Research Institute.

Boddy, R. and Crotty, J., 1975. Class Conflict and Macro-Policy: The Political Business Cycle, *Review of Radical Political Economics*, 7 (1), pp. 1-19.

Bowles, S. and Boyer, R., 1988. Labor Discipline and Aggregate Demand: A Macroeconomic Model, *American Economic Review*, 78 (2), pp. 395-400.

Bowles, S. and Boyer, R., 1995. Wages, Aggregate Demand, and Employment in an Open Economy: An Empirical Investigation. In Epstein, G. and Gintis, H. (Eds.) *Macroeconomic Policy after the Conservative Era*. Cambridge: Cambridge University Press.

Brenner, R., 2006. *The Economics of Global Turbulence: The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945-2005*. New York: Verso.

Caballero, R. and Hammour, M., 1998. Jobless Growth: Appropriability, Factor Substitution, and Unemployment, *Carnegie-Rochester Conference Series on Public Policy*, 48 (1), pp. 51-94.

Collignon, S., 2016. Wage Imbalances in the European Labour Market. In Talani, L.S. (Ed.). *Europe in Crisis: A Structural Analysis*. Palgrave Macmillan.

Comin, D. and Gertler, M., 2006. Medium-Term Business Cycles, *American Economic Review*, 96 (3), pp. 523-551.

De Serres, A., Scarpetta, S. and De La Maisonneuve, C., 2001. Falling Wage Share in Europe and the United States: How Important is Aggregation Bias?, *Empirica*, 28 (4), pp. 375-400.

Dumenil, G. and Levy, D., 2004. *Capital Resurgent: Roots of the Neoliberal Revolution*. Cambridge: Harvard University Press.

Economist Intelligence Unit, 2016. France: The Secular Slowdown in European Productivity, Available at: <http://country.eiu.com/article.aspx?articleid=1493879133&Country=France& topic=Economy>

Edwards, S. and Holmes, F., 1994. *Economic Trends and Linkages*. Wellington: The National Bank and the Institute of Policy Studies.

Engle, R.F. and Granger, C.W.J., 1987. Co-integration and Error Correction: Representation, Estimation, and Testing, *Econometrica*, 55 (2), pp. 251-276.

European Commission, 2007. *Employment in Europe, 2007*. Luxembourg: Office for Official Publications of the European Communities.

Fay, J.A. and Medoff, J.L., 1985. Labour and Output Over the Business Cycle: Some Direct Evidence, *American Economic Review*, 75 (4), pp. 638-655.

Feldstein, M., 2008. Did Wages Reflect Growth in Productivity? *Journal of Policy Modeling*, 30 (4), pp. 591-594.

Foster, J.B., 1987. What is Stagnation? In Cherry, R. et al. (Eds.) *The Imperiled Economy: Macroeconomics From a Left Perspective*. New York: Union for Radical Political Economics.

Gallant, T.W., 2016. *Modern Greece: From the War of Independence to the Present*. London: Bloomsbury.

Glyn, A. and Sutcliffe, R.B., 1972. *British Capitalism, Workers and the Profits Squeeze*. Harmondsworth: Penguin.

Goldstein, J.P., 1986. Mark-up Pricing over the Business Cycle: The Microfoundations of the Variable Mark-up, *Southern Economic Journal*, 53 (1), pp. 233-246.

Goldstein, J.P., 1996. The Empirical Relevance of the Cyclical Profit Squeeze: A Reassertion, *Review of Radical Political Economics*, 28 (4), pp. 55-92.

Gordon, D., Weisskopf, T. and Bowles, S., 1987. Power, Accumulation and Crisis. In Cherry, R. et al. (Eds.) *The Imperiled Economy: Macroeconomics From a Left Perspective*. New York: Union for Radical Political Economics.

Hahnel, R. and Sherman, H., 1982. Income Distribution and the Business Cycle: Three Conflicting Hypotheses, *Journal of Economic Issues*, 16 (1), pp. 49-73.

Henley, A., 1987. Labour's Shares and Profitability Crisis in the US: Recent Experience and Post-War Trends, *Cambridge Journal of Economics*, 11 (4), pp. 315-330.

Henricsson, R. and Lundback, E., 1995. Testing the Presence and the Absence of Purchasing Power Parity: Results for Fixed and Flexible Regimes, *Applied Economics*, 27 (7), pp. 635-641.

Hibbs, D., 1987. *The American Political Economy*. Cambridge: Harvard University Press.

Izyumov, A. and Vahaly, J., 2014. Recent Trends in Factor Income Shares: A Global Perspective, *Journal of Economic Studies*, 41 (5), pp. 696-707.

Jayadev, A., 2007. Capital Account Openness and the Labour Share of Income, *Cambridge Journal of Economics*, 31 (3), pp. 423-443.

