

DEPARTMENT OF ECONOMICS WORKING PAPER SERIES

Distribution-utilization interactions: a race to the bottom among OECD countries

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Working Paper No: 2013-13

November 2013
(revised August 2014)

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Abstract

We explore four decades of short and long run interactions between income distribution and real economic activity for a panel of OECD countries. Allowing for predator-prey dynamics, we find a convergent, rather than persistent, cycle exhibiting profit-led dynamics. Our regressions suggest that the dynamic interaction of these two variables is rather complicated. Estimating the long run point, we argue that this equilibrium has been shifting as a matter of public policy. We hypothesize that a *race to the bottom* arises from a need to be competitive in globalized markets. We report evidence that globalization does have a negative long-run effect on the wage share, and perhaps a positive effect on utilization. We also find that other factors have been important: unionization has been pro-labor, while contractionary monetary policy and R&D spending have been anti-labor.

Keywords: distribution-utilization interactions; dynamics and equilibrium; globalization

JEL Classification: D3; C23;

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1. Introduction

We contend that countries have engaged in an extended *race-to-the-bottom* in terms of the wage share, arising from competition for global markets. This econometric study explores the determinants of the long-run wage share, while accounting for short-run cyclical dynamics. We embed longer-term trends in a short-run business cycle model that allows dynamic interaction between distribution and utilization following Goodwin (1967). We believe that this race has resulted from wide-ranging policies that lower labor costs. Our approach enables an econometric measurement of the long-run distribution-utilization equilibrium as determined by exogenous factors; we identify institutions, technology and policy as being significant factors.

Income inequality has been rising around the world for decades. Empirical researchers have often concentrated on the personal distribution of income, studying distributive measures such as the Gini coefficient. This paper focuses instead on the functional distribution of income, consistent with Goodwin's theory. Figure 1 plots annual OECD observations of the wage share for a panel of countries over four decades.³ The wage share is an index number computed by deflating the unit labor cost.⁴

[Figure 1 here]

Goodwin's original measure of the state of the business cycle is the employment rate. We substitute an aggregate output variable for this concept, the percentage difference between actual and potential gross domestic product. Figure 1 plots GDP gaps for the same countries. These are the data we wish to explain.

³ Included are: Australia, Canada, Finland, France, Germany, Ireland, Italy, Japan, South Korea, Netherlands, Sweden, US and the US. The data was extracted on 28 Oct 2012 20:27 UTC (GMT) from OECD iLibrary, Economic Outlook 90. Our panel is unbalanced because complete data are unavailable for Finland, Germany, Ireland and Korea. The Korean wage share is an obvious outlier. 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 the other industrialized countries. See the Appendix for more detail on these variables as well as independent variables introduced below.

⁴ Giorno et al. (1995) discuss the OECD methodology for estimating the output gap. More information on the OECD's measurement procedure can be found online at <http://www.oecd.org/economicoutlook/methodsoftheoecdeconomicoutlook.htm>OECD.

The GDP gap is defined as the deviation from potential, as estimated from the contemporaneous capital stock, available technology, labor productivity and assuming full employment; we should expect that its long-run value of this measure to be zero. This plot compares the differing severity of business cycle swings among these countries. The worldwide effect of financial crisis of 2008 is especially clear. We believe that the logic of Goodwin's theory remains unchanged by this measurement change, to the extent that the GDP gap is a reliable proxy or deviations of employment rate from its long run trend (Barbosa-Filho and Taylor 2006). Our underlying hypothesis is that distribution and utilization are dynamically linked, and that this interaction is central to an understanding both the business cycle and the long-run evolution of the global economy.

2. Short-run dynamics

Goodwin, a pioneer of economic dynamics, adapts the equations from an ecological model (predator-prey) to link the wage share and the employment rate.⁵ He asserts that business cycles emerge from the dynamic evolution of capital-vs-labor power relations. This model holds that the wage share is determined by the evolving balance of power between capitalists and labor, and that utilization is determined by investment behavior. Without specifically elaborating the determinants of these variables we formalize this theory as a pair of locally stable differential equations:⁶

$$\begin{aligned}\dot{\psi} &= f(\psi, u) \\ \dot{u} &= g(\psi, u)\end{aligned}\tag{1}$$

where $\dot{\psi}$ and \dot{u} are the time derivatives of the wage share and utilization. The wage share equation posits that the change depends on the contemporary state of utilization and the wage share. The second equation captures the reaction of utilization to the same variables.

