

Profit maximising goes global: the race to the bottom

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We explore four decades of cyclical and long-run dynamics in income distribution and economic activity for a panel of 13 OECD countries, as measured by the wage share and output gap. When modeled as predator–prey dynamics, economic activity in OECD countries is weakly profit-led. Convergence to a long-run equilibrium is relatively slow delaying the profit-squeeze stage for many years. Our ‘race to the bottom’ model suggests that the OECD countries have been engaged in undercutting each other’s real unit labour costs. An extension of the model shows that the long-run equilibrium has been shifting south-west towards a lower wage share. It may even be that this race has the undesirable consequence of decreasing economic activity.

Key words: Predator–prey models, Distributive-demand dynamics, Panel data estimation

JEL classifications: D3, C23

1. Introduction

The great crisis of 2008 and its ongoing impact on economies across the world has pushed rising income inequality to the forefront of policy and academic debates (Kumhof and Ranciere, 2010; Rajan, 2010; Taylor, 2011). Others have pointed out that income inequality can have lasting effects that go beyond one-time events such as an economic or a financial crisis (Palley, 2002, 2012). Our study is motivated by the rise in income inequality over the past few decades in OECD countries as captured by the trend in the wage share in Figure 1. Except for Korea, the four-decade average wage share index exceeds the 2005 base in every case, suggesting that the wage share has fallen worldwide.¹

We invoke Goodwin (1967)’s theoretical model of the business cycle to explore cyclical dynamics of income distribution and economic activity. We quantify this model as first differences in the wage share and the output gap and estimate this specification

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¹ Our interpretation of the Korean data is that they reflect a period during which the Korean economy was catching up with the level of development already achieved in other industrialised countries.

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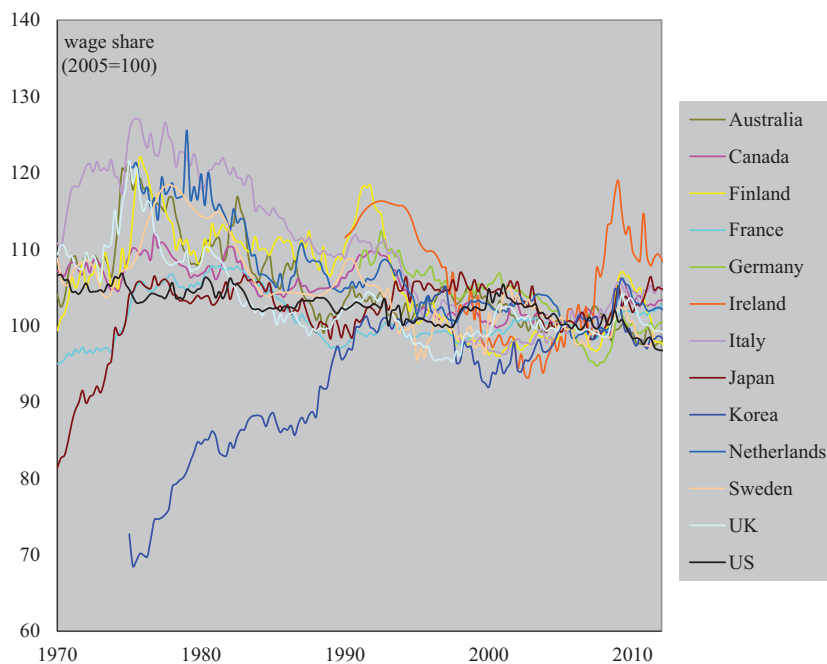


Fig. 1. Labour share

on a panel of OECD countries over the past four decades. Our results suggest that the increasing inequality associated with the great crisis may just be the ‘icing on the cake’. Looking more deeply, we infer that the countries of the industrialised world may be pursuing policies that progressively increase inequality; they may even be forgoing potential output in a quest for a competitive edge in the global economy.²

Using the terminology of this literature, we find a counter-clockwise movement in the capacity-distribution space. Economic activity appears profit-led during the bottom part of the business cycle, and profits get squeezed during the upper part of the cycle. We generalise this econometric specification to allow the long-run equilibrium of this dynamic model to trend, finding that it is shifting to the south-west in distribution-utilisation space, towards a lower wage share and a lower level of utilisation. This inequitable trend suggests the failure of wage suppression policies as proposed in [von Arnim et al. \(2014\)](#) and of counter-productive policy in industrialised economies as discussed by [Storm and Naastepad \(2012\)](#) or [Stockhammer et al. \(2009\)](#) amongst others.

A number of factors may be contributing to this disturbing trend, including long-lasting effects of macroeconomic shocks such as the 2008 crisis, structural changes, government policies and globalisation. Appropriate data for studying these issues are available back to around 1970. Around then governments turned their attention to income distribution as part of a strategy to achieve increased economic and employment growth ([Taylor, 2011](#); [Storm and Naastepad, 2012](#)). It has often been asserted that job creation requires wage moderation, that growth requires higher profits attained through a lower

² An anonymous reviewer suggested that the degree of inequality may also have an impact on the policy stance, as discussed by [Stiglitz \(2012\)](#). In this article we take policy and institutions as exogenous but recognize that such interactions are feasible over the long run.

wage share. We argue that this view is reinforced by accelerating globalisation and that the competition between nations for high profits has given rise to a race to the bottom.

Our finding on the long-run output gap in Section 3 is certainly empirically weaker than our long-run inequality one.³ We find evidence that the long-run equilibrium may have undergone a structural change triggered by the 2008 crisis. Several factors could explain the reduction in long-run utilisation: a global shift towards a more contractionary macroeconomic policy, a long-run decline in capacity utilisation necessary to accommodate higher profits or a decline in labour productivity growth in response to a decline in the wage share. Preceding Sections 3 and 4 is a review of the relevant literature on distribution-growth dynamics.

2. Goodwin’s business cycle model

Goodwin (1967) is one of the first to formalise Marx’s view that business cycles in a capitalist system originate in the distributive conflict between capital and labour. Goodwin introduces this idea in a predator–prey model by dynamically linking the employment rate, the prey, and the income distribution, the predator.⁴ An extensive theoretical and, more recently, empirical literature has developed from his path-breaking insight. Goodwin motivates his theory with classical assumptions of a saving-determined investment and that profits provide all the saving in this economy. However, labour’s power to bargain for a higher wage share increases with its market power derived from its higher employment rate. This conception of the business cycle emphasises economic power relations; the capitalist’s power lies in her use of investment, whilst worker power applies to the wage bargain.

