

**Debt-driven Growth? Wealth, Distribution and Demand in  
OECD Countries**

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# Debt-driven Growth? Wealth, Distribution and Demand in

## OECD Countries

**Abstract:** The paper investigates the effects of changes in the distribution of income and in wealth on aggregate demand and its components. We extend the Bhaduri and Marglin (1990) model to include personal income inequality as well as asset prices and debt. This allows for an evaluation of the wage or profit-led nature of demand regimes, of the expenditure cascade argument (Frank et al. 2010) and several hypotheses regarding the effects of wealth and debt. Our estimates are based on a panel of 18 OECD countries covering the period 1980-2013. For the full panel the average demand regime is found to be wage led. We fail to find effects of personal inequality, but do find strong effects of debt and property prices which have been the major drivers of aggregate demand in the decade prior to the 2007 crisis.

**Keywords:** Post-Keynesian economics, wage-led growth, Bhaduri-Marglin model, demand regimes, wealth effect, Veblen effect, expenditure cascade, aggregate demand.

**JEL classifications:** E11, E12, E21

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# 1 Introduction

The effects of the changes in income distribution on aggregate demand and the role of debt and financial assets are two intensely debated issues in modern heterodox macroeconomics. This corresponds to important changes in contemporary capitalism. Since 1980 dramatic shifts in the distribution of income as well as in the valuation of assets have occurred. Figure 1 shows the evolution of the wage and top income share, real house prices and household debt for five major OECD countries. Wage shares have been falling in all countries. Top incomes as well as property prices and household debt have increased in most but not all countries. Notably Germany and Japan do not experience a property price boom in the decade prior to 2008. While there is agreement on the trends and their importance, there is disagreement in heterodox macroeconomics on their effects.

**Figure 1. Macroeconomic trends 1980-2010**



As regards the role of income distribution there have been two important debates. First, on changes in the functional distribution of income, Kaleckians have argued that an increase in the wage share will increase aggregate demand (called a wage-led demand regime) because the propensities to consume

out of wages is higher than that out of capital incomes (Kalecki 1954). On the other hand, Marxists (Goodwin 1967) argue that higher profits translate into higher investment (called a profit-led demand regime). Bhaduri and Marglin (1990) presented a unifying framework, which allows for both wage-led and profit-led regimes that has become a widely used tool within post-Keynesian economics and 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 2012). Most of this literature focuses on the effects of changes in the functional income distribution, but pays little attention to other factors. The second debate about income distribution focused on the sharp rise in top incomes (Atkinson et al. 2011). The standard Kaleckian hypothesis is that rising inequality will lead to lower consumption expenditures as the rich will have a lower consumption propensity than the poor. However, Frank et al. (2010) argue that people will emulate consumption patterns of richer peers in an attempt to climb up the social ladder. Rising personal income inequality will thus lead to expenditure cascades and increase consumption.<sup>1</sup>

Post-Keynesian (PK) macroeconomics has long recognised the importance of finance in general and asset prices and debt specifically. 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; Ryo 2013). There is 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. We note two shortcomings of the debate. First, while there is an agreement on the key role of debt and wealth, there is no agreed-upon model. 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. Second, the debate has so far motivated more theoretical than empirical work (Zezza 2009 is one of the few exceptions). 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. Onaran et al. (2011) on the USA and Nishi (2012) on Japan are some of the few post-Keynesian studies analysing the effects of functional income

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<sup>1</sup> We use the terms *expenditure cascades* and *Veblen effects* synonymously.

distribution and household wealth and debt, but they do not investigate the role of personal income distribution and, importantly, they only analyse a single country.

The aim of the paper is to analyse the effects of changes in functional and personal income distribution as well as changes of household and business 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 and whether expenditure cascades or ‘the rich save more’ effects dominate. 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 paper extends a Bhaduri-Marglin model for measures of personal income inequality as well as measures of property and financial wealth and private debt. We estimate it based on a panel of 18 OECD countries covering the period 1980 to 2013. Our contribution is threefold: First, we provide a neo-Kaleckian framework to analyse the effects of distribution and wealth on aggregate demand and its components. This allows us to assess different hypotheses on the effects of wealth and debt variables. Second, we provide an empirical assessment of the relative growth contributions of these effects for different country groups. Third, we estimate our model by means of panel analysis whereas most of the relevant literature relies on time series evidence for individual countries.