Setting the time derivatives to zero defines nullcline lines. Figure 2 illustrates a case of a single stable equilibrium and linear nullclines. Such models have fixed points at

⁵ This model takes its name from its initial application to wolf and moose populations Lotka, 1925.

⁶ See Taylor (2004) and Barbosa-Filho and Taylor (2006) for a detailed discussion of the theory behind the model.

the intersections of their nullclines; these may be stable or unstable. Although neither the location of nullclines nor the location of the long-run equilibrium of the model are directly observable, a phase diagram provides for useful heuristic analysis. The idea pursued by this study is that underlying forces are associated with shifts in the fixed point. We postulate that in addition to short-run dynamics caused by the interaction of output and distribution, there are longer-run factors affecting output and distribution in the macroeconomy.

[Figure 2 here]

In general, a variety of dynamics are possible, including globally stable and unstable ones, models that combine local stability with local instability, and models with limit cycles. This paper focuses on the determinants of the long-run equilibrium rather than on dynamics.

Our model responds to exogenous shocks, which can be either temporary or permanent. Figure 2 illustrates the difference between temporary and permanent shocks. A temporary shock to economic activity does not shift the long-run equilibrium. An adverse shock, for example, can shift the economy to point B initially. Subsequently, the economy returns to point A along the turquoise path. This path shows a recovery that initially involves a falling wage share, a phenomenon that has been labeled *profit-led*. With a different configuration of nullclines this recovery can involve a rising wage share; this has been labeled *wage-led*.

A permanent shock, on the other hand, might be characterized as a shift of the long-run equilibrium, perhaps due to technological change, or rivalry for global markets. The diagram illustrates the response to a permanent shift in the utilization nullcline. This economy converges to a new long-run equilibrium at point C. In this example, the recovery is incomplete and anti-labor with the new equilibrium at a lower wage share and an output gap. Of course, other scenarios can be imagined and other nullcline shapes assumed.

While the literature on the long-run relation between income distribution and economic activity is large (see the review by Hein and Vogel, 2008), econometric studies

of Goodwin-style short-run dynamics are rare (see Barbosa-Filho, 2006; and Nikiforos and Foley, 2012 for exceptions). In a related study Fiorio et al. (2013) explore short and long-run connections between income distribution and the rate of employment using a cointegration methodology. Their approach introduces two additional endogenous variables, the power of labor and power of capital. While clearly relevant, we prefer to think of these opposing powers as being exogenous factors.

3. Alternative specifications and results

The original Goodwin model is nonlinear with a horizontal wage nullcline and vertical utilization nullcline, which can be written in difference form as:

$$\begin{aligned}\psi_{it} - \psi_{it-1} &= \alpha\psi_{t-1}(u_{it-1} - u^*) + \varepsilon_{it} \\ u_{it} - u_{it-1} &= \beta u_{it-1}(\psi_{t-1} - \psi^*) + v_{it}\end{aligned}\quad (2)$$

where the subscript refers to the i^{th} country in the t^{th} period. α and β are parameters, ε_{it} and v_{it} are error terms, and starred parameters define a fixed point, (ψ^*, u^*) . This model has a second fixed point at $(0, 0)$, but response trajectories do not converge to either point. Instead they follow recurring orbits around (ψ^*, u^*) .

We estimate this specification on the OECD data as a set of 26 seemingly unrelated regressions with the cross-country restriction that all follow the same model.

$$\begin{aligned}\psi_{it} - \psi_{it-1} &= 0.0047\psi_{t-1}(u_{it-1} - 0.0120) \\ &\quad (21.9) \quad (1.17) \\ u_{it} - u_{it-1} &= 0.0023u_{it-1}(\psi_{t-1} - 259.5) \\ &\quad (0.94) \quad (1.59)\end{aligned}\quad (3)$$

Our estimation procedure assumes an error structure that allows for inter-country interactions, a generalized least squares method that allows different variances for each country, and nonzero intercountry and interequation covariances. The results are not very encouraging. They imply that these economies follow fixed orbits around a fixed point at $(260, 0.01)$, with the wage share index reaching 400. This result casts doubt on the pure Goodwin model, since we do not observe any cases even close to 400.

