Stability of the labour shares: evidence from OECD economies.

D., Ivan

Kolej Yayasan Saad (KYS) Business School, Malaysia

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Stability of the labour shares: evidence from OECD economies

Ivan D. Trofimov, Kolej Yayasan Saad (KYS Business School)

Abstract

In light of ongoing concern about rising inequality in the developed economies, this paper revisits the old standing issue of the stability of the labour share. The paper focuses specifically on the empirical aspect of the problem and considers statistical properties of the labour share in OECD economies over 1960-2014 period, using a battery of time series models and unit root tests. We account for structural changes in labour share using Lagrange Multiplier (LM) unit root tests with up to two structural breaks, address the problem of heterogeneous level shifts using LM panel unit root test, and examine four types of statistical patterns (trend stationarity, mean reversion, random walk with and without drift) using Augmented Dickey-Fuller (ADF) test. Empirical results indicate diverse patterns in labour share movements, with downward deterministic trend with break(s) being the most preponderant. The upward trends are observed in a limited set of economies (Belgium, Luxembourg, and Netherlands). Overall, the stability of labour share hypothesis appears to find only weak support. Exploratory analysis demonstrates that most of the structural breaks are economically significant, short-term fluctuations in series correlate strongly with business cycle turning points, whilst medium-term movements in labour share are adequately explained in terms of broader political and also country-specific factors.

Keywords: Labour share, unit root, trend, factor distribution of income

JEL Classification: C22, D33, N10, P17

1 - Introduction

The issue of functional distribution of national income has been a cornerstone and a main thread in the classical political economy of the 19th century. While frequently being superseded in modern economics by other related topics (such as personal income distribution) and receding into the background, it has recently been considered topical again, following works by Blaug (1996), Atkinson (2009), Glyn (2009), and Piketty (2014). Hailed as "the principal problem of political economy" (Atkinson, 1996: 3), functional distribution matters for several reasons.

Firstly, if instability of labour share is validated, the next step would be to establish the factors that caused instability and to consider implications of instability for other models and theories (e.g. for production function models, such as Cobb-Douglas model, that conventionally assumed fixed factor shares). Secondly, an unstable (or more specifically falling) labour share may affect the personal income distribution (Ryan, 1996). Thirdly, if stability of labour share is proven to hold, the re-distribution arguments (e.g. demands of unions and workers for higher or "fair" labour share and higher wages) would be weakened: any attempts to increase wages and labour share above "natural" or equilibrium level would cause distortions in the labour market, respectively higher unemployment.

As stated by Solow (1958), the stable labour share in national income or stable ratio of labour to capital income may hold only if movements in the relative prices of labour and capital and exactly offset by contrary movements in quantities of factors. In a similar vein, Kaldor (1956) attributed constant labour share to constant savings-output ratio, with propensities to save out of wages being offset by propensities to save out of profits. Lebergott (1964) likewise argued that stable factor shares would imply stable relative price of labour to capital, based on proportional changes of wages costs in capital-producing and capital-using industries. A counter-argument has been that such proportionality can hardly be ensured, as it also requires proportionate changes in rate of return on capital and capital productivity (Alterman, 1964). Another argument against labour share stability has been put by Johnson (1954), attributing long-run increase of labour share to structural changes in the economy (decline of agriculture where labour share of output is particularly low), the growing prominence of

government contribution to GDP in the form of government employees' compensation, the decreasing proportion of unincorporated businesses in total labour force.

This theoretical debate as to (im-)possibility of stable factor shares (reviewed in detail by Scitovsky, 1964) has not been concluded and got revived in recent years (with focus shifting to the determinants of and directions in labour share), but statistical analysis would be instrumental in giving support to any of these explanations.

The purpose of this paper is to provide, given new data made available in recent years, statistical evidence of stability of (or in contrast trends in) labour share and thereby complement previous theoretical debate. In addition, the paper includes some exploratory analysis of the possible drivers of labour share fluctuations, economic significance of empirical results and of the validity of existing theoretical explanations in light of empirical findings. The paper considers both medium-term movements in labour share (i.e. changes over three to four decades, and across business cycles), as well as short-term fluctuations (e. g. during turning points in the business cycle).

The balance of the paper is organised as follows. Section II reviews the empirical literature pertaining to labour share measurement and labour share determinants. Section III discusses the methodological issues relating to the empirical testing. Section IV provides the empirical results and attempts to establish their statistical and economic significance. Section V summarises the paper.

2 - Literature review

The empirical studies relating to the behaviour of factor shares principally concerned constructing comprehensive datasets of the factor share series, as well as explaining the trends in factor shares. Dataset construction included Rodriguez and Jayadev (2013), Karabarbounis and Neiman (2014), Guerriero and Sen (2012) and Penn World Table and Extended Penn World Table projects (Heston et al, 2011; Foley, Marquetti, 2012) for a range of developed and developing economies, Neira Barria (2012) and Tosoni (2014) for Latin American economies, Kraemer (2011a) for a set of developed economies, among others. Dataset construction by institutional bodies included AMECO database by the European Commission, and Structural Analysis Database by OECD. Most of the datasets spanned several decades, including either most recent ones or the entire post-WWII period. Historical datasets dating back to 1930s or the 19th century were provided by Piketty (2014) and Bengtsson and Waldenstrom (2015) mostly for a small set of industrialised and some of the developing economies.

Regarding the dynamics of factor shares, Krueger (1999) and Jones (2005) pointed to the significant variation of labour share in the US and OECD economies. Piketty (2014) argued that labour share exhibits downward trend and at present is at one of the lowest level in over a century. Rodriguez and Jayadev (2013), using economy-wide and manufacturing sector data established the decline in labour share at national, regional and global level, caused by falls in "intra-sector labour shares as opposed to movements in activity towards sectors with lower labour shares."(p. 1). The labour share deterioration tendency was also confirmed by Atkinson (2009), Carter (2007), Bentolila and Saint Paul (2003) and Dunhaupt (2012).