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 we include many European countries, whereas most of the research on wealth effects is on Anglo-Saxon countries. Given that data for household and business debt is only available since 1980 (for most countries) 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 the pooling assumption is a reasonable approximation and that heterogeneous outcomes across the countries are driven primarily by differences in the time paths of the explanatory variables rather than by differences in parameters across countries.

The remainder of the paper is organized as follows: Section 2 presents the theoretical framework used. Section 3 reviews the existing empirical literature dealing with the Bhaduri-Marglin framework and the

empirical literature estimating wealth and debt effects. Section 4 discusses the data set and the econometric issues of using panel data methods in a macroeconomic context. Section 5 presents the results and a final section concludes.

## 2 The theoretical framework

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 expenditure cascades and wealth and debt effects in both investment and consumption. Real aggregate demand ( $Y$ ) 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:

$$AD = C + I + NX \quad (1)$$

Consumption is

$$C = C(Y, WS, Q, WH, WF, DH, \Delta DH), \quad (2)$$

$$\text{With } C_Y, C_{WS}, C_{WH}, C_{WF}, C_{\Delta DH} > 0, C_{DH} < 0, C_Q = ?$$

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  $Y$  to have a positive effect and  $WS$  to have a negative effect because the marginal propensity to consume (MPC) out of wage income is likely to be higher than that out of capital income. 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 ( $\frac{\partial C}{\partial Q} < 0$ ). Second, if households care about consumption and income relative to their peers, an increase in inequality has a positive effect on consumption ( $\frac{\partial C}{\partial Q} > 0$ ). Following the work of Duesenberry (1949), Frank (1985) and Frank et al. (2010) 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).

The role of household wealth and household debt has recently gained prominence, however there are several competing hypotheses, which are summarised in Table 1. Keynesians have long highlighted the importance of financial factors, but consumption has traditionally not featured prominently in this. Early contributions highlighted that changes in the liquidity preference could cause financial crises (Keynes 1973; Davidson 1972). The main transmission mechanism for this was interest rates. In PK models household debt has a dual influence on consumption since it provides a source of finance, thus having a positive impact on consumption but also leads to servicing costs which depresses consumption if the MPC out of interest income is low (Dutt 2006; Nishi 2012; Hein 2012a). In our context this implies the hypothesis of  $\frac{\partial c}{\partial DH} < 0$  because higher debt levels also lead to higher interest payments and thus decrease disposable income and thus consumption. On the other hand  $\frac{\partial c}{\partial \Delta DH} > 0$  since taking on additional debt initially increases disposable income and the ability to finance consumption expenditures. Therefore the overall effect is not a priori clear. However, a shortcoming of these models is that they do not explicitly assign a role to asset prices (or net wealth). However, the most important reason for households to go into debt is not consumption related, but asset transaction related, namely the acquisition of homes. 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. However, Minsky's original writings analysed businesses and their debt rather than households and mortgage debt. Extending his argument to households, 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,  $\frac{\partial c}{\partial WH} > 0$ .<sup>2</sup>

**Table 1. Different consumption theories**

Hypothesis	Theoretical Argument	Predicted signs
the rich save more	Inequality lowers consumption because richer households have a higher propensity to save.	$\frac{\partial c}{\partial Q} < 0$
expenditure cascades	Households make consumption decisions with respect to richer peers.	$\frac{\partial c}{\partial Q} > 0$
housing wealth is no wealth	Rising house prices lead to wealth	$\frac{\partial c}{\partial WH} = 0$

<sup>2</sup> 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.

	effects for home owners and higher savings of willing-to-be-homeowners.	
net wealth effect	Net wealth (NW) is the relevant wealth measure for consumption decisions.	$\frac{\partial C}{\partial(WH+WF)} = -\frac{\partial C}{\partial DH}$
credit constraints	Due to credit constraints, changes in housing wealth effect consumption even if shocks are anticipated.	$\frac{\partial C}{\partial WH} > 0$ and $\frac{\partial C}{\partial WH} > \frac{\partial C}{\partial WF}$
Minskyian households	Rising asset prices lead to increasingly optimistic lending and spending.	$\frac{\partial C}{\partial WH} > 0$
stock and flow effects of debt	The stock of debt implies interest rate payments which affect consumption negatively whereas the flow of debt affects consumption positively.	$\frac{\partial C}{\partial DH} < 0$ and $\frac{\partial C}{\partial \Delta DH} > 0$

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  $\frac{\partial C}{\partial(WH+WF)} = -\frac{\partial C}{\partial DH}$ . However, it is not straight forward that measured net wealth is the relevant variable. Buitert (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, i.e.  $\frac{\partial C}{\partial WH} = 0$ . 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 ( $\frac{\partial C}{\partial WH} > 0$ ) and we would expect  $\frac{\partial C}{\partial WH} > \frac{\partial C}{\partial WF}$  because housing wealth is more likely to be accepted as collateral than financial wealth.