As an alternative we estimate a linear specification for the same two difference equations:

$$\begin{aligned}\psi_{it} - \psi_{it-1} &= \alpha_0 + \alpha_1 \psi_{it-1} + \alpha_2 u_{it-1} + \varepsilon_{it} \\ u_{it} - u_{it-1} &= \beta_0 + \beta_1 \psi_{it-1} + \beta_2 u_{it-1} + v_{it}\end{aligned}\quad (4)$$

After rearrangement this specification can be seen to be a VAR(1). By specifying this model in terms of lagged dependent variables we mitigate worries about spurious regression, an issue that often plagues time series econometrics. The linear model improves the fit, implying that these economies converge to a fixed point well within our observations at (101.9, -0.11).⁷

The linear model may follow cyclical trajectories converging to a unique point as in Figure 3. This model's paths might also diverge, but our estimate shows convergence.⁸ In order to permit multiple fixed points, orbits or limit cycles, we need nonlinearities. The Goodwin equations feature the product of ψ and u , but give a poor fit. Perhaps adding polynomial terms to our linear model, such as:

$$\begin{aligned}\psi_{it} - \psi_{it-1} &= \alpha_0 + \alpha_1 \psi_{it-1} + \alpha_2 u_{it-1} + \alpha_3 u_{it-1}^2 + \dots + \alpha_q u_{it-1}^q + \varepsilon_{it} \\ u_{it} - u_{it-1} &= \beta_0 + \beta_1 \psi_{it-1} + \beta_2 u_{it-1} + \beta_3 u_{it-1}^2 + \dots + \beta_q u_{it-1}^q + v_{it}\end{aligned}\quad (5)$$

will improve the fit, and might imply cyclical dynamics or multiple fixed points. Estimating this system for orders 1, 2 and 3, we find that the linear model fits the data best.⁹

Figure 3 plots the estimated nullclines of the linear and quadratic models and response paths for a variety of initial conditions (each dot denotes one year). Although the quadratic form could in principle result in two fixed points, its nullclines cross only once. The quadratic nullclines (dashed) are nearly linear. Both estimates predict nearly identical trajectories. Both converge to nearly the same point; we estimate the quadratic equilibrium as (102.7, 0.01). Both distribution nullclines slope up and both output gap nullclines slope down, implying essentially identical profit-led dynamics for both.

[Figure 3 here]

⁷ The Schwartz criterion for our linear model is a large improvement over that of the pure Goodwin model: SC(linear)=303, SC(Goodwin)=349; based on 948 observations.

⁸ The linear model is stable with two real roots at 0.88 and 0.69.

⁹ Comparing linear, quadratic and cubic models we find that linear minimizes the Schwartz criterion: SC(linear)=303, SC(quadratic)=311, SC(cubic)=312.

The linear model can be written as a matrix equation:

$$\begin{bmatrix} \psi_{it} - \psi_{it-1} & u_{it} - u_{it-1} \end{bmatrix} = \begin{bmatrix} \alpha_0 & \beta_0 \end{bmatrix} + \begin{bmatrix} \psi_{it-1} & u_{it-1} \end{bmatrix} \begin{bmatrix} \alpha_1 & \beta_1 \\ \alpha_2 & \beta_2 \end{bmatrix} + \begin{bmatrix} \varepsilon_{it} & v_{it} \end{bmatrix} \quad (6)$$

and interpreted as a VAR(1):

$$\begin{aligned} \Delta \mathbf{Y}_t &= \mathbf{A}_0 + \mathbf{Y}_{t-1} \mathbf{A}_1 + \mathbf{E}_t \\ \mathbf{Y}_t &= \mathbf{A}_0 + \mathbf{Y}_{t-1} (\mathbf{I} + \mathbf{A}_1) + \mathbf{E}_t \end{aligned} \quad (7)$$

where the dependent variables are written as a row vector $\mathbf{Y}_t = [\psi_{it} \quad u_{it}]$, $\mathbf{E}_t = [\varepsilon_{it} \quad v_{it}]$ and the \mathbf{A} 's are parameters. This suggests a VAR(p) generalization of the form:

$$\Delta \mathbf{Y}_t = \mathbf{A}_0 + \mathbf{Y}_{t-1} \mathbf{A}_1 + \mathbf{Y}_{t-2} \mathbf{A}_2 + \dots + \mathbf{Y}_{t-p} \mathbf{A}_p + \mathbf{E}_t \quad (8)$$

Estimating this system with lags of 1, 2 and 3, we find that the VAR(2) form fits the data best.¹⁰ Moreover, an examination of the VAR(1) residuals indicates the presence of serial correlation, suggesting that additional lags are needed.