Johansen, S., 1988. Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*, 12 (2-3), pp. 231-254.

Johansen, S. and Juselius, K., 1990. Maximum Likelihood Estimation and Inferences on Cointegration with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, 52 (2), pp. 169-210.

Kaldor, N., 1961. Capital Accumulation and Economic Growth. In Lutz, F.A. (Ed.), *The Theory of Capital*, London: Macmillan.

Kalecki, M., 1954. *Theory of Economic Dynamics*. London: Allen and Unwin.

Kohli, U., 2011. Total Factor Productivity and Factor Augmenting Technological Change, Paper Presented at the EMG Workshop, University of New South Wales, December.

Kraemer, H.M., 2011. Bowley's Law: The Diffusion of an Empirical Supposition into Economic Theory, *Papers in Political Economy*, 61 (2), pp. 19-49.

Kremers, J.J., Ericson, N.R. and Dolado, J.J., 1992. The Power of Cointegration Tests, *Oxford Bulletin of Economics and Statistics*, 54 (3), pp. 325-347.

Kwiatkowski, D., Phillips, P.C.B., Schmidt, P. and Shin, Y., 1992. Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root, *Journal of Econometrics*, 54 (1-3), pp. 159-178.

Lawless, M. and Whelan, K., 2007. Understanding the Dynamics of Labor Shares and Inflation, European Central Bank, Working Paper Series No. 784, pp. 1-44.

Lawrence, R.Z., 2015. Recent Declines in Labor's Share in US Income: A Preliminary Neoclassical Account, Peterson Institute for International Economics, *Working Paper,* pp. 15-10.

Macri, J. and Sinha, D., 1999. An Empirical Study of Labour's Share in Income for Australia, *MPRA Paper* No. 4018.

Manasse, P. 2015. What Went Wrong in Greece and How to Fix It: Lessons for Europe from the Greek Crisis, Centre for Economic Policy Research Policy Portal, VoxEu Comment, available at <http://voxeu.org/article/what-went-wrong-greece-and-how-fix-it>

Metwally, M.M. and Tamaschke, H.U., 1983. The Effect of Inflation and Technology on Factor Shares, *Applied Economics*, 15 (6), pp. 777-791.

Metwally, M.M. and Tamaschke, H.U., 1986. A Note on the Determinants of the Cost Structure of Gross Domestic Product: A Cross Country Analysis, *Economic Analysis and Policy*, 16 (2), pp. 137-144.

Mohun, S. 2006. Distributive Shares in the US Economy, 1964-2001, *Cambridge Journal of Economics*, 30 (3), pp. 347-370.

Mohun, S. 2014. Unproductive Labour in the US Economy, 1964-2010, *Review of Radical Political Economics*, 46 (3), pp. 355-379.

Moseley, F. 1987. The Profit Share and the Rate of Surplus Value in the US Economy, 1975-85, *Cambridge Journal of Economics*, 11 (4), pp. 393-398.

Munley, F. 1981. Wages, Salaries, and the Profit Share: A Reassessment of the Evidence," *Cambridge Journal of Economics*, 5 (2), pp. 159-173.

Narayan, P.K., 2004. Reformulating Critical Values for the Bounds F-Statistics Approach to Cointegration: An Application to the Tourist Demand Model for Fiji, Monash University, *Department of Economics Discussion Paper* No. 02/04.

Narayan, P.K., 2005. The Saving and Investment Nexus for China: Evidence from Cointegration Tests, *Applied Economics*, 37 (17), 1979-1990.

OECD, 1998. Employment Outlook, June 1998. Paris: OECD Publications.

OECD, 2010. Employment Outlook 2010. Paris: OECD Publications.

Pesaran, M.H., 1997. The Role of Economic Theory in Modelling the Long-Run, *Economic Journal*, 107 (440), pp. 178-191.

Pesaran, M.H., Shin, Y. and Smith, R.J., 2001. Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16 (3), pp. 289-326.

Phillips, P.C.B. and Perron, P., 1988. Testing for Unit Roots in Time Series Regression, *Biometrica*, 75 (2), pp. 335-346.

Raffalovich, L.E., Leicht, K.T. and Wallace, M., 1992. Macroeconomic Structure and Labor's Share of Income: United States, 1950 to 1980, *American Sociological Review*, 57 (2), pp. 243-258.

Rosenfeld, J., 2006. Desperate Measures: Strikes and Wages in Post-Accord America, *Social Forces*, 85 (1), pp. 235-265.

Ryan, P., 1996. Factor Shares and Inequality in the UK, *Oxford Review of Economics and Statistics*, 12 (1), pp. 106-126.

Scherer, F.M., 1980. *Industrial Market Structure and Economic Performance*. Boston: Houghton Mifflin.

