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A note on the wage share in OECD countries: Is there a race to the bottom?

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Keywords: predator-prey models; distributive-demand dynamics; panel data estimation;
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1 Introduction

Income inequality has been rising for the past four decades in many countries across the world. Kuznets (1955) speculated long ago that inequality is a normal aspect of dynamic economies that undergo deep structural changes in the process of development. Since then, the empirical literature has provided mixed results on the inverse-U shaped relationship between inequality and economic growth (Acemoglu and Robinson (2002)). Over the years, the economic profession has turned to microeconomic explanations of income inequality. Skill-biased technical change and differential returns to education are favored as factors driving wage inequality in mature economies (Card and DiNardo (2002), Katz and Murphy (1992)). More recently, the literature has added union coverage, offshoring of jobs and financial reforms to the list (Criscuolo and Garicano (2010), Gordon and Dew-Becker (2008),Agnello et al. (2012)).

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Yet, most of the focus in the literature has been on the personal distribution of income. We take a classical approach here and, instead, focus on the functional distribution of income or factor income shares. Our study is motivated by the trend in the wage share or real unit labor cost observed across OECD countries (see Figure 1). For most countries the average wage share index trends downward over our sample in stark contrast with Kaldor's stylized fact that factor income shares remain constant over long periods of time.[1]

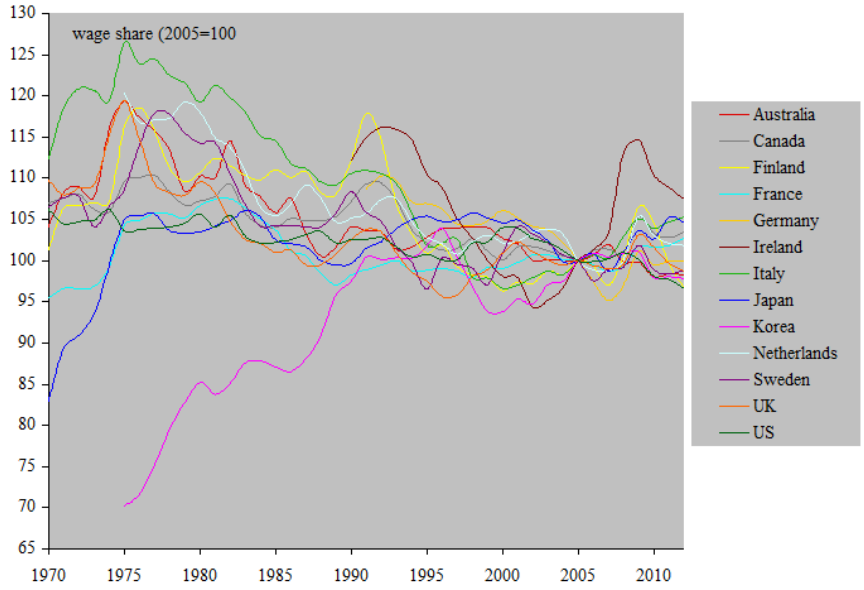

Figure 1: Labor share

In this note we explore a variety of determinants of the long run wage share for a panel of OECD economies. We suggest that the OECD countries may be in a race to the bottom in terms of real unit labor costs. We begin with the following speculation: the race to the bottom has arisen from a need to be competitive in globalized markets. Competitiveness is justified on the premise that it stimulates demand for domestic goods and therefore output. This is achieved by lowering real unit labor costs, in other words, by suppressing real wages relative to labor productivity. Hence, the observed downward trend in the wage share across OECD countries. We explore this hypothesis in a business cycles framework. Our starting point is Goodwin (1967)'s model which formalizes cyclical dynamics between income distribution and economic utilization. Our contribution is an econometric specification of the unobserved long run wage share and output gap as functions of institutions, globalization, technology, structural change and macroeconomic policy.

[1]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.