Using the same initial conditions as Figure 3, Figure 4 shows that the VAR(2)-estimated trajectories are considerably different from the VAR(1)-estimated ones. This plot demonstrates that the VAR(2) paths converge to a nearly identical long-run equilibrium at (102.2, -0.004). It also shows that the VAR(2) paths can cross. The convenient nullcline concept is no longer defined for this generalization, making phase diagram analysis more complicated. While we still find profit-led behavior (in fact, recovery from a recessionary shock is more anti-labor), other types of dynamics can be seen, especially in the relative speed of convergence.¹¹ While the VAR(1) responses appear interrelated, the VAR(2) ones look more decoupled: that equilibration of utilization appears to occur faster than for the wage share. Following a utilization shock, the VAR(2) paths return nearly to equilibrium in about three years (followed by some overshooting), while wage share convergence takes longer.

[Figure 4 here]

Overall, our estimates for the long-run distribution are statistically significant and reflect

¹⁰ Using the same number (896) of observations throughout we find that $p=2$ minimizes the Schwartz criterion: $SC(\text{VAR}(1))=253$, $SC(\text{VAR}(2))=200$, $SC(\text{VAR}(3))=214$.

¹¹ The VAR(2) model is stable with roots at 0.90, 0.29 and $0.47 \pm 0.40\sqrt{-1}$.

the sample-wide normalization to 2005=100. Our estimates of the long-run GDP gap are essentially zero, consistent with the definition of this indicator. Although we do find profit-led dynamics, our estimated dynamics look very different from the inherent and persistent cycles that the business cycle literature portrays.

4. Generalizing the long-run equilibrium

The long-run equilibrium we estimate above is invariant for all countries. In light of the wage share trend evident in Figure 1, this is surely an oversimplification. We believe that the fundamental cause of differences in the fixed point is the extent to which countries have pursued a strategy of globalization. The literature suggests a variety of other considerations that may be relevant to our thesis. Krugman's recent op-ed piece emphasizes two possible causes for the long-term downward trend in the wage share: robots, an abbreviation for technological change that places workers at a disadvantage, and robber barons, symbolizing an increase in unregulated markets (Krugman, 2012). The imperative of international competitiveness may help employers resist pressures to raise real wages, perhaps by shifting production to low-wage regions, or by adopting labor-saving technology. Card and DiNardo (2002) elaborate on the distributive impact of technological change; also see (European Commission, 2007; IMF, 2007; and Kennedy, 1964).

No doubt countervailing union power influences the outcome. Unionism has a political dimension that is institutionalized into the generosity of social safety nets. It certainly differs among countries and evolves over time (see footnotes 15-19 for descriptive statistics). IMF and ILO reports cite differing labor market institutions and the degree of taxation as contributing to differing distributive outcomes; see European Commission, 2007; IMF, 2007; and Stockhammer, 2013. Gonzalez and Sala (2013) contend that increases in financialization has had an anti-labor effect by crowding out productive investment, and by facilitating the offshoring of jobs; also see Agnello et al. (2012) and Criscuolo and Garicano (2010). Probably other factors are important too.

Assuming stability, we define the long-run equilibrium for our general VAR(p) by setting the left side to zero, and denoting the long-run with a star:

$$\begin{aligned}\mathbf{0} &= \mathbf{A}_0 + \mathbf{Y}^* \mathbf{A}_1 + \mathbf{Y}^* \mathbf{A}_2 + \dots + \mathbf{Y}^* \mathbf{A}_p \\ \mathbf{Y}^* &= -\mathbf{A}_0 (\mathbf{A}_1 + \mathbf{A}_2 + \dots + \mathbf{A}_p)^{-1}\end{aligned}\quad (9)$$

Working backwards, we write the intercept coefficients in terms of the long-run point:

$$\Delta \mathbf{Y}_t = -\mathbf{Y}^* (\mathbf{A}_1 + \mathbf{A}_2 + \mathbf{A}_3 + \dots + \mathbf{A}_p) + \mathbf{Y}_{t-1} \mathbf{A}_1 + \mathbf{Y}_{t-2} \mathbf{A}_2 + \dots + \mathbf{Y}_{t-p} \mathbf{A}_p + \mathbf{E}_t \quad (10)$$