Investment is

$$I = I(Y, WS, i, Q, WH, WF, DH, DB) \quad (3)$$

With  $I_Y, I_{WH}, I_{WF}, I_{\Delta DB}, I_{\Delta DH} > 0, I_i, I_{DB}, I_{DH} < 0, I_{WS}, I_Q = ?$

where  $i$  and  $DB$  are the long term real interest rate and business debt respectively. 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 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 investment is thus ambiguous. Second, since housing is an especially visible expenditure, it is likely to be influenced by status comparison behaviour. Thus if there are strong consumption cascades, we would also expect them to show in investment expenditures. Third, 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

$$NX = NX(Y, Y^f, EX, WS, WH) \quad (4)$$

$Y^f$  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<sup>3</sup>. 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,  $Y^*$ . The effect of a change in the wage share on  $Y^*$  then is:

$$\frac{dY^*}{dWS} = \frac{f_1}{1-f_2} \quad (5)$$

where  $f_1 = \left(\frac{\partial C}{\partial WS} + \frac{\partial I}{\partial WS} + \frac{\partial NX}{\partial WS}\right)$  and  $f_2 = \left(\frac{\partial C}{\partial Y} + \frac{\partial I}{\partial Y} + \frac{\partial NX}{\partial Y}\right)$ . 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

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<sup>3</sup> In fact the AMECO database defines and computes real unit labour costs and the wage share at market prices identically.

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,<sup>4</sup> thus we do not distinguish between different regimes. However, we may wish to assess the relative actual impact of changes in income distribution and of changes in wealth variables.

In the empirical analysis we will identify these regimes, which are based on the partial effects. In addition we will also identify estimated contributions. These are calculated as the estimated coefficient times 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  $\frac{\partial C}{\partial WH}$ .

### 3 The related empirical literature

As our approach integrates considerations of functional income distribution, personal income distribution and wealth and debt, there is a potentially large and diverse literature that it 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 do not distinguish between effects on consumption and investment. Stockhammer and Onaran (2004), estimate a five variable VAR and find weak evidence for wage-led demand. Barbosa-Filho and Taylor (2006), Kiefer and Rada (2014), Carvalho and Rezai (2014) estimate two variable VARs and find profit-led demand.<sup>5</sup> 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), Naastepad and Storm (2007), Hein and Vogel (2008), Stockhammer and Stehrer (2011) and Onaran and Galanis (2012).<sup>6</sup> All these studies find wage-led domestic demand regimes for most countries. Third, Hartwig (2014) is the only study to use panel data

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<sup>4</sup> Theoretically the effect of housing wealth on investment could be negative. In this case a negative total effect could arise.

<sup>5</sup> 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.

<sup>6</sup> 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).

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) and Nishi (2012) are among the few exceptions and will be discussed below.

Second, there is a growing theoretical literature that is employing the relative income hypothesis. Nevertheless there is of yet little empirical research that analyses its impact on aggregate consumption.<sup>7</sup> Behringer and van Treeck (2013) use inequality as a variable explaining current account positions as well as household saving rates and find a negative effect for the G7 countries. Brown (2004) offers a time series analysis of consumption expenditures for the USA, where he controls for current income and for inequality and finds a negative effect of inequality on consumption, which is at odds with Frank's argument. Carvalho and Rezai (2014) offer a theoretical model along the Bhaduri-Marglin lines with personal income distribution effects based on consumption cascades. Their empirical estimation uses a Threshold VAR, i.e. they split the sample according to periods of high and low personal inequality, but do not control for personal inequality directly, nor do they control for financial variables.

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) and Aron et al. (2012) stress the role of housing wealth in relaxing credit

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<sup>7</sup> Neumark and Postlewaite (1998) and Bowles and Park (2005) use income and inequality measures to explain labour supply decisions. McBride (2001) reports the effects of relative income on self-reported happiness. Again on the micro level, Alvarez-Cuadrado et al. (2012) report that consumption is a positive function of average consumption of a geographical reference group. Thus an increase in inequality would decrease aggregate consumption.

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 and Bezemer (2014) investigate the effects of debt on growth 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. The specification does not include the level of household debt, nor does it include distributional variables.