Schmidt, T. and Vosen, S., 2013. Demographic Change and the Labour Share of Income, *Journal of Population Economics*, 26 (1), pp. 357-378.

Sherman, H., 1991. *The Business Cycle: Growth and Crisis under Capitalism*. Princeton: Princeton University Press.

Stuchlik, A., 2015. *Wage Developments in the Euro Area. Increasingly Unequal?* Brussels: European Parliament Research Service.

Torrini, R., 2005. Profit Share and Returns on Capital Stock in Italy: The Role of Privatisations Behind the Rise of the 1990s, *Centre for Economic Performance Discussion Paper* No. 671.

Van Den Berge, W., Erken, H., De Graaf-Zijl, M. and Van Loon, E., 2014. *The Dutch Labour Market during the Great Recession*. The Hague: CPB Netherlands Bureau for Economic Policy Analysis.

Vaona, A., 2011. An Empirical Investigation into the Gravitation and Convergence of Industry Return Rates in OECD Countries, *International Review of Applied Economics*, 25 (4), pp. 465-502.

Weisskopf, T.E., 1979. Marxian Crisis Theory and the Rate of Profit in the Postwar US Economy, *Cambridge Journal of Economics*, 3 (4), pp. 341-378.

Western, B. and Healy, K., 1999. Explaining the OECD Wage Slowdown. Recession or Labour Decline? *European Sociological Review*, 15 (3), pp. 233-249.

Appendix

Table 2. *Unit root test results (the levels of the dependent variables)*

Country	LS1				LS2			
	PP	KPSS	DF-GLS	ERS	PP	KPSS	DF-GLS	ERS
Australia	-1.16	0.50			-2.25	*0.26*	-1.92	5.00
Austria	-0.92	0.87			-2.22	*0.19*	-1.34	11.86
Belgium	-2.41	*0.18*	-1.11	11.65	-2.68	0.39		
Canada	-1.95	0.80			-2.52	0.39		
Denmark	-1.26	0.76			-2.80	0.80		
Finland	-1.62	0.80			-2.27	*0.16*	-1.64	6.50
France	-1.40	0.70			-1.82	0.38		
Germany	-0.83	0.80			-2.64	*0.19*	-1.05	24.39
Greece	-2.72	0.37			-0.41	0.90		
Italy	-1.55	0.83			-1.61	*0.15*	-1.31	7.16
Japan	-0.91	0.67			-2.55	0.76		
Netherlands	-1.07	0.73			-2.85	*0.24*	-1.69	8.98
New Zealand					-1.80	*0.19*	-1.42	8.57
Norway	-1.29	0.77						
Portugal	-1.49	0.52			-2.19	*0.24*	-2.46	2.20
Spain	-0.37	0.91			-2.31	0.69		
Sweden	-1.65	0.68			-2.75	*0.11*	-2.53	2.65
UK	-2.10	*0.22*	-1.98	4.04	-1.85	0.36		
USA	-0.96	0.82			-1.81	0.71		

Note: PP test (constant, no trend) 1%, 5% and 10% critical values are -3.560, -2.917 and -2.597; KPSS test (constant, no trend) 1%, 5% and 10% critical values are 0.739, 0.463 and 0.347; DF-GLS test (constant, no trend) 1%, 5% and 10% critical values are -2.609, -1.947; ERS PO test (constant, no trend) 1%, 5% and 10% critical values are 1.876, 2.981 and 3.931. Unit root null (PP test) at 1% level is shown in bold; stationarity null (KPSS) at 5% level is shown in bold and italics.

Table 7. *Bounds test and estimates of the long-run relationships (narrowly defined labour share as dependent variable, manufacturing capacity utilization as regressor)*

