Demand effects of financialisation and changes in functional income distribution in the EU

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The paper investigates the effects of changes in the distribution of income and wealth on private aggregate demand, which consists of consumption, investment and net exports. Estimates are based on a panel of 12 EU countries covering the period 1980-2011. The average demand regime is found to be wage led. We find strong effects of debt and property prices. In the period 1997-2007, i.e., the decade prior to the crisis, debt and property prices have been the main drivers of aggregate demand, in particular in the Non-Eurozone and southern European countries. The finding lends support to the hypothesis of the existence of an inherently unstable debt-driven growth model for many countries. This has important policy implications. First, finance and debt are potentially powerful drivers of growth, but they also can undermine economic stability. The financial sector needs to be tightly regulated and monetary authorities have to lean against markets. Second, a wage-led growth strategy is economically feasible. In times of crisis wages should not be cut, but increased steadily. Third, the short-run effects of a wage-led growth strategy would be modest compared to the damage of a financial crisis. Fiscal policy thus is needed for economic stabilisation.

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Introduction

The crisis 2008/09 has been the deepest recession since the Great Depression of the 1930s. While the USA, where the crisis emanated from, have experienced a weak recovery since 2009, the crisis has escalated further in Europe and, for southern European countries, has resulted in output losses on par with those of the Great Depression. This report focuses on the decade before the crisis and investigates what had driven growth in that period. It focuses on the changes in income distribution and in financialisation, i.e. the rising importance of asset prices and debt for economic performance.

Our approach synthesises two streams within economic research: the Kaleckian analysis of the effects of changes in income distribution on aggregate demand and the Minskyian analysis of the crucial role of debt and asset prices on economic stability. As regards the role of income distribution Kaleckians have argued that an increase in the wage share will increase aggregate demand because the propensity to consume out of wages is higher than that out of capital incomes (Kalecki 1954). However, if investment were very sensitive to profitability or if net exports were very sensitive to relative export prices, wage growth could have a negative effect on demand. Bhaduri and Marglin (1990) presented a generalised framework, which allows for both wage-led and profit-led regimes that has become a widely used tool within post-Keynesian economics. While the model has inspired a rich empirical literature (Bowles and Boyer 1995; Stockhammer and Onaran 2004; Naastepad and Storm 2007; Hein and Vogel 2008; Stockhammer and Stehrer 2011; Onaran and Galanis 2014), most of this literature pays little attention to financial factors.

Post-Keynesian (PK) macroeconomics has long recognised the importance of finance, in particular debt and asset prices for economic stability. Minsky (1995) regarded debt cycles as the driver of economic fluctuations. Recently there have been several attempts to formalise his model (Charles 2008; Fazzari et al. 2008; Keen 1995; Ryoo 2013), but there is no agreed-upon model yet.[1] There is also a surge in interest in stock-flow consistent (SFC) models (Godley and Lavoie 2007), which highlight the impact of stock variables such as debt and net wealth on macroeconomic aggregates. An important shortcoming of this debate is that it has so far motivated more theoretical than empirical work (Zezza 2009 is one of the few exceptions).

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[1] In Minsky's analysis business debt is central. This clearly does not fit the recent experience of rising household debt and a consumption boom. In contrast the stock-flow consistent modelling (SFC) literature typically highlights household debt and it often allows for different stock and flow effects of debt or asset prices. Palley (1994), Dutt (2006) and Hein (2012a) include household debt in Kaleckian models and Isaac and Kim (2013) is one of the few papers that explicitly model business as well as household debt simultaneously.

This report synthesises Kaleckian and Minskyan arguments in the analysis of determinants of demand. The paper extends a Bhaduri-Marglin model for measures of personal income inequality as well as measures of property and financial wealth and private debt.[2] We estimate it based on a panel of 12 EU countries covering the period 1980 to 2012.

The aim of the paper is to analyse the effects of changes in income distribution as well as changes of household wealth and debt on aggregate demand and its components. We are interested in the sign of the effects, which will allow us to evaluate whether demand is wage-led or profit-led. But we also want to analyse the growth contribution of these effects, in order to determine to what extent the characterisation of growth as 'debt-driven' or 'finance-led' (Stockhammer 2012; Hein 2012b) is a useful description.

The remainder of the paper is organized as follows: Section 2 gives an overview of demand regime and the role of income distribution. Section 3 presents some stylized facts for our sample. Section 4 introduces our economic model. Section 5 reviews the existing empirical literature dealing with the Bhaduri-Marglin framework and the empirical literature estimating wealth and debt effects. Section 6 presents the econometric results. Section 7 identifies the demand regimes and drivers of demand before and since the crisis. A final section concludes.

Demand regimes and income distribution

Before we go into the technicalities of the model it will be helpful to present the overall framework, within which the analysis is conducted. Table 1 provides a simple framework to classify growth regimes along two axes. First, the demand regime can be profit-led or wage-led, i.e. the effect of an increase in inequality, measured by the profit share, can be positive or negative. Whether a demand regime is wage led or profit led will depend on the economic structure, on the institutional setting of the country and on its history. The economic structure of a country will only change slowly and can only be indirectly affected by government policies. Second, actual distributional changes can be pro-capital (higher inequality) or pro-labour (lower inequality). Income distribution depends on factors that are beyond (direct) government control such as the extent of globalisation and the speed of technological change, but in part it depends on government social and labour policies such as minimum wages, the union legislation and wealth taxes, among other policies. Thus changes in income distribution are to some extent results of government distributional policies. The framework is a simple but useful one, both for distinguishing between different political ideologies and economic theories as well as for classifying country experiences.

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[2] Onaran et al. (2011) is closest to our study, but it only covers the USA.

Table 1. A typology of distribution and growth regimes

		Actual distributional changes	
		Pro-capital	Pro-labour
Demand regime	Profit-led	Virtuous profit-led growth process ('neoliberalism in theory)	Stagnation or external demand stimulation ('Failed social reform')
	Wage-led	Stagnation or external demand stimulation, e.g. via debt-driven or export-driven growth ('actually existing neoliberalism')	Virtuous wage-led growth process ('social Keynesianism')

Source: Stockhammer 2016

This simple framework allows for a rich analysis that can be used to compare different economic theories as well as different country experiences in specific historic periods. Cell (1,1) depicts a constellation of rising inequality in a profit-led demand regime. This would give a virtuous, profit-led growth model. In fact this constellation depicts the trickle-down economy that many neoliberals of the early 1980s were propagating. The argument is that rising inequality is a healthy thing because it comes with growth, which will eventually benefit the poor. This is 'neoliberalism in theory'. Cell (1,2) has rising wages in a profit-led economy, which will not give rise to a viable growth model, but rather to stagnation. It is this scenario that Margret Thatcher was alluding to when she said 'there is no alternative': social reform is doomed because it cannot generate growth. Cell (2,1) combines a wage-led demand regime with rising inequality. This combination cannot deliver a stable growth model, but creates a downward pressure on demand. However, growth can still occur if there are other stimulants of growth. Indeed, from a PK view, it is this cell where actually existing neoliberalism resides. Empirical studies mostly conclude that private domestic demand is wage-led (e.g. Onaran and Galanis 2014). Rather than generating a profit-led growth regime, neoliberalism has relied on financialisation and globalisation as means for demand stimulation. This has resulted in two distinct growth models, which are both unstable: debt-driven growth and export-driven growth (e.g. Hein 2012). Both allow for growth, but are intrinsically unstable, because they require increasing debt to income ratios. In the case of the debt-driven model it requires indebtedness of the domestic sector; in the case of the export-driven model it requires foreign debt of the trade partners. It is these rising mountains of debt that erupted in the crisis.

PK economics thus offers a simple framework that highlights the following features of neoliberalism. First, there is tension between what we have called neoliberalism in theory and actually existing neoliberalism. Second, actual neoliberalism relies on external stimulation of demand, which typically comes with higher debt and is thus prone to instability. Third, there are at least two types of neoliberalism: a (domestic) debt-driven and an export-driven model. In other words, there is a finance-led as well as an industrial version of neoliberalism.

Let us now turn to the empirical picture. Stockhammer et al. (2011), Onaran and Galanis (2014) and Onaran and Obst (2015) provide evidence that the Euro area overall is in a wage-led demand regime.[3] Individual European countries, in particular ones with small open economies may be profit-led, because of the net export component of aggregate demand, but as European countries mostly trade among each other, these effects to a large extent cancel out at the European level. Growth has not been the result of a profit-led growth regime. Rather, two different growth models have emerged: the Anglophone and southern European countries developed a debt-driven growth model, which was driven by increasing household debt, strong consumption demand and, in some cases, a residential investment boom (like in Spain or Ireland). Other countries, namely Germany, China and Japan adopted an export-driven growth model, where domestic demand is weak and growth relies on export surpluses. Germany pursued this strategy particularly aggressively with average real wages stagnating in the decade prior to the crisis and a sharp increase in wage inequality.