2 Goodwin's business cycles in the long run

A pioneer of cyclical macroeconomic models, Richard Goodwin put forth a predator-prey model linking dynamically the employment rate and income distribution (Goodwin (1967)).[2] Goodwin's insight is that economic cycles originate in the wage bargaining that emerges from the economic power relations between capital and labor. In turn, the employment rate is a positive function of capitalist's investment. Observing that the employment rate and the output gap are alternative measures of the utilization concept, we use OECD statistics on the output gap in place of Goodwin's employment rate. This model is formalized using the law of motions of output gap $u = 100ln(Y/Y^*)$, the logarithm of the ratio of actual to potential real output, and the wage share $\psi = \omega/x$, the ratio of the real wage to labor productivity. Taken together, the gap-distribution dynamics are described by a system of differential equations:

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

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

The output gap dynamic of equation (1) arises from excess demand or, as the difference between the demand for investment and the supply of saving, both of which are dependent on the output gap and on the wage share. Equation (2) captures the reaction of distribution to the output gap 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 labor productivity, and that both of these are also determined by output gap and distribution.[3] Setting the time derivative to zero, the Goodwin model defines the nullclines. Neither the location of nullclines nor of the long-run are directly observable. This model predicts the equilibrium at the intersection of the two nullclines. The idea pursued in this note is to identify causes of shifts in the economy's long-run equilibrium. 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. The center around which an economy cycles can move over time as a result of shocks to economic activity, to income distribution or to both of these variables. Shocks can be temporary or permanent.

Figure 2 illustrates the difference between temporary and permanent shocks to economic activity or output gap. A temporary shock to economic activity, for example, does not shift the long run equilibrium - following the shock the economy shifts to point B but, because the shock is temporary, the economy returns to point A, along the dashed path. This path shows initially falling wage share and rising economic activity, motivating the profit-led label. 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 how an economy might converge to a new long-run equilibrium at point C. For this

[2]This model takes its name from its initial application to wolf and moose populations; Lotka (1925).

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

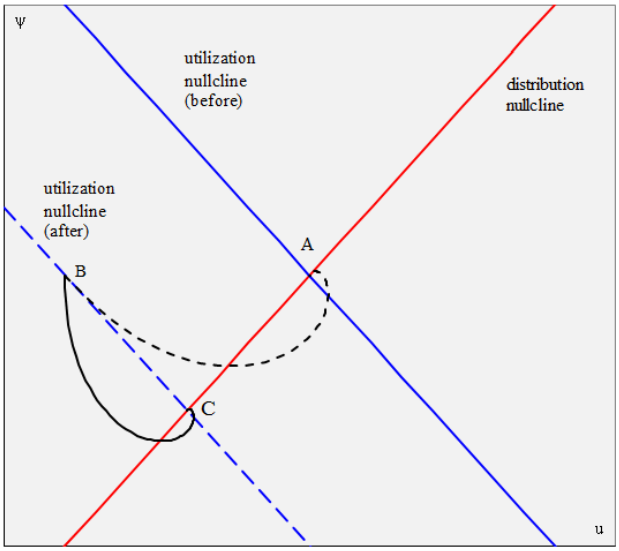

Figure 2: Response to temporary (dashed) and permanent (solid) output gap shock in a profit-led economy

example of an adverse output gap nullcline shift, the recovery (from B to C) is incomplete and anti-labor with the new equilibrium at a lower wage share and output gap (but less that the initial one at point A). Of course, other scenarios can be imagined and other nullcline shapes assumed.

3 Econometric models and estimation results

The trend in wage share is the focus of several recent reports from the International Monetary Fund, the European Commission and the International Labour Office (IMF (2007), EC (2007), Stockhammer (2013)). While the literature on the relation between income distribution and economic activity in the long run is large (see the review by Hein and Vogel (2008)), only a few econometricians have focused on short-run Goodwin dynamics (see Barbosa-Filho and Taylor (2007) and Nikiforos and Foley (2012)). A recent paper by Fiorio et al. (2013) uses cointegraion econometrics to explore both short-run and long-run connections between income distribution and the rate of employment, although their agnostic methodology does not reference Goodwin and introduces two additional endogenous variables, proxies for the power of labor and capital which we prefer to interpret as exogenous.