The forces that potentially caused decline in the labour share (and rise of profit share) in recent decades included: capital accumulation and capital-augmenting technical change (Bentolila, Saint Paul, 2003; Raurich et al, 2012), changes in relative prices of investment goods (Blanchard, 1997), technological factors associated with the increased use of IT-based capital goods and faster obsolescence of capital goods (Ellis, Smith, 2007), financialisation and the increasing role of financial motives, financial actors and institutions in the operations of the economy (Dunhaupt, 2012), deregulation of labour markets and weakening of labour bargaining power (Blanchard, Giavazzi, 2003; Kristal, 2010), privatisation (Torrini, 2005; Azmat et al, 2011), globalisation and greater trade openness (Guscina, 2006; Elsby et al, 2013), foreign direct investment and stronger financial

capital flows (Furceri, Loungani, 2015), various short-run macroeconomic factors, such as exchange rate and oil price changes (Dombrecht, Moes, 1998).

On the other hand, several authors contend that deterioration in labour share has not been universal. In the context of East Asian economies (Hong Kong, Singapore, South Korea and Taiwan), Young (1995) demonstrated that factor shares were relatively stable from 1960s to 1990s. Likewise, according to Giammarioli et al (2002), the decline of labour share was more pronounced in the continental Europe, while in Anglo-Saxon economies it remained stable.

Regarding factors that could have positive effect on labour share, several are mentioned: democratic rule (Rodrik, 1999), offsetting shifts in different industries that keep aggregate labour share stable (Young, 2010), technological innovation and trade openness (Guerriero, Sen, 2012: 31).

While considerable effort has been made in construction of labour and capital share series and in identification of relevant driving forces, little or no empirical analysis has been conducted to establish stability (or its absence) of factor shares. Although a visual examination of series may suggest that labour share is in decline, a more formal analysis is needed to confirm this hypothesis.

Formal statistical analysis could help resolving the old-standing controversy, as to whether stability of the labour share is "illusion" or even "mystery", lacking theoretical basis (Keynes, 1939: 48; Schumpeter, 1939: 575; Solow, 1958), or indeed a "stylized fact" (Kaldor, 1961) or even a law (*Bowley's Law*, Bowley, 1920).

3 - Econometric methodology

3.1 Data

Labour share data has been obtained from European Commission AMECO database. Labour share variable (ALDC0 code in AMECO database) was defined as the ratio of compensation of employees for the total economy to the number of employees in all domestic industries, divided by the ratio of GDP at market prices to employment in persons in all domestic industries. The adjusted labour share was thereby obtained by imputing the average employees' compensation to the self-employed based on labour force composition. This way, the adjusted labour share of GDP is calculated (that is greater than wage share), and the systematic downward bias in labour share is eliminated (Gollin, 2002, Ellis, Smith, 2007), as correct figure that includes the incomes of self-employed agents and income of owners of unincorporated businesses is obtained. Labour share was measured at factor costs, thereby removing the values of depreciation, and taxes on production and imports, and adding back the values of subsidies. This would give more precise estimates, since these items do not represent returns to production factors (Guerriero, 2012).

This adopted labour share measure is likely to be superior to other used in empirical work. Firstly, it is more robust than adjusted labour share calculated by allocating 2/3 of the mixed income from self-employment to labour income (Johnson, 1954), which appears to be an arbitrary procedure that also does not account for variation of labour and capital income proportions over time. Secondly, allocation of all mixed income to labour income (Kravis, 1959) would overstate labour share, particularly in the developed economies, since self-employment does generate some capital income. Thirdly, the adopted measure does not rely on the assumption of the same labour and capital income proportions in the self-employment sector and unincorporated enterprises as in the rest of the economy and corporate sector (Atkinson, 1983).

The period covered for each economy was set sufficiently long to examine variation of the labour share, spanning 1960 to 2014 for all economies in question except Iceland (where sample included 1970-2014 observations). The paper considers following developed economies – Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, UK, and USA.

3.2 Model

As a first step, a log-linear trend model was estimated in the following form:

$$\ln(LS)_{it} = c_i + \beta_i t + \mu_{it} \qquad (1)$$

,where LS denotes labour share for country i in year t, t is the year of observation, and μ_{it} is a random disturbance term. The trend value is given by β_i that represents average annual change in labour share ratio for country i over the period. Specifically $\beta > 0$ indicates increase in labour share, while $\beta < 0$ points to its deterioration. The possibility of serial correlation dictates that the model is estimated with AR terms: to this end, Prais-Winsten procedure is employed. By removing autocorrelation whilst retaining the first observation, Prais-Winsten transformation improves model efficiency (Doran, 1981; Wang, Jain, 2003: 85).

It is acknowledged (Nelson, 1987) that if dependent variable is non-stationary, the OLS estimator may turn out to be inefficient, resulting in spurious trend results (statistically significant trend when none is in fact present). To address this potential problem, we adopt an autoregressive specification of equation (1) that includes trend- and difference-stationarity (Bleaney, Greenaway, 1993; Athukorala, 2000). When re-parametrized in differences and lagged variables it takes the form of Augmented Dickey-Fuller (ADF) test regression as follows:

$$\Delta \ln LS_{it} = c + \beta_i t + \sum_{i=1}^{m} E^* \Delta \ln LS_{t-1} + \Phi \ln LS_{t-m} + \mu_t \qquad (2)$$

,where $\Phi = -\left(I - \sum_{i=1}^{m} E^* \right)$ and long-run trend in labour share is $b = -\beta\Phi^{-1}$. The model incorporates four alternative hypotheses: the presence of deterministic trend ($\beta < 0, \Phi < 0$ or $\beta > 0, \Phi < 0$), reversion to historical mean ($\beta = 0, \Phi < 0$), random walk with drift ($\beta < 0, \Phi = 0$ or $\beta > 0, \Phi = 0$), and random walk without drift ($\beta = 0, \Phi = 0$). Equation (2) is conceptualised as ideal error-correction model if coefficient Φ (the error-correction term) is significant and belongs to $-1 < \Phi < 0$ (Bleaney, Greenaway, 1993: 351). In this case, change in LS is negatively related to its current level with LS being pulled back to deterministic trend or historical mean. In contrast, when $\Phi = 0$, no such reversion occurs and random walk patterns are present.

We also implement more robust unit root tests to confirm presence (absence) of trend stationarity, specifically Lee-Strazicich univariate and panel Lagrange Multiplier (LM) unit root tests with up to two structural breaks (Lee, Strazicich, 2003, 2004; Im et al, 2005).