The peripheral European countries also followed a debt-driven growth model (see Hein 2013 for a systematic classification). While their *level* of household debt has been traditionally low, the *increase* in household debt, which is the variable relevant for consumption expenditures, has grown rapidly (Stockhammer 2012). Indeed, the increase in household debt in the southern European countries was not only above the increase in the northern European countries (with the exception of the Netherlands), but it also exceeded that of the USA and the UK (see the following section). This rise in household debt was in part caused by the European Commission's policy (namely the Financial Services Action Plan) aimed at creating a single financial market for Europe (Grahl 2009). In theory this means uniform interest rates across Europe and in practise it meant massive capital flows from Germany, France and the UK to the peripheral European countries. While this initially fostered manufacturing investment (as in the case of Spain and Ireland), it soon fuelled an unsustainable property boom.

At the same time the southern European countries experienced substantially higher price and wage inflation. As a consequence the south lost competitiveness. from 2000-08 the southern European

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[3] There are some authors, who report evidence for profit-led growth regimes for several countries (e.g. Kiefer and Rada 2015).

countries all had a (cumulative) real GDP growth of more than 24%, compared to a Euro area average of 16% and Germany at 3%. Together with fast growth in many southern countries, this resulted in substantial current account deficits, which were mirrored by export surpluses in the north. The debt-driven and export-driven growth models thus were in symbiotic relation, where credit-driven growth in the south pulled in exports from the north and Nordic trade surpluses were recycled as private credit flows to southern Europe, where they financed property bubbles and rising household debt.[4] In fact the situation differed by country, but a massive increase in *private* household debt (in southern European countries) is the hallmark of this growth. With the exception of Greece, public debt was declining (see also de Grauwe 2010).

Stylized facts on growth, distribution, debt and wealth

Our data set covers 12 EU countries from 1980 to 2011. To illustrate and contextualise the developments in these countries, we group the countries into several country groups and, in this section, will also contrast the performance of the European groups with non-EU Anglophone countries. The four groups are: Anglophone (Australia, Canada, the United Kingdom and the United States), Euro-North (Austria, Belgium, Germany, Finland, and the Netherlands), Euro-South (Spain, Italy and Ireland) and non-Euro-North (Denmark, Switzerland, Norway and Sweden). These country groupings are motivated by the hypothesis that distinct growth models have emerged in the form of a debt-driven model in the Anglophone countries and the southern European countries and an export-driven model in the Nordic countries (Stockhammer 2009; Hein 2012b).

Definitions and data sources are provided in Table A4 in the Appendix. We use real GDP (Y) as well as private final consumption (C), gross fixed capital formation (I), exports of goods and services (X) and imports of goods and services (M) at 2005 market prices in billions of national currency. These variables, the corresponding deflators and the adjusted wage share at current factor costs (WS) are taken from the Annual Macro-Economic database (AMECO). Real long term interest rates (i) are taken from AMECO and OECD's Main Economic Indicator (MEI) database. Credit to households (DH), real property prices (PP) and trade weighted effective exchange rates (EX) are from the Bank for International Settlements (BIS). We use a Gini index estimated from Theil index wage dispersion data from the University of Texas Inequality Project (EHII) as well as Gini coefficient ($Gini$) and the share of richest 1% of households ($Top1$) from the Standardized World Income Inequality Database. The

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[4] Two qualifications are in place. First, actual trade relations are more complex relations than indicated here. For example, Germany's largest export surpluses are with Austria and with France. Austria has had export surpluses itself. France's export position was rather balanced in the first half of the 2000s and deteriorated thereafter. Both countries had surpluses with southern European countries. Second, financial flows are quite independent of trade imbalances. In particular French and British banks have had strong exposure to southern European banks, reflecting their positions as financial centres.

IMF's International Financial Statistics and the OECD's MEI database are the sources for the stock price series (SP). The latter is deflated using the CPI from the AMECO database. Real GDP of OECD countries (Y^f) is also taken from OECD's MEI database.

Table 2 contains the data that will be used in the econometric analysis for these country groups (GDP-weighted averages). We note that Anglophone countries and Euro-South have had high growth rates in the 1997-2007 period (35% and 29% respectively) compared to 22% in the Euro-North group. While all countries experienced a sharp recession 2008-09, the Anglophone group and the Euro North resumed growth 2010-13 (at 8.4% and 6.6% respectively), the Euro-South group stayed in recession with GDP falling another 2.4%. Functional income distribution, i.e. the wage share has declined somewhat in the decade before the crisis, but the change in that period is modest. The big changes in functional distribution have happened in the 1980s and 90s (Stockhammer 2016a). Top incomes increased substantially in all country groups, but most in the Anglophone countries.

Property prices increased dramatically in the Anglophone countries and Euro South, and less so in the Euro North group. In the crisis property prices fell sharply in the early phase (2008/09) in the Anglophone countries, and in the later phase (2010-13) in the Euro South countries. Household debt shows a similar patter, with a massive increase before the crisis in the Anglophone countries and Euro South and a modest decline during the crisis.

Table 2. Demand components, distribution, asset prices and debt in four country groups

	Anglophone			South €		
	97-07	08-09	10-13	97-07	08-09	10-12
Y	0.350	-0.031	0.084	0.288	-0.054	-0.024
C	0.423	-0.017	0.084	0.292	-0.034	-0.055
I	0.462	-0.176	0.133	0.519	-0.202	-0.189
X	0.473	-0.054	0.237	0.527	-0.166	0.224
M	0.817	-0.153	0.217	0.842	-0.193	0.006
WS	-0.012	-0.004	-0.024	-0.043	0.022	-0.019
TOP	0.237	-0.095	0.010	0.149	-0.051	-0.044
PP	0.823	-0.224	0.035	0.586	-0.053	-0.231
SP	0.154	-0.349	0.296	0.646	-0.541	-0.183
DH	1.035	0.001	-0.092	1.775	0.067	-0.098
DBUS	0.283	0.035	0.000	0.540	0.038	0.000
i	-0.028	0.006	-0.025	-0.022	0.016	0.014
Yf	0.287	-0.035	0.061	0.287	-0.035	0.061
	North €			North non €		
	97-07	08-09	10-12	97-07	08-09	10-12
Y	0.217	-0.038	0.066	0.284	-0.032	0.078
C	0.130	0.008	0.034	0.290	0.005	0.081
I	0.181	-0.104	0.042	0.482	-0.124	0.100
X	0.958	-0.110	0.241	0.614	-0.078	0.115
M	0.787	-0.062	0.204	0.698	-0.093	0.162
WS	-0.061	0.060	-0.009	-0.026	0.051	-0.026
TOP	0.141	0.049	0.015	0.121	-0.077	0.004
PP	0.114	0.004	-0.024	0.712	-0.032	0.118
SP	0.249	-0.506	0.276	0.740	-0.461	0.424
DH	0.314	0.008	-0.022	0.830	0.082	0.143
DBUS	0.232	0.052	0.000	0.143	0.119	0.000
i	-0.025	0.000	-0.021	-0.024	0.025	-0.063
Yf	0.287	-0.035	0.061	0.287	-0.035	0.061

As household debt will play a key role in our econometric results, Table 3 summarises the increase in household debt for individual countries as percent of GDP.