Goodwin’s equations have been interpreted with other scenarios. Flaschel (2008, 2009) provides a good flavor of the framework’s many uses. Prominent amongst these is the Keynesian view of effective demand as the prime economic driver, substituting for the classical view of saving-driven investment (Bhaduri and Marglin, 1990; Barbosa-Filho and Taylor, 2006; Tavani *et al.*, 2011; Nikiforos and Foley, 2012). This approach describes the economy in terms of interactions between the capacity utilisation and income distribution. Both interpretations can be quantified using the output gap $u = Y / Y^*$, the ratio of actual to potential real output, and the wage share $\psi = \omega / x$, the ratio of the real wage to labour productivity. Taken together, the utilisation-distribution dynamics are formalised by a system of locally stable differential equations:

$$\dot{u} = f(u, \psi) \tag{1}$$

$$\dot{\psi} = g(u, \psi) \tag{2}$$

There are different ways to describe the law of motion for capacity utilisation, and all of them share the Keynesian postulate that excess demand causes increased utilisation. Following Nikiforos and Foley (2012) and Taylor (2004) we think of excess demand

³ There is an issue with the OECD’s definition of the output gap. If stagnation is long-lasting, the OECD tends to revise its estimate of the natural rate of unemployment upwards and its estimate of the potential output downwards, leading to a decline in the output gap. For example, their estimate of Finland’s NAIRU reached 12% during the post-crisis 1990s. Although their methodology can be questioned, we nevertheless chose to adopt their estimates.

⁴ This model takes its name from its initial application to wolf and moose populations (Lotka, 1925).

as the difference between the demand for investment and the supply of saving, both of which are dependent on the capacity utilisation and on the wage share. By definition, an increase in the wage share implies a reduction in the profit share, which leads to a decline in investment.⁵ Even relaxing the classical assumption that workers do not save, a redistribution towards wages has an overall negative effect on saving because workers save less than capitalists. On the other hand, higher capacity utilisation positively affects both investment and saving, although if the effect on the latter is not greater, the model will be locally unstable. Our assumption that higher capacity leads to higher investment might be explained by either the accelerator principle or by firms that want to hold excess capacity as a way to meet expected future spikes in demand or perhaps as a deterrent to rivals (Steindl, 1952; Skott, 2012).

Equation (2) captures the reaction of distribution to changes in utilisation conditioned on the contemporary state of distribution. This relation may be motivated by observing that the wage share is defined as the ratio of the real wage and labour productivity and both of these are determined by capacity utilisation and distribution.⁶ Empirical studies have consistently indicated that the real wage tends to rise in expansions and fall in recessions, and that labour productivity increases rapidly at the beginning of a recovery.⁷

In general, a variety of dynamics are possible, including stable and unstable ones, or both in the presence of non-linearities. We describe two of the stable ones with unique long-run equilibria in a phase diagram in $u - \psi$ space, which plots nullclines (the $\dot{\psi} = 0$ and $\dot{u} = 0$ loci) and trajectories (see Figure 2).⁸ Our nullclines are linear, although non-linear ones are often theorised. The dashed trajectory plots the recovery from an exogenous output shock, specifically a sudden drop in utilisation with no change in distribution. Their differences derive from the relative strengths of the several effects modeled by f and g .

If utilisation nullcline slopes up and the distribution curve slopes down, recovery will follow a clockwise trajectory after an adverse utilisation shock (see the left panel). In this case a rise in the wage share stimulates economic activity due to the strong response of consumption to a higher wage share, compared to the weaker negative response of investment demand to lower profitability. This has come to be known as a wage-led economy, an outcome shared by the traditional Kaleckian model (Rowthorn, 1981; Taylor, 1983; Dutt, 1984).⁹ Although the wage share initially rises in wage-led economies, eventually it falls (and the wage share gets squeezed) as the economy returns

⁵ The Kaleckian model has been discussed in many papers. Notable contributions are from Dutt (1984), Blecker (1989), Lavoie (1995) and Naastepad (2006) amongst others.

⁶ Goodwin's model derives the distribution equation from a Phillips curve, finding a vertical nullcline that depends on labor productivity and expected wage inflation.

⁷ Using mostly the USA as the relevant case, Taylor (2004) explains at length different forces acting on the real wage and labour productivity over the cycles. Inflation also plays a crucial role in the determination of income distribution over cycles. He identifies two factors that affect the wage share: wage inflation associated with a profit squeeze and price inflation, which leads to what is known as 'forced saving'.

⁸ Slopes of the two nullclines are given by: $-\frac{\partial f_u}{\partial f_\psi}$ for utilisation and $-\frac{\partial g_u}{\partial g_\psi}$ for distribution. The local stability

assumption translates in negative signs for the partial derivative signs on the Jacobian's main diagonal.

⁹ Bhaduri and Marglin (1990), for example, model capacity utilisation as a function of income distribution; therefore, as Taylor (2004) and Barbosa-Filho and Taylor (2006) have shown, it can fit the Keynesian perspective naturally into the Goodwin model. One important distinction between the two models is that income distribution is endogenous in Goodwin's but exogenous in Bhaduri and Marglin (1990). Another is that Goodwin takes a fully dynamic approach, whilst Bhaduri and Marglin follow a comparative statics analysis.