Both univariate and panel versions of LM test were implemented using Model C, allowing for two shifts in the intercept and trend. Breaks were considered to occur at unknown time and were determined endogenously through a grid search over [0.1T; 0.9T] interval, where T is the number of observations in the sample. The null hypothesis was presence of unit root with up to two breaks, while an alternative hypothesis was trend stationarity with up to two breaks.

The test statistic was estimated using following equation:

$$\Delta LS_t = d' \Delta Z_t + \phi \tilde{S}_{t-1} + \sum \delta_i \Delta \tilde{S}_{t-i} + \varepsilon_t \qquad (3)$$

,where $\tilde{S}_t$ is de-trended series, ε_t is an independently and identically distributed error term, Z_t is a vector of exogenous variables, ϕ is a relevant estimator used in calculating minimum LM statistic. The latter is defined as $LM = \inf_{\lambda} \tau(\lambda)$, where λ is break location, and τ is a ratio of estimator ϕ to its standard deviation. The number of augmenting terms ΔS_t (included to correct for serial correlation) was obtained through a general-to-specific procedure, with the maximum number of augmenting terms k was set at $k_{\max} = 8$.

The panel LM unit root test is performed to ensure greater robustness of results, given low power of univariate tests in small samples (Shiller, Perron, 1985). The panel LM test statistic is calculated as an average of univariate LM test statistics for each economy in the panel, as follows:

$$\bar{LM}_{NT} = \frac{1}{N}\sum_{i=1}^{N} LM_i^{\tau} \qquad (4)$$

The standardised panel LM test statistics is calculated using expected value and variance of LM_i^{τ}, i.e. $E(L_T)$ and $V(L_T)$ contained in Im et al (2005). Due to possibility of heterogeneous autocorrelation errors, these values are selected based on the weighted average of k determined by univariate LM test for individual economies.

The standardised panel LM test statistics is thus given as:

$$\Gamma_{LM} = \frac{\sqrt{N}[\bar{LM}_{NT} - E(L_T)]}{\sqrt{V(L_T)}} \qquad (5)$$

The univariate models (log-linear trend, ADF, and LM tests) were implemented sequentially. The trend and ADF models were estimated initially with no structural dummies, and if diagnostic problems appeared (heteroscedasticity, serial correlation and non-normality of residuals) were re-estimated with dummies and/or additional lag terms. The structural breaks and respective dummies in ADF and trend models were determined through a combination of procedures (residuals from ADF regressions, recursive residuals, N-step forecasts and Quandt-Andrews test).

Univariate LM test was first implemented with two structural breaks. If only one break was significant (i.e. only one trend dummy variable D_t was significant), LM test with one break was performed (irrespective of acceptance or rejection of the null hypothesis). In no breaks were significant, the LM unit root test with no breaks (Schmidt, Phillips, 1992) was implemented.

We consider the possibility that three univariate tests (log-linear trend model, ADF, and univariate LM tests) and visual inspection may be delivering conflicting results. In this case, an eclectic procedure is adopted. It has been well known (Kendall, 1953) that *ad hoc* visual inspection without sensible statistical model is prone to delivering spurious results and patterns, and hence visual inspection is performed in conjunction with formal tests and based on the analysis of economic significance of labour share changes. With regard to log-linear trend model, several authors (Granger, Newbold, 1974; Nelson, 1987) indicate likelihood of spurious trends, while others argue that trend models are valid and robust (Canjels, Watson, 1997; Kakwani, 1997), as long as asymptotically valid inference is possible and efficient estimators are available. Dickey-Fuller methodology suffers several shortcomings: specifically false non-rejection of null hypothesis of unit root when structural breaks are not considered; low power against alternative hypothesis of stationarity when large autoregressive root is present; tendency to over-reject the null when series contain large negative MA root. At the same time,

given that conventional unit root tests results are not definitive sources of information about the series but are rather results of exploratory procedure (Mahadeva, Robinson, 2004: 12), and that a general form of ADF test adopted allows testing multiple hypotheses and detecting a variety of statistical patterns, the respective results are seen informative.

Lagrange Multiplier tests are superior to ADF and standard unit root tests (Perron, 1989), as well as many of the unit root tests with structural breaks: in contrast to Perron tests, they determine the timing of the breaks endogenously; in contrast to Zivot-Andrews and Lumsdaine-Papell tests they allow for unit root behaviour with breaks under null hypothesis and hence can convincingly accept/reject unit root null (Christiano, 1992; Lee, Strazicich, 2003). Thereby, we consider them as the principal analytical instrument to make inference.

The six alternative outcomes are possible. 1). If all three tests point to trend in series (with or without breaks), it is concluded that labour share is not stable and earlier balanced growth assumptions are less justified. 2). The similar conclusion is reached (albeit is a weaker form), if univariate LM tests suggest trend (with one or two breaks) and one of the other procedures adopted points to the same. 3). If univariate LM tests reject trend hypothesis, and only one of the other tests indicates the trend while the other does not, we conclude that no trend (with or without breaks) was present. 4). Likewise, if univariate LM tests indicate trend hypothesis, but two other tests do not, the conclusion is that there is no trend (with or without breaks). 5). If all three tests point to non-deterministic behaviour, the trend is not present. 6). If results of ADF and log-linear trend models override the results of LM tests (the former suggest trends, while the latter do not), no conclusion is reached, and further testing is required. With outcomes 3), 4) and 5), the series tend to revert to historical mean (particularly when ADF points to mean reversion), and hence labour share is considered stable in line with predictions by Kaldor (1961) and Bowley (1920). Alternatively, labour share is seen to follow random walk, with or without drift, and no definite conclusions regarding its future direction are possible.

4 - Empirical analysis

4.1 Tests' results

The visual observation of the labour share series (Figure 1) suggests that in most economies the level of labour share at the end of the sample period was lower than at the beginning of the period. Belgium, Denmark, Luxembourg and Netherlands stand as exceptions, showing positive changes in labour share. In other economies, decline in labour share was observed, either without major breaks in the series (the case of the USA), or with changes in the intercept of the series (Greece), with temporary increases (Australia, Portugal), or possibly with stepwise decline (Norway). In several instances, the labour share appeared to show no distinct patterns or tendencies (Iceland). In terms of magnitude of changes, the largest or precipitous declines were observed in Greece and Ireland (with labour share standing in 2014 at 68.8% and 67.0% of its level in 1960 respectively), and the largest increases in Luxembourg (20.9% increase over the period). It is acknowledged that inspection of time plots or estimation of log-linear trend models may lead to spurious trend results and invalid inference, and thereby ADF regression is considered.