Table 3. Increase in household debt (in % GDP), 2000-08

Northern European Countries		Anglophone Countries	
Germany	-11.3	USA	26
Netherlands	32.8	United Kingdom	28.1
Austria	7.9	**Southern European Countries**	
France	15.8	Ireland	62.7
		Greece	35.5
		Spain	33.8
		Portugal	27.4
Source: Eurostat, except USA: FoF			

4. An extended Bhaduri Marglin model

The starting point for our investigation is the Bhaduri and Marglin (1990) model that has become a standard reference point in modern post-Keynesian economics. We extend the model to include wealth and debt effects in both investment and consumption. Real aggregate expenditures (Y^{exp}) consists of consumption spending (C), investment expenditures (I), net exports (NX) and government spending (G). We abstract from government and thus write aggregate demand as:

$$Y^{exp} = C + I + NX \qquad \text{(1)}$$

Consumption is

$$C = C(Y, WS, Q, WH, WF, DH), \qquad \text{(2)}$$

where $Y, WS, Q, WH, WF,$ and DH are income, the wage share, personal income inequality, housing wealth, financial wealth and household debt, respectively. We expect Y and WS to have a positive effect on consumption. In the latter case due to the fact that the marginal propensity to consume (MPC) out of wage income is likely to be higher than that out of capital income.[5]

The role of household wealth and household debt for aggregate demand formation has recently gained prominence, however there are several hypotheses. In PK models household debt has a dual influence on consumption since it provides a source of finance, thus having a positive impact on

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[5] The personal distribution of income is relevant for two reasons. First, the marginal as well as average propensities to consume vary across income groups. The standard assumption here is that the poor have a higher MPC, which would imply a negative effect of inequality on consumption. Second, if households care about consumption and income relative to their peers, an increase in inequality has a positive effect on consumption. Following the work of Duesenberry (1949), Frank (1985) and Frank et al. (2014) developed the theory of consumption cascades, which can occur when people have upward-looking consumption norms, i.e. if they try to keep up with those above them in the income distribution. Several authors have incorporated these assumptions in macroeconomic models (Kapeller and Schütz 2014; Belabed et al. 2013).

consumption but also leads to servicing costs which depress consumption if the MPC out of interest income is low (Dutt 2006; Nishi 2012a; Hein 2012a). This implies the hypothesis that consumption declines with increasing household debt levels because higher debt levels also lead to higher interest payments and thus decrease disposable income and thus consumption. On the other hand consumption increases with higher debt growth since taking on additional debt initially increases disposable income and the ability to finance consumption expenditures. Therefore the overall effect is not a priory clear. The Minskyian stream within post-Keynesian economics has long emphasised the role of asset prices in borrowing (and lending). In these models (Ryoo 2013), optimistic investors will drive up asset prices during boom phases, lowering corporate financing costs and thus encouraging businesses to take on more debt. Extending Minsky's argument to households,[6] we would expect a strong effect of housing wealth, which underwrites household debt and we would expect autonomous movements in housing wealth to drive both, debt and consumption[7].

In mainstream consumption theory households maximise utility over the life-cycle. Thus net wealth, which is assets minus liabilities ($NW = WH + WF - DH$), plays a key role. If net wealth is the variable to affect consumption, this implies that there is a positive effect of net wealth and an equivalent negative effect of debt on consumption. However, it is not straight forward that measured net wealth is the relevant variable. Buiter (2010) argues that housing wealth does not constitute wealth since rising prices only make consumers who are long in housing better off, whereas those who rent are worse off. He shows that in a representative agent model the net effect is zero. New Keynesian modifications of the neoclassical model highlight the possibility of credit rationing (Muellbauer 2007). In these models housing wealth can relax credit constraints because it serves as collateral thus implying a positive effect of housing wealth.

Investment is

$$I = I(Y, WS, i, Q, WH, WF, DH) \tag{3}$$

where i is the long term real interest rate respectively.[8] Aggregate demand and long-term real interest rates are standard in investment functions. The wage share may indicate future profitability and retained earnings are an important source of funding. Stock markets represent funding

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[6] Minsky's writings analysed businesses and their debt rather than households and mortgage debt.
[7] This means that in our context the hypotheses derived from Minsky for household behaviour, namely a positive partial derivative of C with respect to property prices, is equivalent to that of Muellbauer. There are theoretical differences however. Muellbauer (2007) is based on rational life-cycle consumption while Minskyian households are becoming more optimistic due to endogenous animal spirits based on asset price cycles.
[8] We originally also included business debt in the investment equation. As business debt had statistically insignificant effects, but it does reduce the sample, it was dropped. Stockhammer and Wildauer (2015) do include business debt, but use a different sample of countries.

conditions for firms and are considered a leading business cycle indicator. We expect a positive effect. Total investment consists of business investment and residential investment. We regard residential investment as determined by a similar set of variables as consumption expenditures, i.e. our investment function will also depend on the wage share, income inequality, housing and financial wealth, and household debt. Three remarks are in order. First, while business investment will depend negatively on the wage share, residential investment may also react positively to changes in the wage share if wage earners own homes. The overall effect of the wage share on total investment is thus ambiguous.[9] Second, property prices are a cost for residential investment and thus rising housing wealth may have a negative effect. However, increasing property prices raise household wealth may improve access to credit (because of the rising value of collateral). This will have a positive effect on residential investment. Theoretically, the effect of housing wealth on investment is thus ambiguous.

Net exports are

$$NX = NX\left(Y, Y^f, EX, WS, WH\right) \tag{4}$$

Y^f represents real foreign income and EX is the nominal effective exchange rate. For net exports the close relationship of real unit labour costs and the wage share, justifies including the latter[10]. Since wages are driving the domestic price level and thus the country's international competitiveness, net exports are expected to depend negatively on the wage share. The influence of domestic and foreign income as well as the effective exchange rate is straight forward. Beside of that, rising housing wealth, via rising property prices, potentially influences domestic price competitiveness and thus exports.

Substituting equation 2, 3, and 4 into 1, we can solve for equilibrium income, Y^*.

$$Y^* = Y\left(WS, i, Q, WH, WF, DH, Y^f, EX\right) \tag{5}$$

The effect of a change in the wage share on Y^* then is:

$$\frac{dY^*}{dWS} = \frac{f_1}{1-f_2} \tag{6}$$

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[9] Since housing is an especially visible expenditure, it could be influenced by status comparison behaviour. Hence, if there were strong consumption cascades, we would also expect them to show in investment expenditures.

[10] In fact the AMECO database defines and computes real unit labour costs and the wage share at market prices identically.

where $f_1 = (\frac{\partial C}{\partial WS} + \frac{\partial I}{\partial WS} + \frac{\partial NX}{\partial WS})$ and $f_2 = (\frac{\partial C}{\partial Y} + \frac{\partial I}{\partial Y} + \frac{\partial NX}{\partial Y})$. The short run effect is determined by f_1 which is private excess demand and represents the effect of a change in the functional income distribution given a certain level of income. $\frac{f_1}{1-f_2}$ is the multiplier that also includes the marginal effects of income on investment. If $f_1 > 0$ then the demand regime is called wage-led and profit-led if the effect is negative.

The effect of a change in WH is expected to be positive[11] and we will assess the relative actual impact of changes in income distribution and of changes in wealth variables.

The effect of Q is a priory not clear. If status comparison plays an important role in households' (consumption and real estate purchase) decision making we expect a positive overall effect due to positive effects via consumption and residential investment. On the other hand if rising personal income inequality reduces aggregate consumption due to higher saving rates of more affluent households we expect a positive contribution overall.

In our empirical analysis we identify these regimes, based on the estimated partial effects. In addition we will also identify the relative contributions to actual growth attributable to these effects by multiplying the estimated coefficient with the actual change in the explanatory variable, e.g. $\hat{\beta}_{CWH}\Delta WH$, where $\hat{\beta}_{CWH}$ is the estimated coefficient of WH on C, which is an estimate for the partial effect $\frac{\partial C}{\partial WH}$.

The related empirical literature

As our approach integrates considerations of functional income distribution and wealth and debt, there is a potentially large and diverse literature that is relevant. The first debate is that on wage-led or profit-led demand regimes. Bhaduri and Marglin (1990) has become a standard point of reference for the empirical literature. There are differences in the behavioural equations estimated as well as in econometric methodology. The first one relies on a system approach based on VAR models and often focuses on the mutual interaction between distribution and demand, but typically does not distinguish between effects on consumption and investment. Stockhammer and Onaran (2004), estimate five variable VARs for the US, UK and France using data from the early 1960s to the late 1990s and find weak evidence for wage-led demand. Barbosa-Filho and Taylor (2006) for the US from 1948-2002, Kiefer and Rada (2014) for 13 OECD countries from the 1970s to 2010 and Carvalho and

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[11] Theoretically the effect of housing wealth on investment could be negative. In this case a negative total effect could arise.

Rezai (2014) for the US from 1967-2010, estimate two variable VARs and find profit-led demand.[12] A second group applies a single equation approach where consumption, investment and the external sector functions are estimated separately. Papers covering several countries include Bowles and Boyer (1995), who cover fived OECD countries from the 1960s to 1987, Naastepad and Storm (2007) investigate eight OECD countries from 1960 to 2000, Hein and Vogel (2008) use data on six OECD countries from 1960 to 2005, Stockhammer and Stehrer (2011) estimate their model using data on 12 OECD countries from 1970 to 2007 and Onaran and Galanis (2014) investigate the G20 countries from 1960 to 2007.[13] All these studies find wage-led domestic demand regimes for most countries. Third, Hartwig (2014) is the only study to use panel data (31 OECD countries, 1970 to 2011) to estimate a single equation approach and finds a slightly wage-led demand regime. Kiefer and Rada (2014) estimate demand and distribution equations for a panel of OECD countries with a set of control variables that shift income distribution and find that demand is profit-led. Neither Hartwig (2014) nor Kiefer and Rada (2014) control for wealth variables or personal income distribution. Most of the literature uses relatively simple specifications including disposable income, interest rates and the wage share as determinants in capital and investment functions. Onaran et al. (2011) is one of the few exceptions and will be discussed below.