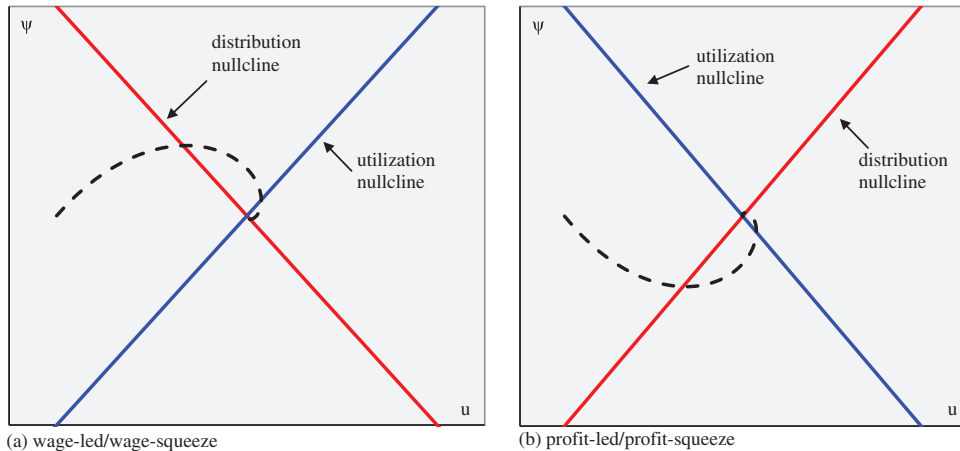


Fig. 2. Graphical representation of a structuralist Goodwin model

to its long-run equilibrium. This late-stage effect is described in the ‘wage-led/wage squeeze’ label. If utilisation nullcline slopes down and the distribution curve slopes up, recovery will follow a counter-clockwise trajectory after an adverse utilisation shock; since Bhaduri and Marglin (1990) and Taylor (1991) this has come to be known as a profit-led economy (see the right panel in Figure 2).¹⁰ In this case investment responds strongly to increased profitability implied by a decreasing wage share; sometimes this early stage is known as ‘forced saving’ consistent with the classical assumption that capitalists save all profits.¹¹ Although the wage share initially falls in profit-led economies, eventually it rises (and the profit share gets squeezed) as the economy returns to its long-run equilibrium, consistent with the ‘profit-led/profit squeeze’ label.

Shocks to either of these variables can be temporary or permanent as depicted in Figure 3. A temporary utilisation shock, for example, does not shift either nullcline. One permanent shock, on the other hand, might be visualised as a shift of the utilisation nullcline (distribution nullcline unchanged), perhaps due to technological change, rivalry for global markets or institutional changes that institute a conservative monetary and fiscal policy stance. The diagram illustrates how a profit-led economy might converge to a new long-run equilibrium at point C. For this example of an adverse utilisation nullcline shift, the recovery (from B to C) is incomplete and anti-labour with the new equilibrium at a lower wage share and a higher level of utilisation (but less than the initial one at point A). Of course, other scenarios can be imagined and other nullcline shapes assumed.

It is unwise to associate the movement of a specific nullcline with a particular cause without a more complete theory about the nature of eqs (1) and (2). Notice that we might also shift to a long-run utilisation consistent with the equilibrium point at C by an upwards shift of the distribution nullcline. This recovery would be incomplete and pro-labour. Notice further that a permanent decline in utilisation could occur

¹⁰ To the best of our knowledge it was Taylor (1991) who coined the terms ‘wage-led’ and ‘profit-led’. Bhaduri and Marglin (1990) derived the same analytical results but referred to the wage-led regime as ‘stag-nationist’ and the profit-led regime as ‘exhilarationist’.

¹¹ von Arnim et al. (2014) and Rezai (forthcoming) develop a general equilibrium framework for open economies and show that although each individual economy becomes more profit-led with trade, a redistribution away from labor may have adverse effects on global demand and therefore on each country’s income.

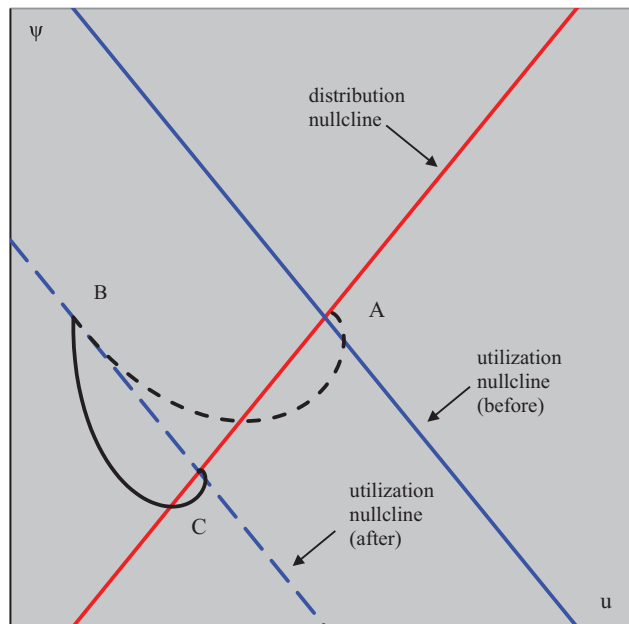


Fig. 3. Response to temporary (dashed) and permanent (solid) utilisation shock in a profit-led economy

without consequences for distribution if there was a leftwards shift of both nullclines. Finally, notice that all these conclusions are contingent on the profit-led configuration of the phase diagram and could be dramatically different for the wage-led configuration. Although they are obviously related, we conclude that it is easier to theorise about the long-run equilibrium (both its utilisation and distribution coordinates) than about individual nullclines. Neither the location of nullclines nor that of the long-run are directly observable. The Goodwin model provides a method for measuring the nullcline slopes. This model also provides a method that can be extended to predict the equilibrium.

3. OECD data, econometric models and estimation results

Is the economy wage-led or profit-led? This question captures much of the current debate on the empirical relationship between income distribution and economic activity.¹² In this section we join this important debate, but first we need to clarify a conceptual difference between Goodwin-type models versus Kaleckian models along the lines of Bhaduri and Marglin (1990). One difference is in the treatment of income distribution—endogenous in Goodwin (1967) but exogenous in Bhaduri and Marglin (1990). For the latter the econometrics boils down to a single regression equation that examines the effect of distribution on different measures of utilisation. Our Goodwin-type model, on the other hand, is formalised by a system of two simultaneous, first-difference equations as specified following eqs (1) and (2). These differences make it

¹² Hein and Vogel (2008) provide a comprehensive review of empirical studies that estimate effects of income distribution on economic activity.

difficult to compare empirical results based on the two models. Possibly single-equation estimates of a relationship between distribution and economic activity should be interpreted as the joint outcomes of the random shocks to distribution and utilisation that have been typical and the inherent dynamic behaviour of these variables, but are instead misleadingly identified as an aggregate demand equation.¹³

Our results are therefore directly comparable only to the literature that follows Goodwin’s approach where income distribution and economic activity are jointly determined variables. A recent econometric study by [Barbosa-Filho and Taylor \(2006\)](#) generalises this methodology with a vector autoregressive (VAR) specification and finds that the postwar USA economy can be described as a profit-led/profit-squeeze case. [Stockhammer and Onaran \(2004\)](#) also use a VAR model to study the inter-connection between output, distribution, unemployment and labour productivity in the USA, UK and France. They find that utilisation is associated with employment growth but are inconclusive about the connection between wages and other macro indicators.