[Figure 1, Appendix]

The results of log-linear trend model with Prais-Winsten transformation are presented in Table 1. The negative trend was present in 18 out of 21 economies, and positive trends were identified in three economies (Belgium, Luxembourg and Netherlands). Out of 18 negative trends, 12 were found to be statistically significant (at 1% or 5% level, with the exception of Sweden, where downward trend was significant at 10% critical level). Out of 3 positive trends, only two were significant (In Belgium and Luxembourg). The largest statistically significant declines in labour share occurred in Ireland, Greece and Norway (-43.63%, -31.14% and -27.75% respectively), the smallest in the UK (-7.60%). The largest statistically significant increase was experienced in Luxembourg (17.49%). These results are in concordance with visual inspection of series.

Table 1: Log-linear trend model estimates

Country	Trend	Cumulative change (%)	p-value	rho	Break	Model
Austria	-0.0032	-17.49	0.00	0.85		TS
Australia	-0.0017	-9.29	0.22	0.91	1974	
Belgium	0.0016	8.85	0.14	0.94		
Canada	-0.0023	-12.34	0.00	0.73		TS
Denmark	-0.0007	-3.62	0.35	0.83		
France	-0.0016	-8.47	0.14	0.96	1975	
Finland	-0.0038	-20.51	0.00	0.84		TS
Germany	-0.0018	-9.69	0.01	0.89		TS
Greece	-0.0058	-31.14	0.01	0.91		TS
Iceland	-0.0020	-8.87	0.12	0.63	2009 or 1983	
Ireland	-0.0081	-43.63	0.00	0.85		TS
Italy	-0.0027	-14.84	0.00	0.86		TS
Japan	-0.0037	-19.72	0.00	0.91		TS
Luxembourg	0.0032	17.49	0.01	0.80	1975	TS
Netherlands	0.0004	2.21	0.78	0.95		
Norway	-0.0051	-27.75	0.00	0.70		TS
Portugal	-0.0027	-14.67	0.17	0.88	1975	
Spain	-0.0024	-12.89	0.00	0.89		TS
Sweden	-0.0016	-8.73	0.07	0.84		TS
UK	-0.0014	-7.60	0.00	0.72	1974-5	TS
USA	-0.0018	-9.91	0.00	0.79		TS

Note: TS represents stationarity around deterministic trend.

ADF model estimates are presented in Table 2. The coefficient of error-correction term (Φ) is negative and hence the model is valid. The models passed usual diagnostic tests (normality, autocorrelation, heteroscedasticity, joint significance of variables). In the case of Canada, Newey-West estimator was used to overcome autocorrelation and heteroscedasticity and respective standard errors were obtained. In the case of Germany and Luxembourg, additional lag of the difference variable was introduced to address autocorrelation.

Deterministic trend is likely to be present in 15 economies ($\beta \neq 0, \Phi \neq 0$), if conventional t-statistics (1.96 at 5% critical level) is used to determine significance of ψ, or in 7 economies, if Dickey-Fuller critical value is used (-3.13 at 5% critical level). In the latter case, deterministic trend is present in Canada, Denmark, Netherlands, Portugal, Sweden, UK and the US. With the exception of Luxembourg, all identified trends are negative. The largest decline in labour share along deterministic trend was experienced in Ireland (-0.94% p.a.) and Norway (-0.62% p.a.). Reversion of series to historical mean was witnessed in Belgium, Greece and Iceland. Labour share appeared to follow random walk in France and Japan, or stochastic trend in Germany.

Table 2: Augmented Dickey-Fuller (ADF) model estimates

Country	δ	p-value	ψ	t-statistics	Break	Trend	R^2	Notes	Model
Austria	-0.0008	0.02	-0.200	-2.60	1975	-0.39	0.21		DT
Australia	-0.0004	0.08	-0.121	-2.27	1974	-0.34	0.35		DT
Belgium	0.0000	0.92	-0.099	-2.11	1974	X	0.17		MR
Canada	-0.0007	0.00	-0.266	-3.29	2009	-0.26	0.26	NW	DT
Denmark	-0.0005	0.01	-0.247	-3.28	2009	-0.22	0.21		DT
France	0.0000	0.91	-0.049	-1.08	1975	X	0.35		RW
Finland	-0.0010	0.03	-0.220	-2.85	1975	-0.43	0.26		DT
Germany	-0.0004	0.10	-0.091	-1.35	2009	-0.39	0.26	$\Delta lnLS_{t-2}$	ST
Greece	-0.0003	0.42	-0.165	-3.05	1973	X	0.30		MR
Iceland	-0.0006	0.33	-0.497	-4.20	2009	X	0.37		MR
Ireland	-0.0020	0.00	-0.219	-3.04		-0.94	0.17		DT
Italy	-0.0006	0.05	-0.196	-2.53	1975	-0.30	0.15		DT
Japan	-0.0002	0.37	-0.062	-1.16	1971	X	0.15		RW
Luxembourg	0.0008	0.03	-0.189	-2.62	1975,1977	0.40	0.64	$\Delta lnLS_{t-2}$	DT
Netherlands	-0.0005	0.01	-0.186	-3.48	1975	-0.27	0.27		DT
Norway	-0.0025	0.00	-0.411	-3.88		-0.62	0.19		DT
Portugal	-0.0010	0.00	-0.282	-5.27	1975, 1984	-0.34	0.52		DT
Spain	-0.0008	0.00	-0.225	-3.64		-0.38	0.25		DT
Sweden	-0.0007	0.02	-0.283	-3.37	1977	-0.25	0.18		DT
UK	-0.0005	0.01	-0.347	-4.39	1974-5	-0.14	0.48		DT
USA	-0.0005	0.01	-0.266	-2.94	1983	-0.18	0.19		DT

Notes: DT, MR, ST and RW represent deterministic trend, reversion to historical mean, stochastic trend and random walk. X indicates that trend coefficient is not statistically significant. NW indicates Newey-West standard errors due to presence of heteroscedasticity and autocorrelation. $\Delta lnLS_{t-2}$ is additional lag term to overcome autocorrelation.