The large moves in financial as well as housing wealth, especially in the US, have led to renewed interest in the size of wealth effects, much of it is inspired by a neoclassical framework. In the basic formulations either financial wealth, housing wealth and debt or share and property prices are added to standard control variables (Girouard et al. 2006; Ludwig and Sløk 2004; Slacalek 2009). They find that the MPC out of housing wealth is higher compared to financial wealth in the US and UK, but that MPC out of housing wealth is often small and/or statistically insignificant in European countries. Moreover, wealth effects have been increasing with financial deregulation. In a variation emphasising the importance of credit availability Muellbauer (2007) working on the US, UK, South Africa and Japan and Aron et al. (2012) using data for the UK, US and Japan, stress the role of housing wealth in relaxing credit constraints. They show that for the USA and the UK measures of credit availability are a key driver of consumption.

Wealth and debt considerations have not played a major role in post-Keynesian analysis of consumption until recently. Indeed while there has been resurgence in the role of debt and financial instability, most contributions do not explicitly address consumption dynamics. For example Zhang

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[12] Among these only Barbosa-Filho and Taylor present results for investment and consumption. They find large negative wage share results in the consumption function, which is at odds with their theoretical model.

[13] A series of later papers puts more focus on the estimation of the net export effects where real unit labour costs are driving price levels and thus are affecting exports and imports (Stockhammer et al. 2008; Onaran et al. 2011; Stockhammer et al. 2011).

and Bezemer (2014) investigate the effects of debt on growth for a panel of 37 countries over the period 1970 to 2012 and disaggregate debt by sector and according to whether it is stock-transaction related. They find a negative effect of debt. Kim et al. (2015) is one of the few exceptions that addresses consumption directly. They develop a post-Keynesian theory of consumption based on social norms, relative income considerations and rule of thumb behaviour. They estimate an aggregate consumption function for the USA 1952-2011 as a function of income, wealth, borrowing and other controls and find that borrowing has positive effects. Based on an SFC framework Zezza (2009) reports results for a private expenditure function, i.e. consumption plus investment, that is explained by financial assets, stock prices, housing wealth and the change in household and business debt, estimated using US data from 1970 to 2007. The specification does not include the level of household debt, nor does it include distributional variables.

Overall, post-Keynesian macroeconomics here lags behind the mainstream literature, which has built a substantial body of empirical research on wealth effects and consumption, which is ironic, given that most mainstream macro models have given little role to debt.

The closest to our research question are Onaran et al. (2011). Onaran et al. (2011) introduce housing and financial wealth in a Bharduri-Marglin model and also distinguish between rentier and non-rentier profit incomes in order to control for the effects of financialisation. They find the US economy to be modestly wage-led and that growth has relied on wealth effects during periods of a declining wage share, using a sample covering the years 1962 to 2007.

The empirical analyses of the effects of changes in income distribution and of changes in wealth have proceeded separately within post-Keynesian macroeconomics. While there is a high degree of coherence in modelling of functional income distribution, there is no agreed-upon Minsky model for empirical analysis. Although Post-Keynesian economics has produced some highly original works on the role of debt and wealth, in its empirical analysis it does lag behind the mainstream, which has produced a substantial literature on wealth effects and consumption.

Econometric Results

We use real property and stock price indices as proxies for housing wealth and financial wealth of the household sector, because wealth data is not available (for sufficiently long time periods) for most countries. This is common in the literature estimating wealth effects[14], but it only captures price indices but not quantity changes.

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[14] See Paiella (2009), Attanasio and Weber (2010) and Cooper and Dynan (2014) for recent surveys.

The panel approach does impose the restriction that parameters are identical across countries, which clearly will only hold as an approximation. Panel analysis comes with costs as well as benefits. Its main advantage is that it allows for including a rich set of country experiences, i.e. more variation in the variables. In particular our panel consists of 12 EU countries,[15] whereas most of the research on wealth effects focuses on Anglophone countries. Given that data for household debt is only available since 1980 for the majority of countries studied and that top income data is only available annually, our research question can only be explored by panel analysis. However, we will provide some evidence that heterogeneous outcomes across the countries can be explained by differences in the time paths of the explanatory variables rather than by differences in parameters across countries.

Our panel has a small N as well as a small T (N=12, T=32), which leads to econometric issues that are distinct from much of the panel literature which assumes a very large N and small T. Panel unit root tests (Choi 2001) indicate that the logarithmized data in levels exhibit unit roots. After first differencing, the null hypothesis that all series contain a unit root can be rejected for all variables. Our econometric baseline specification is thus a first difference (FD) estimator. The non-stationarity of our data set is also a reason not to use the widely used dynamic system GMM procedure (Blundell and Bond 1998) since it requires mean-stationary series (Baltagi 2013, p.167). Stockhammer and Wildauer (2016) present several robustness checks.

The consumption function we are estimating is of the following form:

$$\ln(C_{it}) = \beta_1 \ln(Y_{it}) + \beta_2 \ln(WS_{it}) + \beta_3 \ln(DH_{it}) + \beta_4 \ln(PP_{it}) +$$
$$\beta_5 \ln(SP_{it}) + \beta_6 \ln(Q_{it}) + \mu_i + v_{it} \tag{7}$$

where μ_i are country fixed effects[16]. Heteroskedasticity and autocorrelation robust standard errors are used in all specifications. The results are summarised in Table 4.

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[15] The countries included are: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Netherlands, Sweden and the United Kingdom.
[16] Due to our limited sample size we were not able to include country and time fixed effects simultaneously, especially with the dynamic specifications. Adding time dummies only proved to be relevant for the crisis years anyway and including them did not change our results. Results are available upon request.

Table 4: Consumption and Investment specification

dep. var:	C	I
Y_t	0.776***	1.721***
	(0.09)	(0.08)
Y_{t-1}		-0.341***
		(0.11)
WS_t	0.271***	0.480**
	(0.08)	(0.20)
WS_{t-1}		-0.442***
		(0.15)
i_t		-0.321**
		(0.14)
DH_t	0.074***	0.124*
	(0.02)	(0.06)
DH_{t-1}		-0.365***
		(0.10)
PP_t	0.013	0.210***
	(0.01)	(0.04)
PP_{t-1}		0.152***
		(0.06)
SP_t	0	0.052***
	(0.00)	(0.01)
$TOP1_t$	0.011	0.017
	(0.01)	(0.06)
N	310	298
uncent. R^2	0.86	0.79

* p<0.1, ** p<0.05, *** p<0.01, heteroskedastic and autocorrelation robust standard errors reported in brackets.

We find an income elasticity of about 0.8, which is of an expected magnitude. A 1% increase in the wage share has a direct effect on consumption of about 0.27%. Household debt, as well as property prices have positive impacts on consumption with elasticities of about 0.07 and 0.01, respectively.[17] Since mortgage debt dominates household debt measures, we interpret the pronounced effect of the latter as evidence for the importance of housing wealth and equity withdrawals in financing consumer spending. Surprisingly the variable which captures these effects directly, the property price index, turns out statistically insignificant and with a much smaller estimated partial effect compared

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[17] When testing for differences between stock and flow effects in household debt (see Stockhammer and Wildauer 2015), we find statistically significant positive effects for debt levels, representing the stock effect, as well as for changes, representing the flow effect.

to household debt levels. The reason might be that rising property prices are a prerequisite for equity withdrawals but that the actual decision of households to withdraw equity for consumption purposes are influenced by other factors independent of property prices. If household debt is dropped from the specification, property prices do become statistically significant. Stock prices have no statistically significant effect on consumption and the estimated effect is close to zero. We do not find evidence for consumption cascades which is reflected by a very small and statistically insignificant effect of the top 1% income share.

The findings from the analysis of the consumption function can be summarized as follows: First, the wage share has a statistically significant positive effect on consumption expenditures. Second, household debt seems to be the most important financial variable in explaining consumer behaviour. Third, property prices have small and often statistically insignificant effects. Housing wealth effects seem to be captured by the debt measure since consuming housing wealth requires taking on additional mortgages. Fourth, share prices have no statistically significant effect on consumption. Fifth, we fail to find evidence for an effect of personal income inequality on aggregate consumption spending.