We study this topic with a panel of 13 OECD countries for the past four decades.¹⁴ To the best of our knowledge this is the first panel data application of a Goodwin-type model. Table A.1 in the appendix summarises our data. We measure income distribution by the wage share index, or real unit labour costs, computed as the ratio of unit labour cost to the GDP deflator. We measure capacity utilisation by the GDP gap, the percentage difference between actual and potential gross domestic product. Given the OECD definition of the GDP gap, it is a little surprising this statistic averages slightly negative for all countries except Ireland.¹⁵ [Figure 4](#) shows that utilisation has been considerably more volatile than distribution in [Figure 1](#). This plot also documents the linkages involved in the great crisis of 2008, indicating that the downturn has been felt most severely by Ireland and Finland.

3.1 Cycles and trends

The qualitative features of the pure predator–prey model used by Goodwin are unrealistic when it comes to an actual economy. The model exhibits closed orbits around a unique fixed point. It is possible to constrain the model to reflect pure Goodwin cycles. This specification (reported in Appendix 1) performs poorly. We work instead with a difference-equation version of the differential-equation theory eqs (1) and (2):

$$u_{it} - u_{it-1} = \beta_0 (\psi_{it-1} - (\psi_t^* - \beta_1 u_t^*) - \beta_1 u_{it-1}) + v_{it} \tag{3}$$

$$\psi_{it} - \psi_{it-1} = \alpha_0 (\psi_{it-1} - (\psi_t^* - \alpha_1 u_t^*) - \alpha_1 u_{it-1}) + \varepsilon_{it} \tag{4}$$

¹³ We thank an anonymous referee who pointed out this interpretation of the estimation results of the single-equation approach.

¹⁴ Selected OECD economies are Australia, Canada, Finland, France, Germany, Ireland, Italy, Japan, South Korea, the Netherlands, Sweden, UK and the USA. The data were extracted on 28 Oct 2012 from OECD iLibrary, Economic Outlook 90.

¹⁵ [Gianella et al. \(2008\)](#) and [Giorno et al. \(1995\)](#) amongst others discuss the OECD methodology for estimating the output gap.

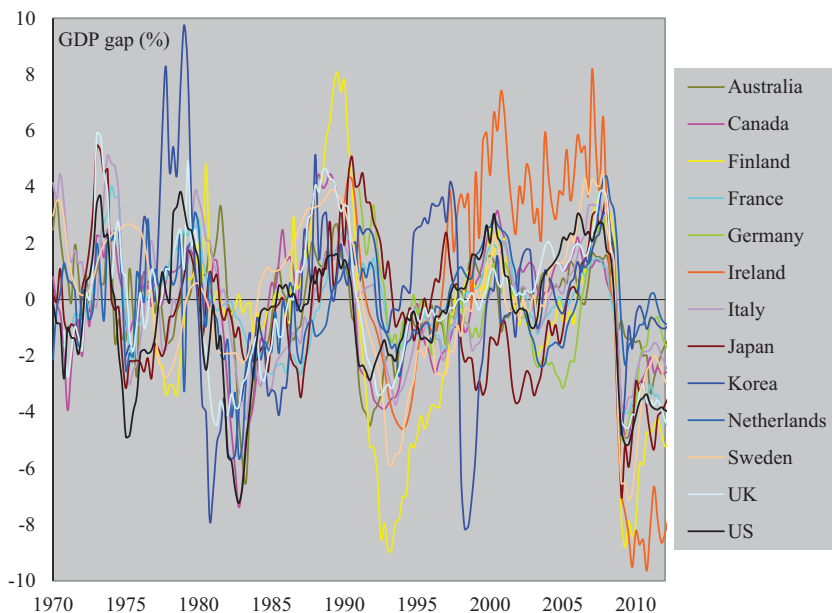


Fig. 4. GDP gap

where the subscript refers to the i th country in the t th period. The α 's and β 's are parameters, and ε_{it} and v_{it} are error terms. We use several specifications for the long-run coefficients ψ_t^* and u_t^* . We begin by imposing a cross-equation restriction that requires a long-run equilibrium along the wage share axis at $\psi_t^* = \psi_0^*$ (a parameter) and at $u_t^* = u_0^* = 0$ (a restriction). We refer to the $u_0^* = 0$ specification as the NAIRU restriction because it imposes the conventional assumption that the long-run equilibrium occurs at the potential output. This restriction is consistent with the OECD's method of estimating the GDP gap, although many studies of the Goodwin model do not require that the long-run utilisation be fixed at zero.

After rearrangement this specification can be seen as a $VAR(1)$; the dependent variables depend entirely on lagged values of their levels. Table 1 reports generalised least squares (GLS) estimates of this model in column (a) under the assumption of different variances for each country, and non-zero inter-country and inter-equation covariances. In other words, we allow for short-run stochastic interaction amongst countries.¹⁶

Figure 5 (left) illustrates model (a); it indicates that these economies are profit-led and that the Goodwin-style causation is relevant for understanding macroeconomic outcomes.¹⁷ All the coefficient estimates are statistically significant; our distribution nullcline slopes up and the utilisation nullcline slopes down consistent with

¹⁶ We can further generalise the error structure by introducing within-equation serial correlation. Although this does yield a somewhat better fit in terms of the Schwarz criterion (an unreported estimate of model (a) achieves Schwarz = -1,265), we reject it. Our objection is that these results suggest that the underlying model should be re-specified as a $VAR(2)$, but such a specification loses its intuitive appeal as an analogue of the Goodwin model. In further unreported results we re-estimated these two equations as a $VAR(2)$; we find that the dynamic properties of this generalisation are indistinguishable from those of model (a).