For a VAR(2) version, this parameterization expands as:

$$\begin{aligned}\begin{bmatrix} \psi_{it} - \psi_{it-1} & u_{it} - u_{it-1} \end{bmatrix} &= -\begin{bmatrix} (\alpha_1 + \alpha_3) \psi_{it}^* + (\alpha_2 + \alpha_4) u_{it}^* & (\beta_1 + \beta_3) \psi_{it}^* + (\beta_2 + \beta_4) u_{it}^* \end{bmatrix} \\ + \begin{bmatrix} \psi_{it-1} & u_{it-1} \end{bmatrix} \begin{bmatrix} \alpha_1 & \beta_2 \\ \alpha_2 & \beta_2 \end{bmatrix} &+ \begin{bmatrix} \psi_{it-2} & u_{it-2} \end{bmatrix} \begin{bmatrix} \alpha_3 & \beta_3 \\ \alpha_4 & \beta_4 \end{bmatrix} + \begin{bmatrix} \varepsilon_{it} & v_{it} \end{bmatrix}\end{aligned}\quad (11)$$

An estimate of this specification with a constant long-run point is reported as model (a) in Table 1.

[Table 1 here]

To test for worldwide trends, we substitute linear trends for each of the long-run equilibrium coordinates

$$\begin{bmatrix} \psi_{it}^* & u_{it}^* \end{bmatrix} = \begin{bmatrix} \psi_0^* + \psi_1^* t & u_0^* + u_1^* t \end{bmatrix} \quad (12)$$

The coefficient ψ_0^* is the 1970 wage share equilibrium, u_0^* is the 1970 gap equilibrium and t is defined as number of years after 1970. We do not impose directions on these trends, they may go up or down. Model (b) in Table 1 shows a negative, but insignificant trend in the long-run GDP gap, although we do find a significant downward trend in the wage share, consistent with our notion of a race to the bottom.¹²

To investigate underlying causes, we consider a set of determinants z of the long-run wage share and another set y for the long-run GDP gap:

$$\begin{bmatrix} \psi_{it}^* & u_{it}^* \end{bmatrix} = \begin{bmatrix} \psi_0^* + \sum \psi_i^* z_{it-1} & u_0^* + \sum u_i^* y_{it-1} \end{bmatrix} \quad (13)$$

For generality we estimate effects on both coordinates for each hypothesized cause. We use measurements in the previous year for consistency with our assumption about the

¹² Kiefer and Rada (forthcoming) report statistically significant downward trends in both long-run wage share and utilization. Perhaps this difference results from our use of annual, rather than quarterly data.

direction of causality, and to mitigate issues of simultaneity.

Globalization is our focus: we hypothesize that while seeking competitive advantage, countries have pursued policies that have reduced wages. Globalization encompasses multiple dimensions; Dreher (2006) attempts to summarize these by constructing his KOF index from a multidimensional factor analysis. Model (c) tests our main conjecture using this index as the sole determinant of both long-run coordinates. This globalization model fits these data better than linear trends do.¹³ Our results suggest that globalization has a positive (but insignificant) effect on economic activity in the long run.¹⁴ The small long-run benefit in terms of utilization is associated with a significant reduction in the wage share. This is a classic race-to-the-bottom phenomenon where the racers gain a little long-run advantage, while labor generally suffers significant losses. The various countries in our sample have different histories and have instituted different policies, thus they have different fixed points, but share similar short-run dynamics.

Workers often push back against wage reductions through union activism. We attempt to quantify the many dimensions of union power with a single indicator: the percentage of work force who are union members i.e. *union density*.¹⁵ Model (d) validates our expectation that higher density increases the long-run wage share. We note that according to this estimate union power does not have an adverse effect on long-run utilization. After accounting for the effects of union power, the adverse distributive effect of globalization remains robust.¹⁶

Finally, the literature suggests that macroeconomic policy, technological change and financialization could also affect the long-run coordinates. Model (e) extends our methodology by adding three additional variables: an indicator of monetary policy over the long term, (the 5-year average of the short minus long interest rate spread),¹⁷ an

¹³ Model (c) lowers the Schwartz criterion: SC(b)=314 and SC(c)=313.

¹⁴ There may be unmodeled short-run effects.

¹⁵ Statistics on trade union density comes from the OECD Database on Trade Unions http://www.oecd.org/employment/emp/UnionDensity_Sourcesandmethods.pdf. This measure understates union power to the extent that nonmember workers are often covered by collective bargaining agreements.

¹⁶ Our short-run dynamic results are also robust. In an unreported plot of responses to shocks, we find that models (a) and (d) predict virtually indistinguishable dynamics.