The investment function takes the following form:[18]

$$\ln(I_{it}) = \beta_1 \ln(Y_{it}) + \beta_2 i_{it} + \beta_3 \ln(WS_{it}) + \beta_4 \ln(DH_{it}) +$$
$$\beta_5 \ln(PP_{it}) + \beta_6 \ln(SP_{it}) + \beta_7 \ln(Q_{it}) + \mu_i + v_{it} \qquad \textbf{(8)}$$

again with country fixed effects μ_i and in addition to those variables already used in the consumption function also a long-term real interest rate (i) is included. The specification above is augmented by lags of the exogenous regressors (Table 5). Stockhammer and Wildauer (2016) find the results are reasonably robust across specifications, however not as stable as in the case of the consumption function.

Results reported in Table 5, column 2, are as follows: Income has a very strong impact on investment spending with an elasticity well above 1. The summed elasticity with respect to the wage share is about 0 which implies that steady changes of the wage share will not affect investment. Long term real interest rates affect investment expenditures negatively. Household debt overall has a negative effect. Property prices have a strong positive summed up effect of about 0.36, pointing to the importance of property prices for residential investment spending. The income share of the richest 1% of households has a positive but statistically insignificant effect. We conclude that relative consumption, with respect to housing, does not feed through to aggregate (residential) investment

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[18] An earlier specification also included business debt, which was then dropped as it had no statistically significant effects but did reduce the sample.

spending decisions. Stock prices have a highly statistical significant effect. A considerable part of total capital formation relies on household spending decisions and therefor partially explains a zero effect of the wage share on total investment as well the negative effect of household debt.

The key findings regarding the investment function are the following: First, it is not straightforward to find negative effects of the wage share on investment. Positive wage share effects on capital formation are possible in the construction sector. Second, property prices influence investment spending positively, pointing to the positive effect of property price booms on residential investment. Third, the negative effect of household debt indicates that higher debt levels prevent households from residential investment spending. Fourth, the personal distribution of income, measured by the income share of the richest 1% of households is not statistically significant, not supporting Veblen effects.

The external sector (Table 5) was modelled by estimating an export as well as an import equation. The elasticity of exports with respect to foreign demand (Y^f) is about 1.8. This seems to be influenced by a trend of globalization since income elasticities of exports well beyond 1 are not plausible in the long run. As expected, the elasticity of exports with respect to the wage share is negative and about -0.7. The elasticity with respect to the nominal effective exchange rate is negative and thus is in line with expectations (i.e. appreciations of the domestic currency leading to lower exports). Property prices have a slightly positive impact on exports which is unexpected because if rising property prices contribute to domestic inflation they are increasing export costs.

Table 5: Export and Import Equations

dep. var:	X	M
Y^f_t	2.035***	
	'(0.15)	
Y^f_{t-1}	-0.226*	
	'(0.13)	
WS_t	-0.735***	0.251***
	'(0.27)	'(0.08)
WS_{t-1}		-0.148*
		'(0.08)
ex_t	-0.158***	0.078**
	'(0.05)	'(0.03)
ex_{t-1}	-0.087*	0.078***
	'(0.05)	'(0.02)
PP_t	-0.077**	0.114***
	'(0.03)	'(0.04)
PP_{t-1}	0.095**	
	'(0.04)	
Y_t		1.275***
		'(0.22)
Y_{t-1}		-0.264***
		'(0.07)
X_t		0.509***
		'(0.05)
N	315	326
uncent. R^2	0.757	0.853

* p<0.1, ** p<0.05, *** p<0.01, heteroskedastic and autocorrelation robust standard errors reported in brackets.

The income elasticity of imports is about 1. The summed up effect of the wage share is statistically significant and about 0.1. Exchange rates have a statistically significant positive effect, as expected. Property prices also statistically significantly affect imports in a positive way. Rising property prices might drive up the domestic price level and thus encourage imports, ceteris paribus. The export elasticity of imports is about 0.5. The import equation includes exports to reflect the dependence of exports on imported raw materials and intermediary goods. Results are similar if exports are excluded.

Demand regimes and drivers of medium-term growth[19]

Table 6 summarises the key results regarding the wage- or profit-led characteristic of the demand regime across countries and country groups. Demand is understood to be wage-led if an increase in the wage share positively impacts GDP growth. In contrast one speaks of a profit-led demand regime if a decrease in the wage share (and thus a rise in the profit share) positively impacts GDP growth. One can think of the question whether the demand regime of a particular country is wage- or profit-led as whether wages dominate in their role as source of demand for that economy or in their role as a cost of production. Theory predicts that the more open an economy is and the more an economy relies on export surpluses the more important becomes the role of wages as a cost factor. In order to assess the demand regime the elasticities of them GDP components (consumption, investment, exports and imports) with respect to the wage share are transformed into marginal effects, such that they can be combined to obtain the overall effect of changes in the wage share on GDP. Marginal effects are expressed in percent of GDP such that they can be compared across countries. For example the marginal effect of the wage share for the whole panel is computed in the following way:

$$\frac{\partial Y^{PED}}{\partial WS}\frac{1}{Y} = \hat{\beta}_{C,WS}\left(\emptyset\frac{C}{Y}\right)\frac{1}{\emptyset WS} + \hat{\beta}_{I,WS}\left(\emptyset\frac{I}{Y}\right)\frac{1}{\emptyset WS} + \hat{\beta}_{X,WS}\left(\emptyset\frac{X}{Y}\right)\frac{1}{\emptyset WS} - \hat{\beta}_{M,WS}\left(\emptyset\frac{M}{Y}\right)\frac{1}{\emptyset WS}$$

$\hat{\beta}_{\_,WS}$ is the estimated elasticity of consumption, investment spending, exports or imports with respect to the wage share. $\emptyset\frac{C}{Y}$ represents the GDP weighted average of the consumption-to-income ratio of the 12 countries included in the panel and similarly $\emptyset WS$ is the GDP weighted average of the wage share. So first GDP weighted averages (based on PPPs) of C/Y, I/Y, X/Y and M/Y are computed for each year. In a second step averages of these yearly averages are computed.

We report results for the entire panel and three subgroups: northern Eurozone members (Austria, Belgium, Germany, Finland and Netherlands), southern Eurozone members (Spain, Italy and Ireland) and non-Euro EU countries (Denmark, United Kingdom, and Sweden) as well as results for selected individual countries. The rationale for choosing these specific subgroups is that we think European countries relied on profoundly different sectors and mechanism to achieve their growth targets. Northern European and especially those countries within the Eurozone relied heavily on their trade partners and aimed at achieving export surpluses while southern European countries also benefitted

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[19] We use the terms economic growth and growth contributions as they are used in the context of the National Accounts, where growth contributions are defined as the year on year changes of GDP components relative to GDP. This should not be confused with the equilibrium growth rates which are part used in growth theory. Specifically we will be calculating growth contributions for the 11 year period from 1997 to 2007.

from asset price booms. Non-Eurozone countries adopted somewhat of an in between approach[20]. We argue that these patterns finally turned out not to be compatible over the long run and erupted in the aftermath of the Financial Crisis which is referred to as the Eurozone crisis. We do not assign France to either of the groups as it is unclear where it would fit in.

The row labelled Y^{PED} in Table 6 presents the effect of a 1%-point change in the wage share on private excess demand, Y^{PED}, which is the numerator of equation (6), f_1, and determines the sign of the effect of changes in the distribution on equilibrium demand. It can be thought of as the first round effect or the sum of the partial effects, given a certain level of income. The second round effects include the indirect effect as the first round effects increase income and thus induce additional expenditures.

Table 6: Demand regimes

	Panel	€-north	€-south	non-€	Germany	France	Netherlands
C	0.23%	0.23%	0.25%	0.23%	0.24%	0.23%	0.20%
I	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
NX	-0.22%	-0.29%	-0.18%	-0.19%	-0.24%	-0.16%	-0.44%
Y^{PED}	0.03%	-0.05%	0.08%	0.05%	0.01%	0.07%	-0.23%
openness	31%	40%	25%	29%	32%	24%	60%

Effects are based on coefficients from Tables 5 and 6. Elasticities are converted into marginal effects using GDP weighted sample averages. Openness is computed as the average of nominal import and export shares.

There are several interesting patterns. First, the domestic effects of the wage share on consumption and investment are similar across countries and country groups. Demand regimes in all countries are domestically wage led. Second, there is a substantial difference of the net export effects that directly corresponds to the degree of openness, i.e. exports plus import relative to GDP[21]. A large economy like France has a much small net export effect and is overall strongly wage led compared to small open economies like the Netherlands. In the case of this latter group of small economies, the negative external sector effects become so large that the total demand regime can become profit led.