The closest to our research question are Onaran et al. (2011) and Nishi (2012). Onaran et al. (2011) introduce housing and financial wealth in a Bhaduri-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. Nishi (2012) extends the standard Bhaduri Marglin framework for household borrowing and estimates a structural VAR including the profit share, capital accumulation and the debt ratio with quarterly data on Japan for the period 1992-2010, he finds Japan being profit-led and debt burdened. Both do not control for personal income distribution and their studies are restricted to one country each. Nishi only considers debt, but not financial or housing wealth.

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 disagreement over the effects of changes in the wage share and of personal income distribution. There is as of yet hardly any empirical results on expenditure cascades at the macroeconomic level. 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.

## 4 Data and econometric method

Our data set covers 18 OECD member countries from 1980 to 2013 on an annual basis<sup>8</sup>. Definitions and data sources are provided in Table A1 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 ( $DH$ ), credit to the business sector ( $DB$ ), real property prices ( $PP$ ) and trade weighted effective exchange rates ( $EX$ ) are from the Bank for International Settlements (BIS). The Theil index of wage dispersion ( $Theil$ ) is from the University of Texas Inequality Project. The Gini coefficient ( $Gini$ ) and the share of richest 1% of households ( $Top1$ ) are taken from the Standardized World Income Inequality Database. The 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.

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<sup>9</sup>, but it only captures price indices but not quantity changes.

Our panel has a small  $N$  as well as a small  $T$  ( $N=18$ ,  $T=33$ ), which leads to econometric issues that are distinct from much of the panel literature which assumes a very large  $N$  and small  $T$ . Our econometric baseline specification is thus a first difference (FD) estimator and we perform a several robustness checks. In our panel time series issues such as non-stationary regressors and unit roots are important. Indeed, 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 (see Appendix Table A2). Based on these results we prefer the FD estimator to the standard within-panel transformation since both allow for country fixed effects but the former is more reliable with non-stationary data. The non-stationarity of our data set is also a reason not to use the widely used

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<sup>8</sup> The countries included are: Austria, Australia, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom and the US.

<sup>9</sup> See Paiella (2009), Attanasio and Weber (2010) and Cooper and Dynan (2014) for recent surveys.

dynamic system GMM procedure (Blundell and Bond 1998) since it requires mean-stationary series (Baltagi 2013, p.167).

To address potential problems of autocorrelation in dynamic specifications we apply the Anderson and Hsiao (1982) (A&H) estimator as well as restricted versions of one-step Arellano and Bond (1991) as robustness checks. With the popular difference (Arellano and Bond 1991) and system GMM (Blundell and Bond 1998) estimators the set of instruments required to handle the correlation of the lagged dependent variable with the error term (Nickell 1981) exhibits quadratic increase in  $T$  and thus these methods become unfeasible when  $T$  gets large in relation to  $N$ . We do not use the system GMM estimator because it requires mean stationarity in levels (Baltagi 2013, p.167), which is not satisfied in our dataset. We also experimented with cointegration specifications (available upon request). Results were qualitatively similar to the FD estimator, but the results are not robust and cointegration relations are usually very weak.

To investigate the sensitivity of our results to the pooling assumption we compare our results to those of the mean group (MG) estimator of Pesaran and Smith (1995). The MG approach estimates an individual model for each unit and averages across them. Thus one obtains an average estimate as with a pooled procedure but without a priori restricting the coefficients to be identical for each country. If the estimated parameters were strongly heterogeneous across units, the MG estimator and its standard errors would differ from a pooled regression.

## 5 Results

### 5.1 Consumption function

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

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

where  $\mu_i$  are country fixed effects<sup>10</sup>. Heteroskedasticity and autocorrelation robust standard errors are used in all specifications. We estimate equation 7 using different techniques and the results are summarised in Table 2. The first four columns report variations of a FD estimator with varying control

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<sup>10</sup> 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. See Table A5 in the Appendix.

variables. Specification 2 uses a Gini index and specification 3 a Theil index of wage dispersion instead of the income share of the richest 1% of households in order to measure the personal income distribution. Specification 4 focuses on the role of debt rather than assets and includes household debt in differences as well as in levels in order to allow for negative stock and positive flow effects. Specification 5 employs the MG estimator in order to assess the robustness of the FD estimator with respect to the assumption of homogeneous coefficients across countries. Specification 6 reports a dynamic specification using the A&H estimator and specification 7 the difference GMM estimator.