In the majority of cases, the correctly specified model was obtained if dummy variables (of impulse of shift form) representing structural breaks in series were included. The majority of the breaks appeared to occur in the mid-1970s (12 breaks), 2009 (4 breaks), and early 1980s (2 breaks). Importantly, the majority of the breaks in labour share series corresponded to the rise in the level of series. Structural breaks in Greece (1973), Italy (1975), Portugal (1984), Spain (1984), Sweden (1977), and USA (1983) stood as exception.

The LM unit root tests with breaks demonstrate mixed results (Table 3). For the labour share variable, structural breaks were present in all economies in question (one break in Greece, Iceland, Italy, Netherlands and Sweden, two breaks in the remainder of the sample) and at least one of the dummy variables representing change in level or trend was significant at 5% level. Schmidt-Phillips unit root tests were thus not performed. Trend stationarity with break(s) was witnessed in all economies except Canada, Germany, Greece, Ireland, Italy and Netherlands, implying that labour share was not stable over the study period. The location of the breakpoints was less precise than with ADF test with smaller correspondence to actual economic developments (this, as shown below, being the major shortcoming of LM test). Nonetheless, out of 37 breakpoints, 10 were located in the 1970s, another 10 in the early 1980s, and 1 in the late 2000s.

Table 3.:Univariate Lagrange Multiplier (LM) test results

Country	LM test (2 breaks)					LM test (1 break)				Model
	Break significance			Break dates		Break significance			Break date	
Austria	-7.621*	[7]	B1D1B2D2	1973	2002					TSB
Australia	-6.038	[8]	B1D1B2D2	1972	1985					TSB
Belgium	-5.299**	[6]	B1D1D2	1972	1984					TSB
Canada	-4.669	[1]	D1D2	1988	2000					URB
Denmark	-5.671	[6]	B1D1D2	1974	2000					TSB
France	-6.290	[7]	B1D1D2	1983	1998					TSB
Finland	-6.634*	[6]	D1D2	1988	1999					TSB
Germany	-5.223	[3]	D1B2D2	1981	2009					URB
Greece						-3.564	[8]	D1	1975	URB
Iceland						-4.708	[3]	D1	2006	TSB
Ireland	-5.175	[8]	B1D1D2	1982	1994					URB
Italy						-3.853	[8]	D1	1992	URB
Japan	-5.474**	[6]	D1D2	1978	1983					TSB
Luxembourg	-7.612*	[1]	B1D1B2D2	1976	1990					TSB
Netherlands						-3.328	[5]	B1D1	1978	URB
Norway	-5.743*	[7]	D1B2D2	1978	1999					TSB
Portugal	-5.672	[1]	D1D2	1977	1991					TSB
Spain	-5.705	[6]	B1D1D2	1982	1995					TSB
Sweden						-4.617	[1]	D1	1981	TSB
UK	-5.920	[1]	D1D2	1980	1998					TSB
USA	-6.560*	[8]	B1D1D2	1981	1998					TSB

Notes: TSB indicates trend stationarity with break(s), URB represents unit root with break(s). B1, D1, B2, D2 indicate significant (at 5% level) intercept and trend dummy variables (for the first and second breakpoint respectively). Lags selected by general-to-specific procedure are shown in square brackets. Model C with 1 break at 5% critical values range from -4.45 to -4.51. Model C (2 breaks) critical values are: -6.16 to -6.45 (1% significance level); -5.59 to -5.74 (5% significance level); -5.27 to -5.33 (10% significance level, depending on location of the breakpoint. Model C (1 break) critical values are: -5.05 to -5.15 (1% significance level); -4.45 to -4.51 (5% significance level); -4.17 to -4.21 (10% significance level, depending on location of the breakpoint. Series are trend stationary with breaks at 5% significance level unless otherwise indicated; symbol (*) indicates significance at 1% and symbol (**) significance at 10% levels.

The panel LM unit root test (Table 4) was firstly conducted on a full sample consisting of 20 economies excluding Iceland (for which earlier observations were not available). Secondly, to ensure robustness of results and to account for the possibility of rejection of unit root null due to only one of the series being stationary (Taylor, Sarno, 1998), the test was implemented on a curtailed, consisting only of economies for which univariate LM test accepted unit root null hypothesis (5 such economies in case of LM test with 2 breaks, and 15 economies in LM test with single break).

The results of the panel LM unit root test (run on both full and smaller sample) confirm univariate tests' results. Univariate LM tests pointed to 15 instances, when unit root null was rejected. Panel LM unit root test likewise indicates very strong rejection of unit root, suggesting firstly the higher power of LM tests in a panel framework, and secondly the high likelihood of trends in labour share across economies (as opposed to stability or random walk).

Table 4: Panel Lagrange Multiplier (LM) test results

Panels	LM unit root test with 1 break	LM unit root test with 2 breaks
Panel of 20 economies	-13.804	-27.990
'Unit root' panel	-12.447	-21.323

Notes: The sample for panel LM unit root testing includes all economies, except Iceland. Critical values for the panel LM unit root test at 1%, 5% and 10% significance level are respectively -2.326, -1.645 and -1.282.

Empirical results indicate a number of cases of trend stationarity in labour share over 1960-2014 period, but also frequent reversals as was the case of upward trends in the 1960s being broken in the 1970s and 1980s in most economies. Also, the major structural breaks in the series clustered in specific periods and appeared to have relation to major economic recessions and slumps (the breaks in the mid-1970s, early 1980s and late 2000s). It is instructive to consider these short-run fluctuations and medium-term changes in terms of developed economies' economic history and of the available theoretical explanations.

4.2 Short-term fluctuations

There is generally no consensus regarding behavior of labour share during business cycle turning points. If labour hoarding during recession is assumed, the labour share would move countercyclically (IMF, 2012: 37-37). The regularity was prominent for mid-1970s recession and is confirmed by the foregoing empirical results: labour share spikes are visible graphically and are reflected in numerous structural breaks in 1974 and 1975. The mid-1970s witnessed a global recession associated with the demise of the Bretton-Woods, the first oil shock, and stagflation (and related policy failures to achieve multiple objectives of low inflation and low unemployment). The fall in profitability and capital share during the recession necessarily implied rising labour share, the development being documented by Chan-Lee and Sutch (1985), Heap (1980), and Jankowski (1998). These labour share spikes were observed in mid-1970s in most economies except Germany, Ireland, Spain and Norway (constant or moderately changing share).