¹⁷ This observation underscores an important difference between our approach and the econometric approach used by Nikiforos and Foley (2012) in that they attempt to estimate these nullclines directly from the scatter of points for the USA without specifying the dependent variables as differences.

Table 1. Estimation results

Model	(a) NAIRU, seemingly unrelated	(b) General long run, seemingly unrelated	(c) General long-run with linear trend, seemingly unrelated	(d) Structural break in 2008Q4, seemingly unrelated	(e) General long- run with stochastic trend, maximum likelihood	(f) the race to the bottom, seemingly unrelated
Wage slope α_1	5.386 (6.045)	5.409 (6.019)	4.493 (6.383)	6.481 (5.515)	4.297 (4.910)	4.993 (6.443)
Gap slope β_1	-14.941 (-2.290)	-14.887 (-2.300)	-11.104 (-3.122)	-15.029 (-2.438)	-11.562 (-3.274)	-12.995 (-2.585)
Wage share scaling α_0	-0.023 (-7.033)	-0.023 (-7.001)	-0.027 (-7.844)	-0.021 (-6.349)	-0.029 (-6.417)	-0.025 (-7.494)
Gap scaling β_0	-0.006 (-2.308)	-0.006 (-2.318)	-0.008 (-3.169)	-0.007 (-2.455)	-0.008 (-2.917)	-0.007 (-2.622)
Long-run wage intercept ψ_0^*	102.81 (141.96)	102.60 (106.36)	110.36 (73.61)	103.04 (97.40)		45.429 (1.606)
Long-run gap intercept u_0^*		-0.090 (-0.329)	0.890 (1.656)	0.215 (0.883)		9.580 (1.100)
Long-run wage trend ψ_1^*			-0.345 (-5.585)			
Long-run gap trend u_1^*			-0.045 (-2.025)			
Wage share in rest of the sample ψ_2^*						0.552 (2.031)
Wage share in rest of the sample u_2^*						-0.093 (-1.110)
Shift in wage slope α_{11}				1.627 (0.164)		
Shift in gap slope β_{11}				9.449 (1.311)		
Shift in wage share scaling α_{10}				-0.020 (-1.087)		
Shift in gap scaling β_{10}				-0.004 (-0.154)		
Shift in long- run wage ψ_{10}^*				-3.476 (-1.451)		
Shift in long run gap u_{10}^*				-3.777 (-6.982)		
Schwarz criterion	-1,232	-1,197	-1,250	-1,205	-1,729	-1,198

Notes: *t*-statistics in parentheses. The Schwarz statistic for model (e) is not comparable with the other Schwarz statistics since the estimation includes fewer countries and observations, especially the omission of the 1974 oil shock.

profit-squeeze/profit-led regimes and the results reported by [Barbosa-Filho and Taylor \(2006\)](#). Overall, our estimates for the two slopes are considerably larger, at $d\psi / du = 5.38$ for the distribution and $d\psi / du = -14.94$ for utilisation. These numbers point to a strong profit squeeze but a weak profit-led regime. Along the distribution

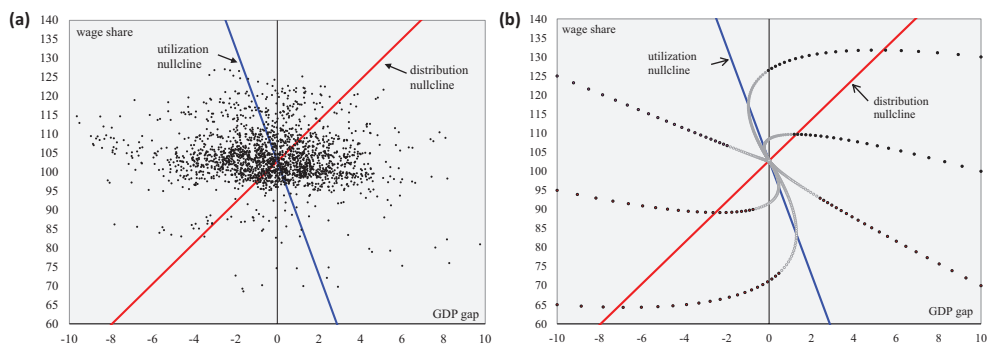


Fig. 5. Nullclines (left) and trajectories (right) for model (a), 1933 observations

nullcline a 1 percentage point increase in utilisation generates over 5 points rise in the wage share for the OECD group, whilst along the utilisation nullcline a 1 point increase in the wage share leads to a $1/14.94 = .06$ percentage point decline in capacity utilisation.¹⁸ When we allow nullcline slopes to vary, we find that a profit-led regime holds across all 13 countries—see estimates of model (g) in the Appendix.¹⁹

Business cycle dynamics are further illustrated in Figure 5 (right panel). Here we simulate the model's predictions in the absence of any shocks starting at a variety of initial conditions. The trajectories do not exhibit persistent Goodwin cycles. All paths converge to a long-run equilibrium at the point where the nullclines intersect.²⁰ Convergence is relatively slow; the first five years of each path are denoted in black, the remainder in grey. This slowness indicates that the profit-led stage of the recovery from a temporary output shock (but no distribution shock) can be rather long-lived, delaying the profit-squeeze stage for many years. Comparing the two plots in Figure 5 suggests that the elongated scatter of points in the left panel around the equilibrium may be explained with the right panel as equilibrating dynamics subsequent to output shocks.²¹

Next, we generalise the long-run equilibrium by removing the NAIRU restriction. The estimates appear in column (b). The estimate for the long-run gap intercept supports the NAIRU restriction but the result $\hat{\psi}_0^* > 100$ implies that the long-run equilibrium may be moving downwards. So does the literature's focus on the adverse effects of suppressing the wage share on economic activity (see Nikiforos and Foley, 2012). To investigate these possibilities, we generalise our specification in model (c) by introducing linear trends for both of the long-run coordinates.²² Although the long-run equilibrium is unobservable, it is the conceptually appropriate indicator of the trend in capitalist economies. The ψ_0^* coefficient is reinterpreted as the 1970 wage share

¹⁸ Barbosa-Filho and Taylor (2006) find a flatter utilisation nullcline for the USA that is equivalent with a stronger profit-led demand regime. Their estimates suggest that a 1 percentage point increase in the wage share leads to a 0.33 percentage point decline in capacity utilization.