¹⁷ Monetary policy stance is defined in terms of the term spread between short and long run interest rates. Data on real long and short-term interest rates comes from the European Commission database, http://ec.europa.eu/economy_finance/ameco/user/serie, except for Australia, Canada and South Korea. For these countries we used the Monthly Monetary and Financial Statistics (MEI) dataset from OECD.

indicator of the pace of technological change (R&D spending as a percentage of GDP),¹⁸ and an indicator of financialization (the value added in finance, insurance and real estate industries as a percent of the economy wide value added).¹⁹ Due to the unavailability of these variables before 1980 this extension is estimated with a smaller sample.

Our statistical results are complicated, and only partially consistent with the literature. Contractionary monetary policy is indicated by a larger (less negative) spread. The negative coefficient ψ_3^* in model (e) implies that tight monetary policy is anti-labor; one interpretation is that contractionary policy weakens labor's bargaining power over the long-term, plausibly through its negative effect on aggregate output and employment. We note union density is no longer statistically significant after adding these variables.²⁰ Conversely, our results also imply that a long-term expansionary monetary stance could partially neutralize the anti-labor effect of globalization.

With respect to technology, we find that R&D spending depresses both long-run coordinates. The anti-labor effect is consistent with an analysis that sees technology as substituting for labor, but the long-term efficiency loss u_4^* is surprising. Perhaps this is a manifestation of a different kind of race among nations; perhaps innovation is expensive, and it is more efficient to imitate new technology.

Contrary to Gonzalez and Sala (2013), we do not find any statistically significant effects associated with financialization, either on distribution or utilization.

Finally, we note that the anti-labor globalization hypothesis is robust to the inclusion of these additional variables, showing a significant positive utilization effect u_1^* . The race-to-the-bottom phenomenon appears well established, and may be reinforced by long-term utilization advantages accruing to the racers.

5. Conclusions

This econometric study explores the determinants of the long-run capitalist

¹⁸ Data on R&D as a percentage of GDP is from the <http://stats.oecd.org/OECD.Stat> and specifically from the Main Science and Technology Indicators dataset.

¹⁹ We use the share of the Financial, Insurance and Real Estate and Business Services in total value added as a measure of the extent of financialization. These data are taken from the OECD's Structural Analysis Database.

²⁰ Possibly the union variable and the monetary policy variable reflect the same trend; perhaps union power might be effective in resisting contractionary macro policy. This explanation is not supported by the low correlation between the union density and monetary policy variables; see Table A.2 in the Appendix.

equilibrium, while accounting for short-run cyclical dynamics. Following Goodwin, we embed this equilibrium in a short-run business cycle model that allows dynamic interaction between distribution and utilization. Our findings are consistent with the profit-led model of the business cycle, although recent OECD outcomes do not support persistent cycles. Focusing on shifts in the long-run equilibrium rather than its dynamics, we find that several oft-cited factors (R&D spending, globalization, tight monetary policy and the weakening of union power) are statistically associated with the downward trend in wages. The continuing trend toward greater globalization may have increased long-run economic output slightly, but has reduced the wage share dramatically.

Appendix:

[Tables A1 and A2 here]

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Figures and Tables:

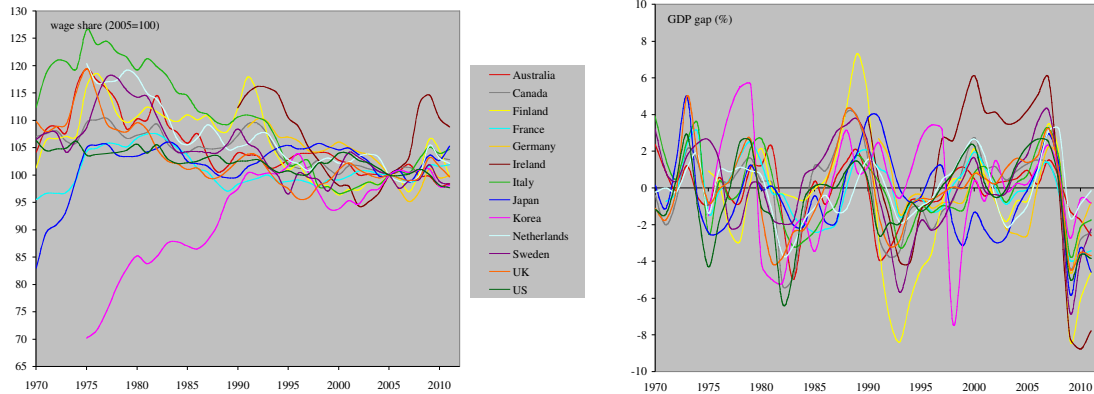


Figure 1: The OECD data

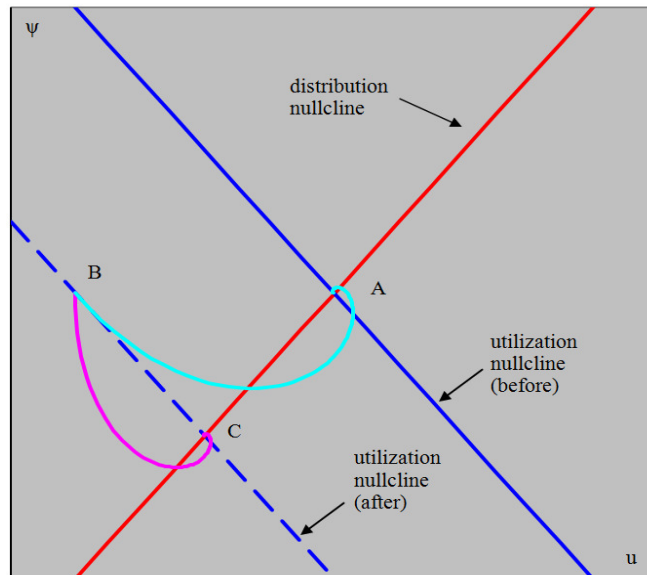


Figure 2: Profit-led response to a temporary (turquoise) and a permanent (pink) utilization shock

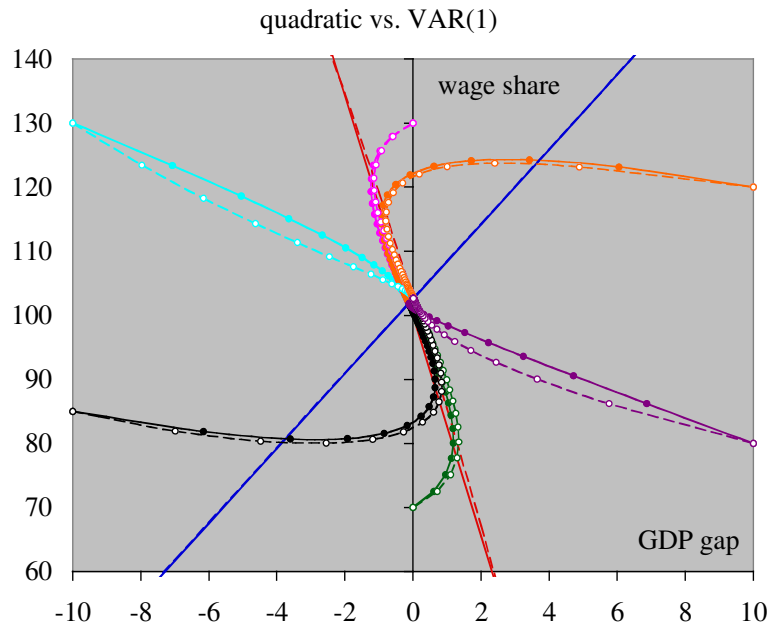


Figure 3: Estimated responses to temporary shocks with the linear (solid dots and paths) and quadratic (white dots and dashed paths) models, wage share nullclines in blue, GDP gap nullcline in red; 1971-2011