**Table 2. Consumption function, dependent variable:  $\log(C_t)$**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	FD	FD	FD	FD	MG	A&H	GMM
$\text{Log}(C)_{t-1}$						0.248*** (0.09)	0.373*** (0.12)
$\text{Log}(Y)_t$	0.710*** (0.07)	0.716*** (0.06)	0.806*** (0.08)	0.718*** (0.06)	0.633*** (0.09)	0.593*** (0.10)	0.569*** (0.15)
$\text{Log}(WS)_t$	0.136* (0.08)	0.136* (0.08)	0.141 (0.09)	0.154* (0.08)	0.144** (0.07)	0.072 (0.07)	0.078 (0.08)
$\text{Log}(PP)_t$	0.017 (0.01)	0.021** (0.01)	0.011 (0.01)		0.013 (0.03)	0.027*** (0.01)	0.027** (0.01)
$\text{Log}(SP)_t$	-0.002 (0.00)	-0.001 (0.00)	-0.003 (0.00)		0.009 (0.01)	0.003 (0.00)	0.004 (0.00)
$\text{Log}(DH)_t$	0.110*** (0.02)	0.105*** (0.02)	0.085*** (0.02)	0.114*** (0.02)	0.128*** (0.02)	0.049** (0.02)	0.011 (0.03)
$\Delta\text{Log}(DH)_t$				0.038* (0.02)			
$\text{Log}(TOP1)_t$	0.008 (0.01)			0.008 (0.01)	-0.017 (0.03)	0.008 (0.01)	0.007 (0.01)
$\text{Log}(GINI)_t$		0.027 (0.02)					
$\text{Log}(THEIL)_t$			0.018 (0.05)				
cons					1.098** (0.46)		
N	474	485	361	456	492	448	387
cent. R <sup>2</sup>	0.859	0.860	0.879	0.863		0.866	
F-stat	349	342	503	345		602	
p-value Sargan							0.024

p-value Hansen	0.108	0.041
p-value AR(1)		0.200
p-value AR(2)		0.481

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , heteroskedastic and autocorrelation robust standard errors reported in brackets. FD refers to first difference estimators, MG stands for Mean Group estimator, A&H is the Anderson and Hsiao (1982) estimator and GMM refers to the difference GMM estimator. p-value Sargan/Hansen refer to overidentification tests and p-value AR represent Arellano-Bond autocorrelation tests.

Both have been restricted to two lags for instrumenting  $C_{t-1}$  in order to keep the number of instruments in an acceptable relation to our limited sample size. In general, results are robust across specifications, however the difference GMM estimator does not pass the overidentification tests, pointing to endogeneity problems with the instruments. Also the simple OLS version of the A&H estimator barely passes these diagnostic tests. Therefore our preferred estimator is first differences (column 1). Overall, the main results are similar across the static specifications, and we interpret the similar results of our preferred specification (1) and the MG estimator (5) as support for our decision to pool the data.

The most robust result is the (long-run<sup>11</sup>) income elasticity of about 0.7, which is of an expected magnitude. A 1% increase in the wage share has a direct (long-run) effect on consumption of about 0.14% across the static specifications. Household debt, as well as property prices have positive impacts on consumption with elasticities of about 0.1 and 0.02, respectively. When testing for differences between stock and flow effects in household debt (specification 4), we do find statistically significant positive effects for debt levels, representing the stock effect, as well as for changes, representing the flow effect. While the latter result is in line with the hypothesis of debt stock and flow effects, a positive stock effect is not and we therefore focus on the specifications not distinguishing between the two. 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 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. Stock prices have no statistically significant effect on consumption. Estimated effects are small in all specifications and turn negative in some cases.

<sup>11</sup> The coefficients in the dynamic specification are transformed to long run effects by multiplying them with  $1/(1-\beta_c)$  where  $\beta_c$  is the coefficient on  $C_{t-1}$ .



To assess consumption cascades, we include three different measures of the personal income distribution. However neither the income share of the top 1% of households nor an income Gini-coefficient or the Theil index are statistically significant in any of our specifications. Hence, we do not find evidence for consumption cascades.

The main findings from the analysis of the consumption function can be summarized as follows: First, the wage share has statistically significant positive effects on consumption expenditures. The size of that effect is modest but robust across specifications. Second, household debt seems to be the most important financial variable in explaining consumer behaviour. This result is also robust across specifications. We fail to find evidence for different stock and flow effects of debt. 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.