Country	Model - URC	F-statistics	ECT t-ratio	Model	DGDP	CAPUTIL	INFL	UNEMP	R^2_{adj}	JB	LM	RESET	Hetero.
Belgium	(2,0,2,0,0) S	2.642		OLS	-0.003	0.005	0.000	-0.001	0.21	1.32	0.25	0.06	HW
					(-2.12)	(1.44)	(0.40)	(-0.60)		(0.52)			
France	(2,1) FIX	2.679		OLS	-0.003	0.006	0.003	0.002	0.49	1.21	0.57	0.59	HW
					(-3.75)	(2.49)	(2.64)	(1.20)		(0.55)			
Germany	(4,3,0,0,1) A	1.330		OLS	0.000	-0.164	0.002	-0.004	0.43	0.51	0.09	0.25	HW
					(-0.56)	(-5.83)	(2.54)	(-3.19)		(0.77)			
Italy	(1,0,1,0,0) S	1.083		OLS	-0.003	0.036	0.000	-0.003	0.53	0.32	0.18	0.11	0.68*
					(-5.68)	(5.86)	(0.22)	(-2.10)		(0.85)			
Netherlands	(1,1,0,1,0) S	0.963		OLS	-0.002	-0.095	-0.001	-0.003	0.42	2.02	0.99	0.43	HW
					(-2.57)	(-0.86)	(-1.01)	(-1.36)		(0.36)			
Portugal	(3,0,0,0,0) S	11.219	-5.797	ARDL	-0.002	-0.430	-0.005	-0.018	0.89	1.16	0.13	0.85	0.57^
					(-0.46)	(-0.96)	(-2.25)	(-3.96)		(0.56)			
Spain	(4,4,3,1,4) A	1.257		OLS	0.001	*-0.086*	-0.001	-0.001	0.37	0.96	0.50	0.32	0.72^
					(1.68)	(-1.73)	(-1.17)	(-2.83)		(0.62)			
Sweden	(2,0) Fixed	7.209	-4.099	ARDL	-0.007	0.089	-0.002	-0.005	0.72	0.09	0.33	0.90	0.36*
					(-2.17)	(0.44)	(-0.93)	(-2.35)		(0.96)			
USA	(2,1) FIX	1.064		OLS	-0.002	0.006	0.001	*-0.003*	0.16	1.81	0.15	0.19	0.90*
					(-2.59)	(2.03)	(1.58)	(-1.94)		(0.41)			

Note: T-statistics are indicated in parentheses. T-statistics critical values for n = 50 are 2.678 (1% level), 2.009 (5% level) and 1.676 (10% level). Statistically significant variables with correct sign are shown in italics (5% significance level) or italicized bold (10% significance level). LM is the Lagrange Multiplier test of error term serial correlation. JB is Jarque-Bera test for normality in residuals (p-values in parentheses). RESET is the functional form test (p-values). Hetero. is White (*) or Breusch-Pagan (^) test of heteroscedasticity. HW represents Huber-White heteroskedasticity-robust standard errors.

Table 8. *Bounds test and estimates of the long-run relationships (broadly defined labour share as dependent variable, manufacturing capacity utilization as regressor)*

Country	Model - URC	F-statistics	ECT t-ratio	Model	DGDP	CAPUTIL	INFL	UNEMP	R^2_{adj}	JB	LM	RESET	Hetero.
Belgium	(1,1) FIX	4.010	-4.787	ARDL	-0.012	0.872	0.008	*-0.028*	0.89	0.94	0.11	0.65	HW
					(-0.99)	(1.46)	(1.45)	(-1.92)		(0.63)			
France	(3,0,2,4,0) S	6.487	-6.208	ARDL	*-0.013*	-2.484	-0.002	*-0.016*	0.98	1.32	0.32	0.96	0.07^
					(-1.94)	(-3.18)	(-0.81)	(-1.78)		(0.52)			
Germany	(2,1) FIX	1.867		OLS	0.001	-0.295	0.002	-0.004	0.59	1.57	0.45	0.18	0.71^
					(2.81)	(-8.36)	(2.20)	(-2.33)		(0.46)			
Italy	(1,0,1,0,0) S	2.218		OLS	-0.002	-0.176	0.000	-0.002	0.57	2.68	0.58	0.45	0.61^
					(-2.79)	(-3.65)	(1.21)	(-1.23)		(0.26)			
Netherlands	(1,1,0,2,4) S	1.025		OLS	-0.001	-0.166	-0.001	-0.003	0.38	1.01	0.97	0.31	0.07*
					(-1.58)	(-1.15)	(-0.84)	(-1.44)		(0.60)			
New Zealand	(4,1) Fixed	4.951	-6.095	ARDL	0.003	*-2.616*	0.001	-0.015	0.93	1.20	0.24	0.08	0.19^
					(0.60)	(-1.93)	(0.28)	(-1.53)		(0.55)			
Portugal	(3,3,0,3,0) S	7.975	-6.695	ARDL	-0.005	0.412	*-0.002*	-0.002	0.80	4.17	0.11	0.45	0.39^
					(-1.29)	(1.21)	(-1.72)	(-0.56)		(0.12)			
Spain	(4,0,2,0,1) S	2.096		OLS	0.001	-0.125	0.000	-0.000	0.32	0.79	0.79	0.94	0.91^
					(3.48)	(-2.29)	(0.78)	(-0.39)		(0.67)			
Sweden	(2,1) FIX	1.792		OLS	-0.010	0.027	0.001	-0.018	0.67	0.27	0.55	0.25	0.99*
					(-7.74)	(6.35)	(0.89)	(-6.42)		(0.87)			
USA	(4,1,2,1,0) A	5.026	-6.265	ARDL	0.008	0.238	0.002	0.004	0.94	1.70	0.18	0.90	0.07^
					(2.97)	(2.20)	(1.86)	(1.57)		(0.43)			

Note: As per Table 7.