¹⁹ Table A.3 in the Appendix reports further estimates of country-specific nullclines.

²⁰ Model (a) has two real roots at 0.96 and 0.93, verifying dynamic stability.

²¹ Nikiforos and Foley (2012) emphasise the possibility of multiple long-run equilibria arising from non-linear nullclines and the counter-intuitive inferences that this implies. We investigate this possibility by adding quadratic terms to our basic model's equations, eqs (3) and (4). Estimation results for this specification, which can be provided on request, show little statistical support for non-linearities.

²² Specifically we use $u_t^* = u_0^* + u_1^* t$ and $\psi_t^* = \psi_0^* + \psi_1^* t$.

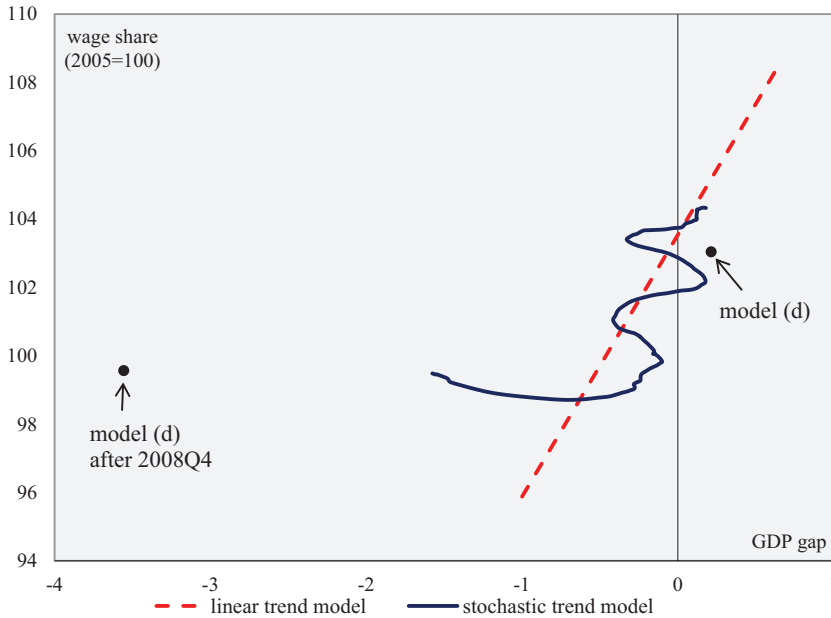


Fig. 6. Comparison of alternative trajectories of the long-run equilibrium

equilibrium and u_0^* as the 1970 utilisation equilibrium. This generalisation is motivated by a variety of evidence that there have been long-term trends in the global economy, notably the trend towards greater income inequality. This specification does not impose a direction on these trends; they may be positive or negative. Model (c) finds significant downwards trends for both long-run coordinates; it also achieves a better Schwarz statistic.

We can use the estimates in Table 1 to calculate the steady-state solutions for our variables and measure the magnitude of the overall shift. Simple computations using estimates in column (c) show that the intersection of the two nullclines has shifted from $(\psi_{1970}^* = 110.36, u_{1970}^* = 0.89)$ to $(\psi_{2012}^* = 95.87, u_{2012}^* = -1.0)$. Our linear trending equilibrium specification in Figure 6 assumes that the annual shifts are evenly spaced. We estimate the slope of the steady-state trajectory and obtain $\Delta\psi^* / \Delta u^* = 7.67$. This implies that a 1 point increase in the steady-state wage share is associated with $1/7.67 = 0.13$ percentage point rise in capacity utilisation at the steady state. Conversely, a 1 percentage point decline in u^* coincides with a 7.67 point decline in the wage share in the long run. This slope, however, cannot determine whether the trends in two unobserved variables share the same underlying cause.

Instead of a steady trend, the shifts in utilisation may be episodic and linked to events such as the 2008 crisis. We explore this possibility with the structural-break model (d), which introduces shifts in all six model parameters. Except for the shift in the long-run gap intercept in the fourth quarter of 2008, the crisis does not appear to have altered the basic dynamics, confirming our modelling approach both before and after the crisis. None of the other estimates of the shift coefficients are statistically significant; the signs of the slopes remain unchanged so that these economies can still be characterised as profit-led. These results can be interpreted to mean that the 2008 crisis has only shifted the cycle towards a more negative output gap. Figure 6 illustrates

Table 2. Summary of linear trend model's the between-country covariance matrix

	Average	Observations
gap $Var(v_{it}) = \sigma_{iu}^2$	1.034	13
Wage share $Var(\varepsilon_{it}) = \sigma_{i\varepsilon}^2$	1.555	13
Within $Cov(\varepsilon_{it}, v_{it}) = \sigma_{i\varepsilon v}$	-0.698	13
Between gap $Cov(v_{it}, v_{jt}) = \sigma_{jv}$	0.196	78
Between wage $Cov(\varepsilon_{it}, \varepsilon_{jt}) = \sigma_{j\varepsilon}$	0.107	78
Between gap-wage $Cov(v_{it}, \varepsilon_{jt}) = \sigma_{jv\varepsilon}$	-0.141	156

our alternative estimates of the long-run equilibrium. Perhaps the great crisis brought a long-lasting shift in the level of activity of capitalist economies, perhaps this time is different. However, since only 15 quarters are available after 2008Q4, and since the global recovery has been unusually sluggish, we hesitate to interpret the post-crisis equilibrium as evidence of a true structural change.

Our econometric model contains two error terms ε_{it} and v_{it} that account for random shocks, both utilisation shocks like a temporary fiscal contraction or a Tsunami disaster and wage share shocks like a furlough. Table 2 averages the 351 estimates in this covariance matrix for model (c). The estimated covariance matrix is one measure of the global linkages between modern economies.