Finally we turn to the question which variables have been the main drivers of growth in the decade prior to the 2007 crisis. In order give an answer to this question we compute how much each of the explanatory variables contributed to GDP growth between 1997 and 2007. Since your regressions are

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[20] In our case this groups includes Denmark, Sweden and the UK. While all three countries experienced major property price rallies since the 1980s it was only Denmark and Sweden which also enjoyed large current account surpluses.

[21] Openness is computed as the average of nominal exports and imports to nominal GDP. We evaluate export and import shares at sample average and assume that current account is in balance.

specified in the log-log form the contribution of the wage share on consumption growth ($g_{C,WS}$) over that period is calculated as:

$$g_{C,WS} = \exp\left[\hat{\beta}_{WS} \ln\left(WS_{2007}/WS_{1997}\right)\right] - 1 \qquad \textbf{(9)}$$

which yields by how much consumption expenditures changed due to the change in the wage share between 1997 and 2007. Equivalent calculations are conducted for the other GDP components and then they are summed up based on the weight of each component:

$$g_{Y,WS} = g_{C,WS}\frac{C}{Y} + g_{I,WS}\frac{I}{Y} - g_{M,WS}\frac{M}{Y} \qquad \textbf{(10)}$$

This is what we interpret as short run effects because they need to be understood as 'first round' effects, without any feedback to GDP itself. Put differently these computations correspond to f_2 of equation (6). The next step is to obtain the medium term equivalents by taking feedbacks on GDP into account which corresponds to the multiplier effect of f_2 from equation (6). Thus multipliers are computed as:

$$M = \frac{1}{1-f_2} \qquad \textbf{(11)}$$

$$f_2 = \hat{\beta}_{C,Y}\frac{C}{Y} + \hat{\beta}_{I,Y}\frac{I}{Y} - \hat{\beta}_{M,Y}\frac{M}{Y} \qquad \textbf{(12)}$$

Then the medium term effects are obtained by multiplying the effects obtained from equation (10) by the multipliers obtained from equation (11). The multipliers amount to 1.7, 1.5, 2 and 1.8 for the panel, €-north, €-south and non-€ groups, respectively. The resulting medium term growth contributions are summarized in Figure 1 for the main explanatory variables.

Figure 1 allows to identify several patterns. First, the total direct effects of distributional shifts were negligible.[22] Neither changes in the wage share nor the income share of the top 1% had a measurable impact on GDP growth in any of the country groups. This does not rule out indirect effects. It could be the case for example that household indebtedness was driven by rising inequality but since we control for debt separately in our regressions such effects show up as 'debt effects' rather than the effects of inequality. Second, property and stock prices together with household debt dynamics were a main driver of growth in Europe in the decade prior to the crisis. Its role however varies greatly across countries and country groups: While in the northern Eurozone countries asset prices and household borrowing only marginally contributed to GDP growth, in the southern Eurozone countries and also in the non Euro countries it contributed about 10 percentage points. This demonstrates very

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[22] The finding that the total effect of changes in the wage share on aggregate demand does not imply that changes in the wage share do not have any effect. As Table 6 indicates the effects on consumption and on net export are of similar size but opposite direction.

drastically that a large group of countries within the European Union relied on rising house prices as a source of collateral to secure borrowing. These debt fuelled growth trajectories collapsed with the house prices after the Financial Crisis (see Figure 2 and corresponding discussion). Third, the northern Eurozone countries, Austria, Belgium, Germany, Finland and Netherlands, heavily relied on net exports as their primary engine of growth. Figure 1 depicts the growth contribution arising from the difference in domestic income and OECD GDP growth (blue bar). The fact that these northern countries relied heavily on export surpluses is well known. For reasons of data availability our group of southern Eurozone countries only comprises Italy, Spain and Ireland. While results for the country groups are based on GDP weighted averages and thus Italy and Spain have a larger weight, the large trade surpluses of Ireland surely bias this result upward. Ireland is a clear outlier in terms of its export and import shares. These reported trade movements are likely to be distorted due to transfer pricing and tax shifting and thus do not reflect actual trade activity.[23]

**Figure 1: Medium term growth contributions: 1997-2007**
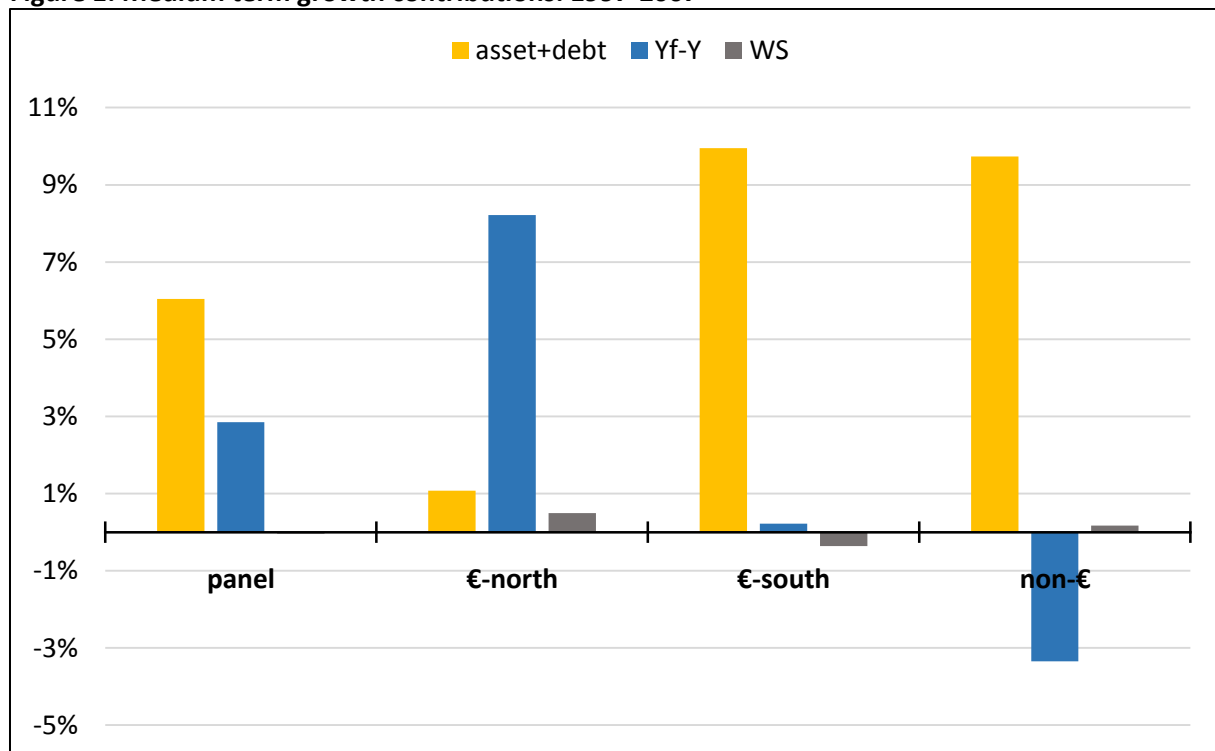
If one contrasts the pre-crisis period with the four years between 2008 and 2011 the unsustainability of the different growth patterns becomes evident. Figure 2 demonstrates that those countries which

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[23] As Ireland is an outlier both in terms of its (reported) openness to international trade and its growth performance, we have estimated the investment function and consumption function for Ireland in a time series approach (using quarterly data). This is reported in Appendix 1, which confirms that our model can be applied to Ireland as regards consumption and investment. A serious treatment of the trade block for Ireland is beyond the scope of this paper.

heavily relied on asset and debt bubbles to sustain their growth paths, suffered from strong negative effects when these bubbles burst. In the case of the southern Eurozone countries the collapse of the debt-fuelled asset bubble negatively affected GDP by 3 percentage points. Also the non-Eurozone countries had to deal with the negative effects of declining asset prices, although the decline was not as dramatic as in the southern group. One important aspect is completely missing from the analysis however and that is the role of fiscal policy. We refrained from explicitly modelling fiscal policy because we were mainly interested in medium term trends. However for the discussion of the post-crisis period it is important. Differences in fiscal policy are the most plausible explanation for the vast differences in growth outcomes across European countries.