We apply a linear specification of Goodwin's equations to annual observations of the wage share and the GDP gap with an unbalanced panel of thirteen OECD countries over four decades.[4] The OECD's wage share ψ_t is an index number computed from the ratio of

[4]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 sample is unbalanced because complete data are unavailable for Finland, Germany, Ireland and Korea. See the Appendix for more detail on these dependent variables as well

unit labor cost to GDP deflator, see Figure 1. We take the OECD's GDP gap, the percentage difference between actual and potential gross domestic product as our measure of utilization.[5] Our linear version of the Goodwin model is parameterized to incorporate dynamics and to identify its long-run equilibrium.[6]

$$u_{it} - u_{it-1} = \beta_0 \left(\psi_{it-1} - (\psi_0^* - \beta_1 u_0^*) - \beta_1 u_{it-1}\right) + \upsilon_{it} \tag{3}$$

$$\psi_{it} - \psi_{it-1} = \alpha_0 \left(\psi_{it-1} - (\psi_0^* - \alpha_1 u_0^*) - \alpha_1 u_{it-1}\right) + \varepsilon_{it} \tag{4}$$

where the subscript refers to the i^{th} country in the t^{th} period. The $\alpha' s$ and $\beta' s$ are parameters, ε_{it} and υ_{it} are error terms, and ψ_0^* and u_0^* parameterize the unobserved long-run equilibrium point. After rearrangement this specification can be seen to be a $VAR(1)$ with cross-equation restrictions; the first differences of the dependent variables depend entirely on lagged values of their levels. By specifying this model in terms of changes, we directly reflect Goodwin theory and mitigate worries about the spurious regression problems that often plague time series econometrics. We report generalized least squares (GLS) estimates of the model under the assumption of different variances for each country, and nonzero intercountry and interequation covariances. In other words, our error structure allows for the apparent interactions among countries.

Column (a) of Table 1 reports an estimate of this model. The signs of the coefficient estimates validate the profit-squeeze/profit-led characterization; the distribution nullcline slopes up and the output gap nullcline slopes down. Figure 3 plots the estimated nullclines and response paths for a variety of different temporary shocks (each dot denotes one year).

The estimate for the long-run distribution, ψ_0^*, is significant and close to 100 reflecting its sample-wide normalization to 2005. Our estimate of u_0^* is negative but insignificant.[7] Although we clearly see profit-led dynamics, these estimates look very different from the inherent and persistent cycles that the literature portrays. Persistent Goodwin cycles are possible with this linear specification as the distribution nullcline approaches the vertical and the output gap nullcline approaches the horizontal, however it is hard to interpret these paths as an explanation for the business cycle.

3.1 A race to the bottom?

In a recent op-ed piece, Krugman (2012) contemplates the downward trend in the wage share in the US and offers two possible causes: robots, a euphemism for technological change that has placed workers at a disadvantage, and robber barons, a euphemism for an increase in unregulated markets.[8] The IMF and ILO reports cited above extend the list to globalization,

as the independent variables introduced below.

[5]Gianella et al. (2008) and Giorno et al. (1995) among others discuss the OECD methodology for estimating the output gap. More information on the OECD methodology can be found at http://www.oecd.org/eco/sourcesmethodsoftheoecdeconomicoutlook.htmOECD.

[6]Nikiforos and Foley (2012) emphasize the possibility that the nullclines are actually nonlinear. In Kiefer and Rada (2013) we find that this conjecture has little empirical support.

[7]Model (a) is stable with two real roots at 0.89 and 0.68.

[8]For a more formal analysis of the anti-labor aspects of technological change see Kennedy (1964).