The positive covariance σ_{jv} of utilisation shocks is expected, reflecting obvious demand linkages between countries. Interestingly, we also find a positive covariance $\sigma_{j\varepsilon}$ of wage share shocks; that there are between-country wage shock linkages is less obvious, although it is consistent with our global race to the bottom hypothesis; a wage drop in one country is associated with a wage drop in other countries.²³ More surprising are the negative covariances $\sigma_{i\varepsilon v}$ between wage share and utilisation shocks. This finding indicates that temporary negative shocks to the GDP gap in one country is statistically associated with temporary positive shocks to the wage share in another country. This suggests that some aspects of the wage-utilisation dynamic are not captured in our simple linear model. Perhaps this negative between-country wage-utilisation covariance indicates yet another source of global linkage.

Models (a) and (b) allow only temporary shocks, but (c)'s downwards trend and (d)'s leftwards shift suggest that there may be permanent shocks, as well as temporary ones. We study this distinction in model (e) by further generalising our specification as a state space model. This way of estimating the movement of the long-run equilibrium is appealing because it can provide evidence about structural breaks in the model's long-run parameters. Following Kapetanios and Tzavalis (2010), it views structural breaks as being determined within the model by the history of past events, such as booms and crises.

We suppose that the long-run equilibrium that applies in all countries is subject to persistent random shocks, specifically, the long-run equilibrium (ψ_t^*, u_t^*) is redefined as two random walks.²⁴ Such models are sometimes called stochastic trends (Harvey, 1985). The variances in these equations are restricted to a standard deviation of 0.05 per year for the wage share step and 0.01 per year for the GDP gap step; these are

²³ Rudiger von Arnim suggested that this finding can also be due to imported price inflation which workers are unable to translate into higher nominal wages.

²⁴ Specifically we assume $u_t^* = u_{t-1}^* + \xi_t$, where $\xi_t \sim N(0, 0.01)$ and $\psi_t^* = \psi_{t-1}^* + \mu_t$, where $\mu_t \sim N(0, 0.25)$.

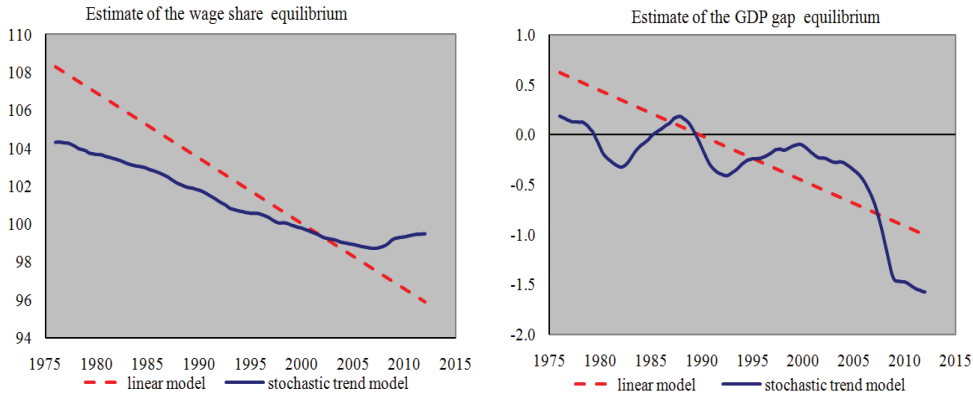


Fig. 7. Comparing the linear and stochastic trend estimates of state variables

chosen to be consistent with the relative trends found in model (c) and to smooth the evolution of long-run equilibrium. The random walk model is appealing because it is agnostic about the path. This specification has the potential of being further generalised to incorporate exogenous determinants of the long run.

This stochastic trend extension can be estimated as a Kalman filter in which the coordinates of the long-run equilibrium are the state variables, and the wage share and the GDP gap are the observation variables. We estimate the coefficients by maximum likelihood on a sample of 145 quarterly observations 1976–2012 on 11 countries.²⁵ In Table 1’s results, model (e) is appealing because of its goodness-of-fit and statistical significance.²⁶ Our stochastic trend estimate of the long-run point is not purely random. The Kalman algorithm estimates the state variables as the most likely values in light of previous observations of observed variables plus a random step; thus, they evolve. When we relax the deterministic linear trend on the equilibrium, we find anything but a linear trend, although the general south-west direction remains unchanged (see Figure 6). We conclude that both temporary and permanent shocks are relevant in the dynamics of these economies.

Figure 7 plots our smoothed estimates of the state variable time series (ψ^* , u^*) in comparison with the linear series predicted by model (c). Despite the flexible nature of the stochastic trend model, the roughly continuous downwards trend in the equilibrium wage share is confirmed, although it does turn slightly upwards following the 2008 crisis. For the equilibrium utilisation, however, the stochastic trend differs markedly from the steady trend enforced on the linear model. The stochastic estimate starts at a point close to 0 in 1976, but does not show any sustained trend until after 2005. Then it drops dramatically at about the 2008 crisis, a finding that is consistent with our structural break model (d).

4. The race to the bottom

There has been a trend towards a lower wage share. Also, there is weaker evidence associated with the 2008 crisis of a decline of economic activity in the long run that is pushing OECD economies below their potential output. These findings could be

²⁵ To obtain a balanced panel of observations, we dropped both Germany and Ireland due to data unavailability. We also dropped the first five years to include Korea and Finland.

²⁶ Unreported results of the covariance matrix of the residuals of this stochastic trend model show a pattern similar to that of the linear trend model in Table 2.

independent, or they could be related. A variety of causes are possible. Although we have not empirically isolated the causes, nevertheless, in light of the short-run linkages, we believe that there are long-run dynamics that require a political economy perspective.

Amongst possible causes are permanent shifts in technology, increased global capitalist market power either in product or labour markets and trends in government policies. We offer a race-to-the-bottom hypothesis as one version of the latter. We propose that governments have been pursuing a broad set of policies to suppress the wage share to increase their exports; they are racing to stimulate output by decreasing labour costs. This worldwide phenomenon has been proceeding steadily during recent decades (see [Bowles et al., 1990](#); [Stiglitz, 2012](#); [Storm and Naastepad, 2012](#)). Amongst policies that have contributed to these trends are tight macroeconomic policies, embodied in inflation targeting for monetary policy, the austerity movement for fiscal policy and a decline in employment protection and labour market standards ([Olney, 2013](#)).