Figure 2: Medium term growth contributions: 2008-2011
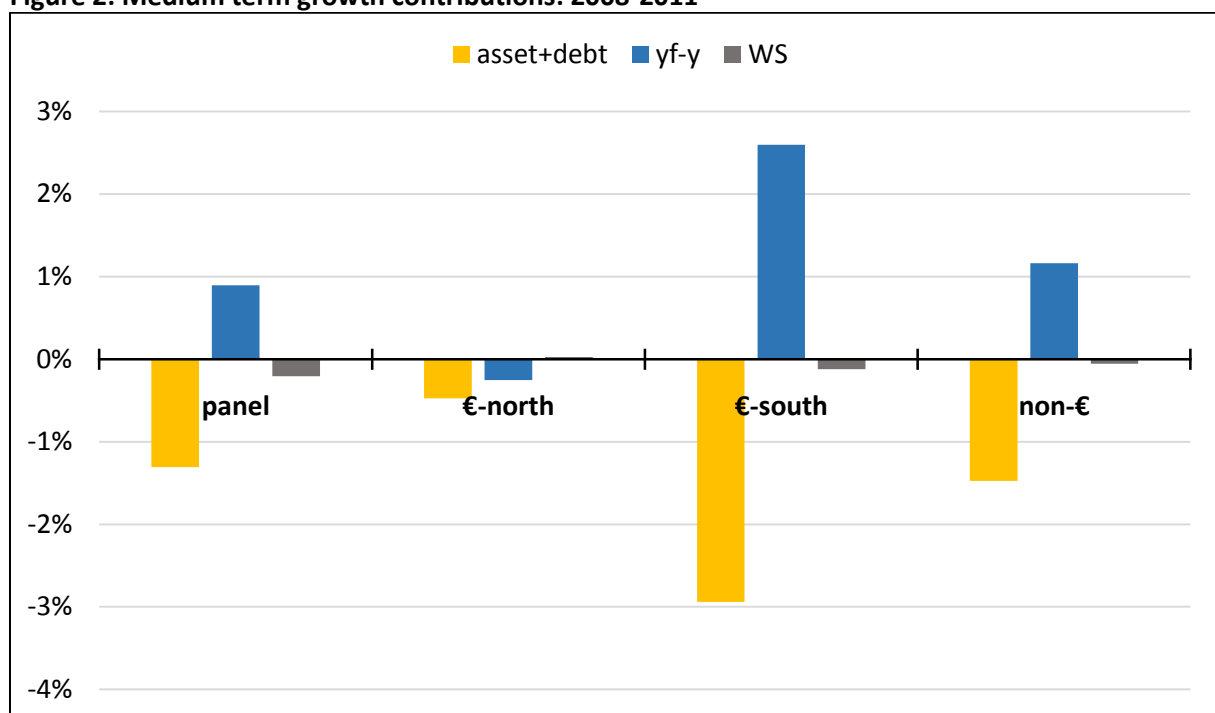
Conclusions

The paper has investigated the role of functional and personal income distribution as well as the role of wealth and debt in consumption and investment. The basis for this was an extended Bhaduri and Marglin (1990) model. The econometric analysis was based on a sample of 12 EU countries for the period 1980-2011. We have three major findings. First, we do find statistically significant effects of the functional income distribution on consumption and investment. These effects are modest in size, but qualitatively, we find wage-led domestic demand.

Second, we find statistically significant and robust positive effects of household debt on consumption. This is at odds with the standard view of the role of wealth, which would expect a

negative partial effect of household debt. We do find negative effects of household debt on investment (which includes residential investment). Real property prices have strong positive and statistically significant effects in the investment function, whereas they only play a limited role for consumption.

Third, to analyse economic significance we have calculated the contributions of key variables to consumption and investment growth in the decade prior to the crisis (1998-2007). This indicated that functional and personal income distribution have negligible effects, whereas property prices and household debt have had strong positive contributions. This is in line with the hypothesis of an asset price-driven (or debt-driven) growth model in explaining growth prior to the 2007 crisis.

Short, we find powerful effects of debt and asset prices that have contributed to economic instability. And we confirm the existence of a wage-led demand regime. These findings have important policy implications. First, finance and debt are potentially powerful drivers of economic performance. They are also prone to overshooting as a credit-driven real estate boom will enable more lending via increased collateral values. Such booms do have powerful real effects, both on consumption and on investment. A growth model that relies on debt as the main driver is, however, an intrinsically unstable one. Rising private debt will eventually lead to financial crises and economic stagnation or even depression. It is therefore essential that the financial sector is tightly regulated and monetary authorities lean against markets if there is danger of financial overheating.

Second, a wage-led growth strategy is a real possibility as observed demand regimes are wage led. In addition to the demand side effects, an expansionary wage policy can also have positive effects on productivity growth (Storm and Naastepad 2013). Wage policy should thus pursue a steady if modest upward pressure on wage shares. In particular in times of recession, wage cuts may be harmful as they will hurt consumption expenditures. To pursue this policy, nominal wage should be growing at 4-5% per annum. In countries that have suppressed their wage shares in the past, like Germany, annual wage growth should be substantially above that to simplify rebalancing within the Euro area.

Third, while there are measurable benefits to a wage-led growth strategy, our results also indicate that its effects are modest in size compared to demand effects of debt. This means that other policy instruments, in particular fiscal policy should be used to stimulate the economy.

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Appendix 1. Results for Ireland with quarterly data

Ireland is an outlier in our sample in some respects. Its property boom was larger than in other countries and its trade openness is substantially higher than those of other countries,This means that our panel results may be a poor guide to understanding the case of Ireland. We have thus performed country level estimations for Ireland to confirm the existence of the effects of wealth and debt in the behavioural equations. This runs into problems of data availability. We have thus used quarterly data. This gives us enough degrees of freedom to perform estimations, even if the sample on which it is based is very short. For our preferred specifications our sample becomes 1998Q1-2014Q1. In other words, these results should be regarded as a robustness check rather than as a stand alone analysis.

Consumption

We began using quarterly data, with a range 2002:Q1 to 2013:Q4 (this was restricted by the availability of data on household debt). Unit root tests found that all variables were integrated of order one I(1) at the 5% level, except household debt which was integrated of order two I(2), which although not ideal is acceptable since household debt is not the dependent variable.

The short date range available meant there were insufficient observations for a specification with 8 lags of every variable, so we began with 4 lags – specification A - on the basis that it is plausible that consumption will only be influenced by changes over the previous year. This gives a fairly unsatisfactory specification with no significant long run effects except for property prices. Testing down yields specification B, which has significant long run effects for all variables except the wage share. In this specification household debt and property prices both have a positive effect on consumption. Our favoured specification is C, which is derived by eliminating household debt from specification B. This slightly extends the range of data availability to 1998, which is useful given the limited degrees of freedom available. This gives strongly significant long run effects of Y, WS and PP all with the expected signs. However the lag structure is not entirely convincing, with only one significant lagged difference (ΔWS_{-3}). Ideally the date range would be extended further by eliminating the WS, but unfortunately quarterly GDP deflator data is only available from 1997, which restricts the date range for real property prices.

Investment

There were insufficient observations to include every variable in an ECM with sufficient number of lags to make a plausible investment function, so we began by eliminating household debt, to maintain consistency with the estimated consumption function. This yielded an unsatisfactory regression which remained so after testing down (Specification A). In particular, the long run effect of income on investment of 2.03 is implausible.

For specifications B and C, business debt was eliminated. This meant all variables were now I(1) and the data range was extended slightly, back to 1998Q1 (now constrained by the availability of data on employee compensation and thus the wage share). Specification B shows the full 8 lags for every variable and Specification C – our preferred regression – shows the results after testing down. All the remaining variables are significant and of the expected sign (with PP positive) except the interest rate which has the expected sign but is insignificant. There are significant gaps in the lag structure but it is plausible that investment responds in this way to changes in previous quarters.