With regard to recent global recession of 2008-9, the countercyclical pattern was confirmed in Canada, Denmark, Germany and visually in Finland, Greece, Ireland, Luxembourg, Norway and Sweden. In other economies, labor share was stable or experienced moderate change, while in Iceland it experienced dramatic fall.

In a related vein, IMF (2012) mentions two distinct labour share patterns in the aftermath of 2008-09 recession. In European economies labour share declined during recovery period, but was still comparable to pre-recession periods, while in the US, Spain and Greece labour share was well below pre-crisis period (in the US it was falling before, during and after global recession). The paper's empirical results confirm this regularity: labour share has been decreasing after 2009 in the US, Spain and Greece, and also in Ireland, Portugal and the UK. The explanation of falling labour share due to severity of long-term unemployment and related zero or negative growth in real wages in recession aftermath (IMF, 2012: 37) may explain labour share decline in Greece, UK and Portugal that experienced negative growth in real wages over 2007-15 (Costa, Machin, 2017: 6), but not Ireland, Spain and the US that experienced increase in real wages.

4.3 Medium-term changes

Prima facie, the widespread downward movements in labour share (19 negative trends as opposed to 3 positive over 1960-2014 period) do not look surprising, given the economic history of the developed economies in the recent decades. The most immediate explanation could relate to declining GDP growth rates across developed economies, a well-recognized fact. With growth capability in the developed economies attenuated (Gordon, 2012), the functional distribution of income became more contested. Coupled with declining bargaining power of the working class, the rise of pro-business economic policies, globalization and offshoring of domestic manufacturing this caused labour share to decline.

A more thorough look at medium-term movements reveals a complex pattern behind labour share falls, with a variety of factors amplifying or in contrast offsetting each other in individual economies, making it difficult (if not impossible) to attribute labour share decrease to a single dominant factor. Likewise, despite some degree of synchronization in labour share movements, country-specific differences as to the timing of breaks and directions of the trends were nonetheless present.

The structural explanations tend to attribute falling/rising labour share to permutations in economic policies, external environment and internal developments in the industries. Those of them, mentioned in the literature review, do appear to give some (but not complete) support for the empirical findings.

With regard to decreased bargaining power of labour explanation, the organized labour has been in demise in most OECD economies in the 1980s onwards (Kristal, 2010: 733). However, we note that the falling labour share and negative deterministic trends were documented in both the economies that witnessed substantial decline in the influence of unions (UK after 1980s) and the economies where organized labour continued to be influential in the 1990s and the 2000s (France, Spain).

Concerning privatization effects on the labour share, we note firstly that breaks in labour share trends (clustered in the 1970s) preceded major wave of privatization that took momentum in OECD economies from the early 1990s (Wolfl et al, 2009) and initially affected state-owned enterprises in the network industries (utilities, transport and communications). Secondly, the negative trends were detected in the economies that undergone large scale privatisations in the 1980s and 1990s (Australia, Spain), as well as the economies where privatization was not an economy-wide phenomenon, such as Canada, USA and Japan (OECD, 2003: 24-26). Importantly several incongruities are observed: in several instances labour share was falling at times when privatization programs were not active, e.g. France in 1988-93, or was rising and stabilizing when privatization was underway, e.g. Portugal after 1985 and 1989 (OECD, 2003: 24; Nunes, Montanheiro, 1997). Thirdly, the privatization effects could be even less salient in explaining labour share fall in the 2000s and 2010s, i.e. when most of privatizations had been complete. This confirms OECD findings (OECD, 2012: 133-134) that indicate moderate effects of privatization on the aggregate labour share in OECD economies (explaining only 5% of labour share decline) and almost no effect of reduced entry barriers on the labour share. Arguably, the privatization effects on labour share could be salient in economies where state ownership was substantial (Spain prior to mid-1980s) and where privatisation was not limited in scale (Cabeza, Gomez, 2007: 394-96). In these economies however the effects of privatization need to be disentangled from broader liberalization initiatives accompanying EU accession (Royo, 2002).

Regarding trade openness effects (Guscina, 2006; Elsby et al, 2013), the analysis of a simple trade openness indicator (trade as a percentage of GDP) contained in the World Bank (2015) database does not reveal any strong link to labour share. 'Trade as a percentage of GDP' indicator has been rising almost monotonously over 1960-2015 period in OECD as a whole and in most of its members, while labour share was changing non-monotonously. Thus, the identified structural breaks in labour share are left unexplained in most instances. The breaks in trade openness (if any) do coincide with breaks in labour share in several cases (break in trade openness in 2000 in Canada, 2009 in Denmark), but have limited correspondence in other instances (trade openness breaks in 1991 in Finland and Iceland, 1993 in Germany). Neither did breaks in labour share align with major cases of international trade liberalization (no breaks related to implementation of GATT Tokyo Round, 1973-79 or Uruguay Round, 1986-94 agreements).

The effect on labour share of ongoing globalization, relocation of manufacturing industries to developing and emerging economies, and decline of domestic manufacturing in the developed economies (due to intensifying competition on the part of newly industrialized economies) appears to be substantiated to some extend: the industry offshoring conventionally is seen to start in the late 1970s (OECD, 2007: 92; Nickell et al, 2004: 2), thereby coinciding with the reversal in labour share trends. However, this effect on labour share is unlikely to be easily generalized: the labour share was falling across many OECD economies, with different industrial structures, varying exposures to international competition, import penetration and various degree and

direction of outward foreign investment. In many instances labour share was accompanied by rising manufacturing share and vice versa. For instance the research by Atkinson et al (2012: 3) revealed a fall in manufacturing share of GDP in Canada, Italy, Spain, the UK, and the US, and increase in Austria, Finland, Germany, Japan, the Netherlands, and Switzerland, whilst the results of log-linear trend model pointed to falling labour share in all these economies. Likewise, UN data on manufacturing share of GDP in 2005 constant prices (United Nations, 2016) over 1970-2015 suggests increase in manufacturing share in Ireland of 230% (the country that experienced one of the largest falls in labour share) and substantial decrease in manufacturing share in the UK of 46% (the country that had one of the smallest decreases in labour share). Also, while according to Nickell et al (2004: 33), Germany and Japan managed to retain the largest shares of manufacturing despite deindustrialization process, this did not prevent substantial labour share declines in these economies (-9.69% and -19.75% respectively based on a log-linear model). Finally, comparison of UN data (UN, 2016) and empirical results indicates that contrary to Elsby et al (2013) suggesting largest labour share declines in manufacturing and trade sectors, the largest decrease in labour share occurred in economies that in mid-1970 were less industrialized (Ireland and Greece as opposed to other European economies and Japan). Overall, broadly-applicable "offshoring factor" or similar deindustrialization influences cannot be easily identified in the paper's empirical results, in line with earlier findings by ILO (2008) of relatively small negative effects of globalization on labour share.