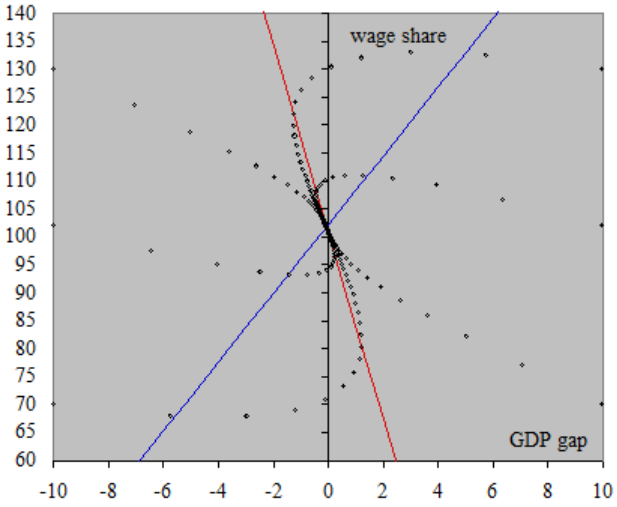

Figure 3: Estimated response paths

labor market institutions or the degree of taxation. Probably offshoring is one of the aspects of globalization that disadvantages workers. No doubt wage outcomes are also influenced by countervailing union power, and no doubt union density has a political dimension that is institutionalized into the generosity of the social safety net.

First, however, we investigate the apparent downward trend in the wage share by an extension of our basic model: we substitute a linear trend for each of the long-run equilibrium coordinates.

$$u_{it} - u_{it-1} = \beta_0 \left(\psi_{it-1} - \left(\psi_0^* - \beta_1 u_0^* + \left(\psi_1^* - \beta_1 u_1^*\right) t\right) - \beta_1 u_{it-1}\right) + \upsilon_{it} \tag{5}$$

$$\psi_{it} - \psi_{it-1} = \alpha_0 \left(\psi_{it-1} - \left(\psi_0^* - \alpha_1 u_0^* + \left(\psi_1^* - \alpha_1 u_1^*\right) t\right) - \alpha_1 u_{it-1}\right) + \varepsilon_{it} \tag{6}$$

The estimates for this specification appear in column (b). The ψ_0^* coefficient is reinterpreted as the 1970 wage share equilibrium, and u_0^* as the 1970 gap equilibrium. This specification does not impose a direction on these trends, it may be positive or negative. As in Kiefer and Rada (2013) we find a significant downward trend for the long-run distribution, but not for utilization.[9] This result is certainly consistent with the notion of a race to the bottom.

To further investigate the causes of this trend, we consider a set of determinants z_{it} of the long-run wage share, and y_{it} of the long-run GDP gap:

$$u_{it} - u_{it-1} = \beta_0 \left(\psi_{it-1} - \left(\psi_0^* + \sum \psi_i^* z_{it-1} - \beta_1 \left(u_0^* + \sum \psi_i^* y_{it-1}\right)\right) - \beta_1 u_{it-1}\right) + \upsilon_{it} \tag{7}$$

$$\psi_{it} - \psi_{it-1} = \alpha_0 \left(\psi_{it-1} - \left(\psi_0^* + \sum \psi_i^* z_{it-1} - \alpha_1 \left(u_0^* + \sum \psi_i^* y_{it-1}\right)\right) - \alpha_1 u_{it-1}\right) + \varepsilon_{it} \tag{8}$$

[9] In our earlier paper we report a downward trend in equilibrium utilization, but which is much smaller than that in distribution. Perhaps this slight difference results from our switch from quarterly to annual data. We make this switch to introduce annual observations of indicators related to the long-run point. The basic dynamics of our results are unchanged by the change in the period of observation.