We do not address the mechanism behind the race to the bottom. Instead, we show empirically its existence. The positive covariance of the wage share shocks discussed above has already suggested cross-country linkages consistent with the race to the bottom hypothesis. Model (f) in [Table 1](#) presents further evidence in support of our claim that the OECD countries have been undercutting each other's real unit labour costs. Using a similar methodology as [Olney \(2013\)](#), we introduce the average wage share in the other countries included in our sample (the rest of the sample) as an explanatory variable of the long-run wage share. The race to the bottom hypothesis implies a positive ψ_2^* ; ²⁷ a decline in the wage share in country i in the current period is associated with a decline in the wage share in the rest of the sample in the previous period. Our results are consistent with the race to the bottom hypothesis. At the same time this race has little effect on the long-run output gap (the estimated u_2^* is insignificant), implying that this race to the bottom in the name of competitiveness does not deliver prosperity.

On other fronts, governments have tilted the capital-labour bargain towards greater inequality through the lax regulation of financial markets, reductions in the progressivity of the tax structure and reductions in corporate tax rates, changes in bankruptcy laws and support for anti-labour collective bargaining agreements. Model (f) suggests that these institutional and policy shocks spread across countries are limiting workers' bargaining power to claim productivity gains or higher nominal wages in response to price increases. Sustained efforts towards deregulation and deterioration of antitrust laws, especially in the USA since the 1980s, also have led to a concentration of market power, which has hindered the process of job creation. As Paul Krugman bluntly put it in a recent op-ed:

antitrust enforcement largely collapsed during the Reagan years and has never really recovered. Yet . . . increasing business concentration could be an important factor in stagnating demand for labour, as corporations use their growing monopoly power to raise prices without passing the gains on to their employees.²⁸

Overlooked in this set of policies is the adverse effect on long-run utilisation. According to the conventional doctrine embodied in the NAIRU restriction, tight macroeconomic policy has only a temporary effect and the GDP gap returns eventually to 0. We propose that a continuing policy of inflation targeting implies that the GDP gap is below 0 for many years and may have a lasting impact. Our results are consistent with

²⁷ Specifically we use $u_i^* = u_0^* + u_2^* \psi_{i-1}$ and $\psi_i^* = \psi_0^* + \psi_2^* \psi_{i-1}$, where ψ_i is the average wage share in the other countries.

²⁸ See the Paul Krugman, 'Robots and Robber Barons', *New York Times*, 9 December 9 2012.

Taylor's (2011) and Stiglitz's (2012) claims that macroeconomic policies, because of their distributional impact, may have permanent effects on the economy. Furthermore, increased income inequality and anti-labour policies may have an adverse effect on economic output if they reduce productivity growth or if they lead to lower demand for labour (Storm and Naastepad, 2012). Our results suggest that whilst the wage share trend has been steady, the long-run shift in economic activity has been more episodic and appears linked to the 2008 crisis.

We interpret our results as an indication of a failure of orthodox economic thinking about macroeconomic management that emerged in the 1970s throughout the profession and around the world. The damage done by the great crisis goes beyond the financial collapse and the recent global recession. OECD economies appear to be moving in an adverse direction and, unless significant institutional changes promote a more equal and equitable distribution of income, we are likely to see cumulative negative effects for many decades to come.

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Appendix

A.1 A pure Goodwin model

The specification for our pure Goodwin model is written as:

$$u_{it} - u_{it-1} = \beta_0 u_{it-1} (\psi_{it-1} - 0) + v_{it} \quad (5)$$

$$\psi_{it} - \psi_{it-1} = \alpha_0 \psi_{it-1} (u_{it-1} - \psi_0^*) + \varepsilon_{it} \quad (6)$$

where the long-run output gap is constrained to 0. Compared to our main specifications the pure Goodwin model performs poorly in terms of the Schwarz criterion; see Table A.2, model (g). Its estimate of the long-run wages share is far from realistic at 219, also statistically insignificant.

A.2 Data

Table A.1. Descriptive statistics, 1971–2012, 13 OECD countries

	Wage share (2005 = 100)	GDP gap (%)	Observations
Australia	105.4	-0.293	165
Canada	104.8	-0.215	165
Finland	106.1	-0.878	146
France	101.0	-0.216	165
Germany	103.5	-0.563	85
Ireland	106.2	0.573	89
Italy	109.8	-0.201	165
Japan	102.3	-0.523	165
Korea	92.7	0.083	149
Netherlands	106.8	-0.087	165
Sweden	104.6	-0.083	165
UK	103.2	-0.118	165
USA	102.4	-0.489	165
Average	103.7	-0.246	

Table A.2. Additional estimation results

Model	(g) NAIRU, pure Goodwin, seemingly unrelated	(h) NAIRU, country-specific nullclines, seemingly unrelated
Wage slope α_1		6.422 ave (-3.520) ave
Gap slope β_1		-22.071 ave (-1.660) ave
Wage share scaling α_0	0.001 (14.212)	-0.023 (-6.946)
Gap scaling β_0	0.001 (0.865)	-0.005 (-1.858)
Long-run wage intercept ψ_0^*	218.55 (1.650)	102.71 (137.96)
Schwarz criterion	-1171	-1155

Note: t-statistics in parentheses.

Table A.3. Country-specific properties of model (h)

Country	Wage share slope	GDP gap slope	Type	Modulus	Dynamics	Roots
Australia	8.267	-32.486	profit-led	0.969	stable	both real
Canada	5.972	-23.047	profit-led	0.968	stable	both real
Finland	6.136	-13.282	profit-led	0.956	stable	complex
France	3.860	-10.388	profit-led	0.963	stable	complex
Germany	7.760	-16.464	profit-led	0.948	stable	complex
Ireland	4.378	-14.148	profit-led	0.960	stable	both real

Table A.3. *Continued*

Country	Wage share slope	GDP gap slope	Type	Modulus	Dynamics	Roots
Italy	6.944	-18.414	profit-led	0.962	stable	both real
Japan	6.145	-21.214	profit-led	0.967	stable	both real
Korea	5.019	-32.285	profit-led	0.972	stable	both real
Netherlands	10.801	-29.832	profit-led	0.966	stable	both real
Sweden	6.088	-15.752	profit-led	0.956	stable	both real
UK	8.018	-28.147	profit-led	0.968	stable	both real
USA	4.095	-31.462	profit-led	0.973	stable	both real
Average	6.422	-22.071	profit-led	0.964	stable	both real