While potentially less aligned with economic structure changes, the labour share fluctuations were well correlated to broader political and policy changes, the latter explaining well both general trends and structural breaks.

Labour share was on rise or stable in the 1960s in most economies, except for Greece and Japan. The most plausible political and policy driver behind the rise was the entrenchment of Keynesian economic policies and prominence of social-democratic approaches to economic management (the 'Great Society' economic programs under L. Johnson presidency being one of the examples), making R. M. Nixon pronounce that "we are all Keynesian now" and R. Lekachman to denote that period as the "age of Keynes" (Lekachman, 1966).

The 1970s witnessed substantial short-term fluctuations in labour share, mostly driven by the above-mentioned economic factors. However, political bargaining and social strife factors exercised stabilizing effect of the labour share: Mohun (2009: 1028) explains relative labour share stability in the 1970s (apart from temporary recession-driven spikes) in terms of stalemate in class struggle and militancy of the labour (Friedman, 2007), managing to get its share in the face of accelerating inflation and rising unemployment.

The demise of labour share in the 1980s is typically attributed to the demise of Keynesian economic management and the rise of alternative economic policy paradigms, epitomized in Reaganomics and Thatcherism. We note firstly that the shift was not a punctuated change or jolt, but rather a gradual change, non-synchronous across economies, originating in the 1970s (Blyth, 2002), meaning that breaks in labour share were scattered over the late 1970s and early 1980s and not accurately corresponding to actual policy regime changes. Secondly, the manifestations of paradigm change and the effects on labour share were diverse, with some of labour share falls occurring without formal rejection of Keynesian policies. In the UK for instance, the break identified by LM test was in 1981, whilst the major labour relations changes took place during the second Thatcher ministry (1983-87). In contrast, in France the labour share break in 1983 coincides rather well with the sharp reversal (that included wage moderation and austerity among other measures) of the earlier Keynesian economic program in the earlier years of F. Mitterrand presidency (Sachs, Wyplosz, 1986: 263, 267). It is debatable however whether such reversal was a case of decisive abandonment of Keynesianism. In the case of Sweden, the identified breaks (1977 and 1981) relate well to the series of devaluations implemented to increase competitiveness of the economy and to boost profitability, without all-encompassing changes to existing policy paradigm (Bengtsson, 2014).

In addition to broader political economic factors, country specific ones were significant too. The cases of labour share changes that do not fall into the general picture are reviewed below.

The fall of labour share in Japan that has continued until the early 1970s has been well documented by Pempel (1978) citing capital share tripling between 1953 and 1974 when labour unions managed to secure large wage increase in the aftermath of the first oil shock, and Shalev (1990: 71-72), explaining sluggish labour share in the post-war Japan in terms of a series of moves by government to strengthen divisions in the labour movement, creation of conditions to nurture loyalty to enterprise, cooptation of unions by the firms, deferment of wage increases through seniority-based mechanisms or generous pension packages and the like.

In Greece, the labour share was under strain since the late 1940s, with defeat of the left governments being an important explanatory factor. After a brief resurgence in mid-1960s (associated with political democratization and strengthening of unions), the share fell further in the late 1960s and early 1970s, mainly due to the anti-labour and pro-business policies of the "regime of colonels" (1967-74), i.e. to political factors (Ioakimoglou, Milios, 1993: 96-97). Post-1974 the share rose moderately, thus appearing to confirm the hypothesis of positive effect of democratic institutions and governments on the resurgence of labour share (Rodrik, 1999). We note a commonality in Greek and Japanese labour share patterns in the earlier periods. The labour share was falling during the times of rapid capital accumulation and economic growth, starting from a relatively low economic base, accompanied by conservative fiscal and monetary policies, within a corporatist and centralized economic management that deliberately weakened labour vis-à-vis capital.

In Portugal, the sharp spike in labour share in the mid-1970s was driven by a combination of political and external economic factors (Vilares, 1986: 184-185). The spike in 1974-5 can be related to the pro-labour policies of the left-wing government that came to power after "carnation revolution" of 1974, resulting in sharp increase in real wages (15.8% and 12.6% in 1974 and 1975) and redistribution of income in favour of labour. Accompanying factors were drastic decline in GDP, loss of colonies and disintegration of colonial empire, massive emigration out of colonies, as well as increase in oil prices that affected Portugal as open economy more substantially.

Regarding economies that experienced the rises in labour share (Belgium, Luxembourg, Netherlands) or the smallest falls (Denmark) over 1960-2014 period, these appeared to be making greatest headway in restructuring towards high-value added sectors or industries (financial services in Luxembourg, transportation services, biotechnology and high-tech agriculture in Denmark and Netherlands, high-value added manufacturing in Belgium), or in exploiting vital competitive advantages (location and infrastructure advantages in Belgium) and respectively having higher overall level of wages and labour share (OECD, 2017). This however leaves unexplained why labour share was falling in economies with equally high wage levels and advanced economic structure (Ireland, Sweden).