According to the estimates in column (c), globalization appears to have a positive effect on economic activity in the long run - with a significant coefficient estimate. We infer that more globalization is associated with a permanent shift to the right of long-run utilization. But the benefit to economic activity comes at a considerable and statistically significant cost for the wage share. Globalization gives employers a way to resist pressures to raise real wages either by shifting production to low-wage regions or by adopting labor-saving technology. Workers often push back against the forces associated with globalization through union activism. Our expectation is that the long-run wage share increases when more of the labor force is unionized. Model (d) validates these expectations. On the other hand, we do not find any evidence that union power has an adverse long-run effect on utilization. Note that our globalization inferences are robust to the addition of unionization to these regressions.

Column (e) extends this methodology to test three additional long-run determinants: an indicator of the speed of technological change, (R&D spending as a percentage of GDP), the extent of financialization (measured as the value added in finance, insurance and real estate industries as a percent of total value added), and an indicator of monetary policy over the long term (the 5-year average of the short minus long interest rate spread). Continuing with our hypothesis that technological change has been inherently anti-labor, increases in investment in research and development should reduce the wage share. It is alleged that more financialization has a negative effect on the wage share by crowding out traditional investment in productive capital, and also by facilitating the offshoring of jobs (Gonzalez and Sala (2013)). Some have suggested that contractionary monetary policy can, under a wage-bargaining system, lead to real wage restraint but also to a lower unemployment rate (Iversen and Soskice (2000)). A downward pressure on the wage share becomes feasible.

Our statistical results are consistent with these additional hypotheses. All three long-run wage share coefficients have negative signs and are statistically significant, although our sample is considerably smaller, dropping all observations from the 1970s. Our R&D result is consistent with IMF (2007) and EC (2007). We note that tight monetary policy has negative and significant consequences for distribution, but not for utilization. Although many of the countries in our sample have pursued contractionary policy on average, our monetary policy coefficient suggests that an expansionary monetary stance in the long-term can partially neutralize the negative effect of globalization on the wage share.

Our result that globalization permanently increases economic output is surprising and remains unexplained. Except for this variable, we find that none of these indicators have a significant impact on the long-run output gap. This is not surprising given the definition of the GDP gap as the deviation from potential, as estimated from the contemporaneous capital stock, available technology, labor productivity and full employment; we should expect that its long-run value to be zero. This interpretation is validated by our insignificant estimate of the gap intercept for model (a), and the insignificance of most of the slope coefficients in (e). Possibly globalization brings some advantage that is not captured in the OECD's procedure for estimating potential GDP.

4 Conclusions

So what do we make of these results? For the past three decades we find that five often-cited factors are statistically associated with the downward shift in the wage share: financialization, R&D spending, globalization, contractionary monetary policy and the weakening of labor unions. We change the usual focus of the Goodwin model to emphasize the determinants of its long-run equilibrium rather than the nature of its dynamics. We do find dynamics consistent with the profit-led model of the business cycle, guaranteed by the positive slope for the distribution nullcline and the negative output gap nullcline slope. A more interesting feature of this approach is the inference that the continuing trend toward greater globalization has in the long run increased economic output, but has reduced workers bargaining power.