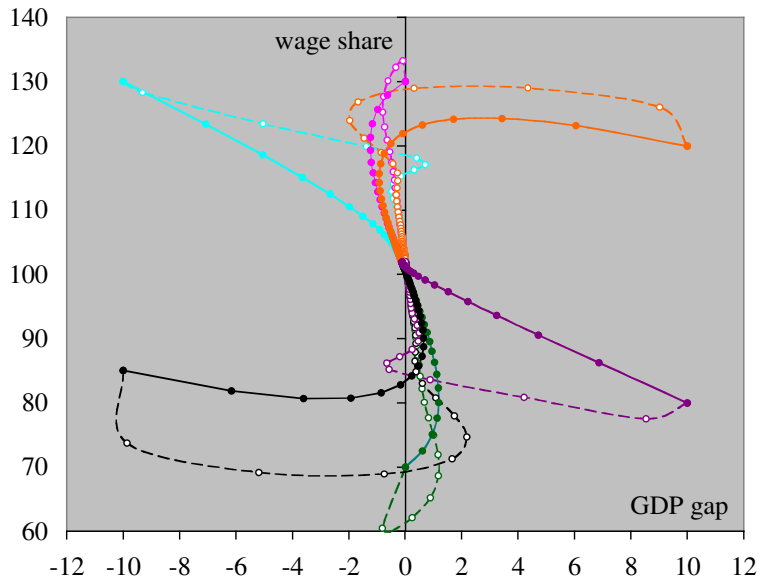


Figure 4. Estimated responses to temporary shocks with the VAR(1) (solid dots and paths) and VAR(2) (white dots and dashed paths) models. An estimate of this specification with a constant long-run point is reported as model (a) in Table 1.

	(a)	(b)	(c)	(d)	(e)
long-run wage intercept ψ_0^*	102.326 (92.199)	110.257 (67.975)	116.237 (25.679)	112.716 (26.597)	112.698 (42.826)
long-run trend ψ_1^*		-0.345 (-5.139)			
globalization ψ_1^*			-0.203 (-3.224)	-0.187 (-3.297)	-0.093 (-2.871)
union density ψ_2^*				0.095 (2.517)	0.038 (1.332)
monetary policy ψ_3^*					-0.874 (-2.903)
technology ψ_4^*					-1.321 (-2.616)
financialization ψ_5^*					-0.136 (-1.238)
long-run gap intercept u_0^*	0.136 (0.717)	0.398 (1.113)	-0.836 (-1.488)	-1.024 (-1.763)	-1.255 (-1.299)
long-run trend u_1^*		-0.017 (-1.115)			
globalization u_1^*			0.011 (1.543)	0.012 (1.724)	0.019 (2.534)
union density u_2^*				0.003 (0.742)	0.003 (0.490)
monetary policy u_3^*					-0.319 (-3.316)
technology u_4^*					-0.312 (-3.117)
financialization u_5^*					0.005 (0.187)
wage eq, wage 1 lag α_1	0.222 (6.167)	0.188 (5.021)	0.182 (4.882)	0.176 (4.720)	0.082 (1.876)
wage eq, gap 1 lag α_2	0.520 (18.537)	0.473 (17.098)	0.487 (17.319)	0.484 (17.383)	0.428 (12.548)
wage eq, wage 2 lags α_3	-0.273 (-8.032)	-0.255 (-7.355)	-0.240 (-6.863)	-0.240 (-6.890)	-0.195 (-4.824)
wage eq, gap 2 lags α_4	-0.198 (-5.876)	-0.139 (-4.115)	-0.142 (-4.159)	-0.135 (-3.978)	-0.049 (-1.207)
gap eq, wage 1 lag β_1	0.049 (2.297)	-0.007 (-0.305)	0.013 (0.592)	0.012 (0.548)	-0.128 (-5.216)
gap eq, gap 1 lag β_2	-0.024 (-0.651)	-0.097 (-2.631)	-0.089 (-2.401)	-0.090 (-2.433)	0.032 (0.761)
gap eq, wage 2 lags β_3	-0.054 (-2.681)	-0.013 (-0.626)	-0.027 (-1.262)	-0.029 (-1.353)	0.064 (2.650)
gap eq, gap 2 lags β_4	-0.399 (-10.85)	-0.369 (-10.01)	-0.381 (-10.32)	-0.384 (-10.353)	-0.476 (-11.92)
Schwartz criterion	217	214	213	215	*
total observations	922	922	922	922	620

Table 1. Estimation results, annual data 1972-2011, 13 countries, t -statistics in parentheses. * Schwartz criteria are not comparable because this model is estimated with a smaller sample size.

	mean	standard deviation	observations
wage share	103.76	6.97	486
GDP gap	-0.23	2.43	485
globalization	71.32	14.17	520
union density	36.03	19.98	528
monetary policy	21.21	5.64	467
technology	-0.67	0.94	491
financialization	2.14	0.76	391

Table A1. Annual data 1971-2011, 13 countries

	globalization	union density	monetary policy	technology	Financialization
globalization	1.000				
union density	0.353	1.000			
monetary policy	-0.176	-0.373	1.000		
technology	-0.090	0.190	-0.344	1.000	
financialization	0.161	-0.590	0.226	0.134	1.000

Table A2. Correlation coefficients, annual data 1971-2011, 13 countries