Concerning the economies that experienced large falls in labour share (Ireland, Greece, Norway and Finland), the reasons could be diverse. In Ireland, the fall in labour share proceeded from an originally high level of labour share. The fall was thus due to initially low profitability; it also related to distorting tax and accounting practices, such as underreporting or rental incomes and profits under old tax regime; as well as to dramatic increase in profit share following operations by multinationals and associated transfer pricing practices since early 1990s (Sweeney, 2013: 112, 116). In Norway, the decline in labour share was attributed to the offshore expansion of the oil industry (OECD, 2012: 148). Indeed if the industry was excluded from calculations, the labour share would turn out to be stable over the study period. The similar effect (structural reallocation towards capital-intensive, low-labour-share industries) could also explain fall in labour share in Australia as well (due to expansion of mining economy). This is in line with OECD (2012: 119) finding, attributing 1/3 of labour share decline to between-industry reallocations. In Finland, the precipitous fall in labour share coincided with 1991 recession (in turn conditioned by the profound restructuring of the economy, collapse of COMECON and the decrease of trade with Eastern Bloc). Increased unemployment and falling labour share persisted long after the recession and never fully recovered, accompanied by the cuts in the welfare system, fast recovery in asset values and capital incomes, and tax system distortions, diverting labour income into capital income. (OECD, 2010: 108). In Greece, the labour share never fully recovered following drastic fall in the early 1970s. While there was some rise in labour share during the return to democratic rule, further increase was halted by an entrenchment of

political-economic regime that was detrimental to efficiency and economic growth. It became progressively more difficult to extract gains to labour in a slow-growing economy plagued by high inflations, growing unemployment and distortions in product and factor markets (Alogoskoufis, 1995).

5 - Conclusion

The principal empirical finding is that diverse patterns of labour share were present and that definitive conclusions can be made only in a smaller set of economies. Firstly, all three univariate tests suggest the presence of deterministic trend with two breaks in Austria, Finland, Luxembourg, Norway, Spain, the UK, and the USA, and deterministic trend with single break in Sweden. Secondly, two tests indicate deterministic trend with two breaks in Australia, Denmark, Japan, and Portugal. Thirdly, in the case of Canada, Ireland and Italy, no definitive conclusions were possible, and additional tests may be needed. Fourthly, in the remainder of the sample no deterministic trends with breaks were discovered. ADF indicated possible non-deterministic patterns: mean reversion in Belgium, Greece and Iceland; random walk without drift in France; and stochastic trend in Germany.

Overall, rather weak evidence is provided as to the stability of the labour share as a "stylized fact" of economic growth or even the law of growth. Given the empirical evidence it appears to be more appropriate to conceptualise stability of the labour share as a working hypothesis with respective implications for the production functions models, distribution theories and economic policy. Panel LM unit root tests confirmed this finding: seen as a panel, labour share is more likely to exhibit deterministic trends rather than contain unit roots.

Regarding economic significance of labour share patterns and the determinants of labour share, the exploratory analysis of AMECO labour share data and empirical findings suggested that identified breaks and trends were generally in line with the events and developments in the economic history of the industrialised economies in the 1960-2010s.

In the short-run, the labour share exhibited countercyclical patterns during the recessions of 1970s and 2000s. This regularity however was not present in all economies in the sample. The global recessions had profound effect on the labour share in individual economies, resulting in numerous structural breaks of various form. Regarding labour share fluctuations in a post-recession period, the cursory look at the results did not reveal any specific pattern: in some economies labour share rebounded, while in other was declining.

In a medium-term the labour share decline was associated with the overall demise of Keynesian economic policies in the industrialised world; at the same time, labour share was also subject to salient country-specific factors. The causal factors that were identified in the literature (industry offshoring, privatization, technical change, trade openness) certainly had explanatory power in many economies; however, in other cases the movements in labour share, the timing of structural breaks and directions of the trends were not in line with these determinants. Political variables (transition to democratic rule, bargaining power of labour) appeared to be significant in explaining labour share movements, particularly in authoritarian or corporatist regimes.

Overall, exploratory analysis suggests that each country likely had its own unique combination of factors that affected labour share, with possible offsetting or synergistic effects present, making generalisations and identification of single principal factors behind labour share fluctuations difficult. Given country-specific nature of the labour share as well as ubiquitous determinants of labour share a combination of case study and cross-national comparisons may be an appropriate method.

There are several avenues for future research of the labour share stability. Firstly, a more systematic approach may be adopted to distinguish labour and non-labour incomes. Instead of multiplying unadjusted wage share by an adjusting factor (the ratio of the number of employed persons to the number of employees) in an ad hoc manner, a preferable approach may be to use national accounts and other supplementary data to separate compensation of employees from the gross operating surplus (and other capital and property incomes, such as incomes from homeownership, from holding financial assets, capital-funded pensions etc) for individual

economies. To this end, the database of capital shares constructed by Bengtsson and Waldenstrom (2015) for a sample of 19 developed and developing economies may be a useful source. The database, whilst giving robust figures of the capital share, covers a limited set of countries, contains time gaps, and importantly does not allow comparison of labour and capital shares across economies (one of the reasons is the calculation of labour share based on either gross or net value added in individual economies).

Secondly, the paper attempted only a cursory approach examining the driving forces of the labour share and identifying the breaks. Once it is established that labour share was stable or in contrast trending, a formal decomposition analysis may be needed, akin to the one performed by Kraemer (2011b). This is particularly the case of economies that were subject to multiple political and economic influences in a short period of time (e.g. Spain and Portugal in the 1970s and the 1980s).

Thirdly, in cases, when definitive conclusions were not possible, additional tests could be recommended. Future research may use other conventional unit root tests (Kwiatkowski–Phillips–Schmidt–Shin/KPSS, Phillips-Perron/PP or Elliott-Rothenberg-Stock/ERS), as well as more advanced unit root tests with structural breaks and non-linear unit root tests (e.g. those developed by Harvey, Mills, 2004; Kapetanios, 2005 in univariate context or by Westerlund, 2006 for the panel data). It is noted as well that LM test (and other unit root tests with structural breaks) is not a test of the structural breaks timing, but the test for the unit root presence, implying inter alia poor precision of the estimated breakpoints. Hence, the identification (and subsequent economic interpretation) of the breaks is to rely on the recursive residuals, N-step forecasts techniques, or more systematic identification methods, such as Bai-Perron method.

Finally, the future research may concern the effects of labour share changes on other economic variables, e.g. investigate the relationship between factor income distribution and rising income inequality, or the effect of falling labour share on aggregate demand or investment activity.

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Figure 1: Labour share (%) in OECD economies, 1960-2014