	(a)	(b)	(c)	(d)	(e)
wage slope α_1	6.162	6.213	18.192	6.204	2.866
	(9.036)	(9.274)	(4.022)	(9.187)	(9.855)
gap slope β_1	-16.688	-50.673	-18.250	-34.502	-3.369
	(-3.481)	(-1.248)	(-3.064)	(-1.588)	(-13.67)
wage share scaling α_0	-0.074	-0.074	-0.029	-0.078	-0.160
	(-10.54)	(-10.45)	(-4.025)	(-10.15)	(-12.05)
gap scaling β_0	-0.022	-0.007	-0.019	-0.010	-0.143
	(-3.539)	(-1.250)	(-3.217)	(-1.592)	(-14.82)
long-run wage intercept ψ_0^*	101.861	111.548	132.375	114.891	112.93
	(94.268)	(39.580)	(14.961)	(26.231)	(79.421)
long-run wage trend ψ_1^*		-0.414			
		(-3.531)			
globalization ψ_1^*			-0.417	-0.219	-0.080
			(-3.451)	(-3.656)	(-4.561)
union density ψ_2^*				0.106	0.024
				(2.499)	(1.630)
monetary policy ψ_3^*					-1.141
					(-6.644)
technology ψ_4^*					-1.290
					(-4.179)
financialization ψ_5^*					-0.167
					(-2.900)
long-run gap intercept u_0^*	-0.065	0.575	-1.507	-1.512	-4.172
	(-0.314)	(1.136)	(-2.465)	(-2.156)	(-5.005)
long-run gap trend u_1^*		-0.019			
		(-0.915)			
globalization u_1^*			0.023	0.021	0.051
			(2.920)	(2.345)	(7.540)
union density u_2^*				0.002	0.004
				(0.268)	(0.769)
monetary policy u_3^*					-0.051
					(-0.734)
technology u_4^*					-0.073
					(-0.738)
financialization u_5^*					0.020
					(0.899)
observations	954	954	950	950	624

Table 1: Estimation results, annual data 1971-2011, t-statistics in parentheses

A Data

We use annual output gap, unit labor cost and GDP deflator provided by the OECD Economic Outlook 90.

	Output gap	Real unit labor cost (2005=100)	Union density	Globalization	R&D (% of GDP)	Interest spread	Financialization
Australia	-0.248	105.2	36.0	72.7	1.50	-0.02	22.6
	43	43	42	41	30	43	37
Canada	-0.258	104.8	33.5	81.3	1.70	-0.74	21.2
	43	43	42	41	31	43	36
Finland	-0.916	105.8	70.7	71.4	2.59	-0.21	16.2
	38	43	41	41	31	43	39
France	-0.326	100.9	13.3	73.2	2.19	-0.71	27.1
	43	43	39	41	31	43	39
Germany	-0.603	103.4	29.6	69.0	2.50	-0.94	22.1
	22	22	41	41	31	43	39
Ireland	0.321	106.2	45.5	79.1	1.09	-0.88	20.4
	23	23	42	41	31	42	22
Italy	-0.148	109.8	40.1	68.6	1.10	-0.55	20.2
	43	43	41	41	31	43	39
Japan	-0.555	101.9	26.1	49.5	2.94	-0.64	20.6
	43	43	42	41	31	41	37
Korea	0.065	92.8	13.2	44.7	2.65	-1.16	14.1
	38	38	41	41	31	12	38
Netherlands	-0.102	106.7	27.3	83.8	1.93	-1.30	21.1
	43	38	42	41	31	43	39
Sweden	-0.060	104.6	77.1	80.4	3.20	-0.62	20.4
	43	43	42	41	31	31	38
United Kingdom	-0.217	103.3	37.8	79.1	1.94	-0.42	20.9
	43	43	42	41	31	43	38
United States	-0.565	102.4	17.3	69.5	2.64	-0.99	26.4
	43	43	42	41	31	43	38

Table A.1: Descriptive statistics: averages and numbers of observations, thirteen OECD countries 1971-2011.

Globalization is measured using the KOF index of Globalization (see Dreher (2006) and Dreher et al. (2008)). Statistics on trade union density comes from the OECD Database on Trade Unions. Data on R&D as a percentage of GDP is also from the OECD.Stat and specifically from the Main Science and Technology Indicators dataset. Monetary policy stance is defined in terms of the term spread between short and long-run interest rates. A contractionary monetary policy is understood in terms of a growing spread. Data on real long and short term interest rates (ILRV, ISRV, deflator GDP) for all countries besides Australia, Canada and South Korea comes from the European Commission AMECO database. We used the Monthly Monetary and Financial Statistics (MEI) dataset from OECD for short and long run interest rates for Australia, Canada and South Korea. We use the share of the Financial, Insurance and Real Estate and Business Services in total value added as a proxy for financialization. The data comes from the OECD's STructural ANalysis Database (STAN).

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