Table A.1: Ireland Consumption						
Date range:	2002Q1 - 2013Q4				1998Q1-2014Q1	
Dep variable: ΔC	A		B		C	
	1		5		9	
C	3.43	0.113	1.98**	0.019	0.5**	0.018
C_{-1}	-0.74**	0.011	-0.53***	0.000	-0.42***	0.0017
Y_{-1}	0.31	0.234	0.28***	0.009	0.36***	0.0031
WS_{-1}	-0.18	0.561	-0.06	0.442	0.14**	0.018
HHD_{-1}	0.12	0.129	0.07***	0.005		
PP_{-1}	0.1*	0.079	0.05***	0.001	0.03***	0.0063
ΔY	0.24	0.437	0.38**	0.025	0.19	0.2792
SUM ΔY	0.20		0.38		0.29	
$ΔWS_{-3}$	-0.06	0.695			-0.18***	0.0056
SUM ΔWS	0.24		0.08		-0.45	
SUM ΔHHD	-0.44		-0.11			
SUM ΔPP	0.22		0.07		0.08	
R2	0.79		0.62		0.60	
DW	2.06		2.18		2.30	
Long run: y	0.42		0.53		0.85	
Long run: ws	-0.25		-0.10		0.33	
Long run: hh_lb	0.17		0.13			
Long run: pp	0.13		0.10		0.08	

Table A.2: IRL Investment						
Date range:	2002Q1 - 2013Q4		1998Q1 - 2014Q1			
	A		B		C	
C	-14.43***	0.003	1.67	0.604	2.30	0.143
I_{-1}	-1***	0.000	-1***	0.001	-0.77***	0.000
Y_{-1}	2.04***	0.000	0.61*	0.061	0.39***	0.001
WS_{-1}	-0.11	0.828	-0.84*	0.082	-0.47**	0.040
PP_{-1}	0.45***	0.009	0.92**	0.021	0.55***	0.000
IRL_{-1}	-0.05	0.465	0.10	0.722	-0.03	0.463
BD_{-1}	-0.35***	0.002				
ΔY_{-5}			1.50	0.206	2.04***	0.001
ΔY_{-8}			2.02**	0.049		
SUM ΔY	0.03		7.49		2.69	
ΔWS	-1.53**	0.028	-0.31	0.730	-1.23**	0.020
ΔWS_{-5}			1.23	0.304	1.46***	0.001
SUM ΔWS	-1.53		3.50		0.23	
ΔPP	0.90	0.126	1.59**	0.046	1.11***	0.009
ΔPP_{-1}			-1.43*	0.065		
ΔPP_{-2}			0.39	0.633	0.85**	0.012
SUM ΔPP	0.90		0.15		1.95	
SUM ΔIRL	-0.11		-1.15		-0.1	
SUM ΔBD	-0.11					
R2	0.74		0.90		0.72	
DW	2.18		1.88		2.02	
Long run Y	2.03		0.61		0.50	
Long run WS	-0.11		-0.84		-0.61	
Long run PP	0.45		0.92		0.71	
Long run IRL	-0.05		0.10		-0.04	
Long run BD	-0.35					

Discussion

This study finds an overall positive impact of property prices on demand, albeit via a small elasticity (0.03) for consumption and a very large one (0.55) for investment. Despite this, the change in property prices accounts for only 2.4% of the change in GDP over the period 1998 – 2014. There are several factors to take into account. First, the investment term captures investment in residential property as well as business investment and Ireland experienced a boom in property investment in the leadup to the crisis – thus this data provides some support that this was driven by rising prices. Second, the assumption underpinning this analysis is that changes in PP have a symmetrical effect on consumption and investment, such that the rise in PP prior to 2007 propelled C and I to the same extent that the subsequent fall in prices reversed it. Fig A.1 shows the dramatic rise and then fall in property prices which Ireland experienced during the period of the sample. Given this, and the extremely short time series available before the crisis, it is difficult to draw firm conclusions, but overall our results do confirm that property prices and debt did have substantial effect on Irish demand formation. The wage share has the expected sign in both specifications but has an extremely small overall effect of just -0.26% of the rise in GDP. This suggests that domestically Ireland was very mildly profit-led during the period, although the size of the effect is so small that it is effectively zero.
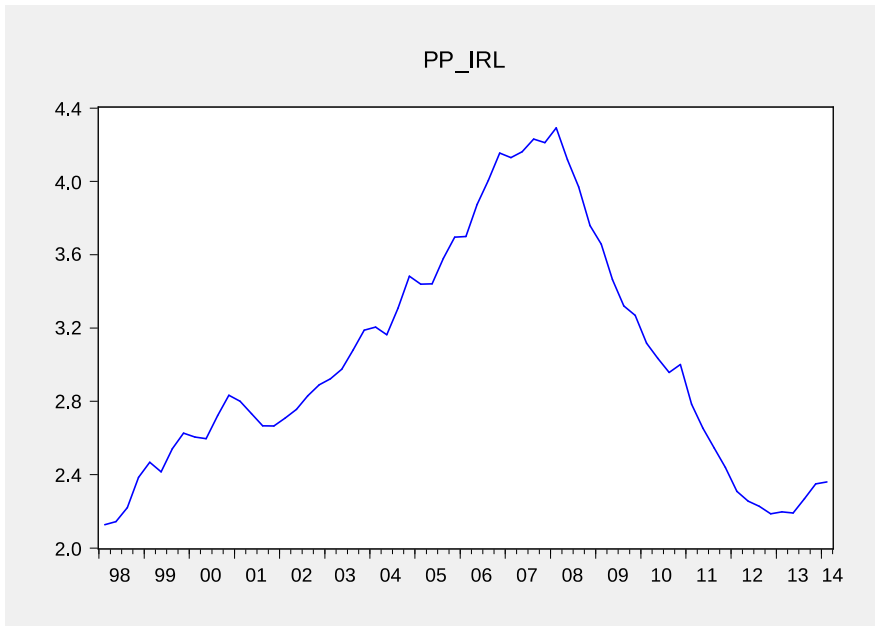
Fig A.1: Ireland's real PP index, 1998Q1 – 2014Q1

PP_IRL

Table A.3. Data sources and range: Ireland

Variable	Measure	Source	Date range - Ireland
Real GDP (y)	Gross domestic product - expenditure approach Millions of national currency, volume estimates, OECD reference year, annual levels, seasonally adjusted	OECD: Quarterly National Accounts	1960Q1 – 2014Q3
Real Consumption (C)	Private final consumption expenditure. Millions of national currency, volume estimates, OECD reference year, annual levels, seasonally adjusted	OECD: Quarterly National Accounts	1960Q1 – 2014Q3
Real Investment (I)	Gross fixed capital formation. Millions of national currency, volume estimates, OECD reference year, annual levels, seasonally adjusted	OECD: Quarterly National Accounts	1960Q1 – 2014Q3
Wage Share (WS)	Derived from: Compensation of Employees (current prices, quarterly levels, seasonally adjusted) as a proportion of nominal GDP.	OECD: Quarterly National Accounts	*1998Q1 – 2014Q2*
Real Household Debt (HHD)	Derived from: Liabilities: Households and non-profit institutions serving households (current prices, annual levels, not seasonally adjusted), and GDP deflator.	Non-consolidated financial balance sheets by economic sector (quarterly table 0720).	*2002Q1 – 2013Q4*
Property Prices (PP)	Index, 2010 = 100 (Units)	BIS: residential property prices statistics	Property price data: 1970Q1 – 2014Q1. *But GDP deflator data only available from 1997Q1 – 2014Q1*
Business Debt (BD)	Credit to non-financial private sector	BIS: Long series on Credit	*2002Q1 – 2014Q1*
Long term interest rate (IRL)	Long-term interest rates, Per cent per annum	OECD: Monthly Monetary and Financial Statistics (MEI)	1971Q1 – 2014Q3

Note: Restrictive data ranges *italics*

Table A.4. Data definitions and sources

abbreviation	full variable name	unit	source
WS	Adjusted wage share: total economy: as percentage of GDP at current factor cost (ALCD2)	% GDP	AMECO
Y	Gross domestic product at 2005 market prices (OVGD)	Billion, national currency	AMECO
PY	Price deflator gross domestic product at market prices (PVGD)	2005=1	AMECO
C	Private final consumption expenditure at 2005 prices (OCPH)	Billion, national currency	AMECO
PC	Price deflator private final consumption expenditure (PCPH)	2005=1	AMECO
I	Gross fixed capital formation at 2005 prices: total economy (OIGT)	Billion, national currency	AMECO
PI	Price deflator gross fixed capital formation: total economy (PIGT)	2005=1	AMECO
PM	Price deflator imports of goods and services (PMGS)	2005=1	AMECO
M	Imports of goods and services at 2005 prices (OMGS)	Billion, national currency	AMECO
X	Exports of goods and services at 2005 prices (OXGS)	Billion, national currency	AMECO
PX	Price deflator exports of goods and services (PXGS)	2005=1	AMECO
i	Real long-term interest rates, deflator GDP	%	AMECO and OECD (MEI)
DH	Household and NPISH, all liabilities	Billion, national currency	BIS
DB	Non-financial corporate, all liabilities less shares and other equity	% GDP	BIS
PP	real property prices BIS (exact definitions vary, deflated with CPI)	2005=1	BIS and OECD
SP	share price index; CPI deflated	2005=1	IMF (International Financial Statistics) and OECD (MEI)
Y^f	OECD real GDP	2005=1	OECD
TOP1	top 1% income share of the SWIID	% of income	SWIID
EX	Nominal effective exchange rate	2005=1	BIS