## 5.2 Investment function

The investment function takes the following form:

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

again with country fixed effects  $\mu_i$  and in addition to those variables already used in the consumption function also a long-term real interest rate ( $i$ ) and non-financial corporate business debt ( $DB$ ). Equation (8) is estimated including only 16 instead of 18 countries since our data set does not contain information on business debt for Switzerland and Ireland. The specification above is augmented by lags of the dependent variable as well as lags of exogenous regressors (Table 3). In estimating equation 8 we start with a baseline first difference approach (specification 1) and then add additional controls or use different estimation techniques. Specification 2 uses a Gini coefficient instead of top income shares, in specification 3 asset prices are dropped in favour of debt stock and flow effects. Specification 4 applies the MG estimator and specifications 5 and 6 the A&H and the difference GMM estimator, again with limited lag length for instruments. A&H does not pass the Hansen overidentification restriction test and we thus do not consider it further. The GMM estimator passes the overidentification restriction test and first order autocorrelated errors are reported as required in the case of a properly specified dynamic first difference estimator. However the estimated coefficient on lagged investment is almost 1.1

implying not only a unit root problem but also an explosive dynamic. Overall, the results are reasonably robust across specifications, however not as stable as in the case of the consumption function. Due to the weak performance of the dynamic specifications, our preferred estimator is again the static FD estimator (specification 1).

Results reported in Table 3 are as follows: Income has a very strong impact on investment spending with an elasticity well above 1. This finding is robust across all specifications. The (long-run) elasticity with respect to the wage share is about 0 in the first differences specifications and negative in the dynamic ones. Long term real interest rates affect investment expenditures negatively in all specifications. Property prices have a positive impact in all specifications ranging from 0.04 to 0.28, pointing to the importance of property prices for residential investment spending. Household as well as business debt have mostly negative effects. If the change in household and business debt is added (specification 3), the estimated coefficients on debt changes are positive, and in the case of household debt statistically significant, whereas the level effect for household debt turns positive. Thus we do not find evidence for negative stock effects of either household or business debt in the investment function. In contrast to the income share of the richest 1% of households, the Gini index turns out to be statistically significant with a negative effect. We conclude that relative consumption, with respect to housing, does not feed through to aggregate (residential) investment spending

**Table 3. Investment function, dependent variable:  $\log(I_t)$**

	(1)	(2)	(3)	(4)	(5)	(6)
	FD	FD	FD	MG	A&H	GMM
$\text{Log}(I)_{t-1}$					0.803*** (0.05)	1.083*** (0.10)
$\text{Log}(Y)_t$	1.910*** (0.12)	1.896*** (0.10)	2.169*** (0.11)	1.826*** (0.26)	2.155*** (0.16)	2.154*** (0.19)
$\text{Log}(Y)_{t-1}$	-0.558*** (0.17)	-0.490*** (0.14)	-0.602*** (0.17)	-0.832*** (0.26)	-1.845*** (0.17)	-2.400*** (0.29)
$\text{Log}(WS)_t$	0.501*** (0.16)	0.424*** (0.14)	0.745*** (0.15)	0.815*** (0.21)	0.186 (0.26)	-0.126 (0.21)
$\text{Log}(WS)_{t-1}$	-0.482*** (0.11)	-0.422*** (0.10)	-0.430*** (0.12)	-1.093*** (0.28)	-0.533*** (0.12)	-0.647*** (0.15)
$i_t$	-0.513*** (0.13)	-0.432*** (0.12)	-0.674*** (0.13)	-0.914*** (0.24)	-0.315** (0.13)	-0.239 (0.16)
$\text{Log}(PP)_t$	0.276***	0.264***		0.221***	0.106***	0.037

	(0.02)	(0.03)		(0.05)	(0.03)	(0.06)
Log(SP) <sub>t</sub>	0.007	0.006		0.045**	-0.014	-0.020*
	(0.01)	(0.01)		(0.02)	(0.01)	(0.01)
Log(DB) <sub>t</sub>	-0.003	-0.001	-0.062	0.031	-0.065**	-0.065*
	(0.02)	(0.02)	(0.04)	(0.06)	(0.03)	(0.03)
ΔLog(DB) <sub>t</sub>			0.045			
			(0.04)			
Log(DH) <sub>t</sub>	-0.105***	-0.106***	0.005	-0.085	-0.063	0.011
	(0.04)	(0.04)	(0.05)	(0.11)	(0.04)	(0.09)
ΔLog(DH) <sub>t</sub>			0.214***			
			(0.07)			
Log(TOP1) <sub>t</sub>	-0.002		-0.006	-0.049	0.051***	0.063***
	(0.02)		(0.02)	(0.09)	(0.01)	(0.02)
Log(GINI) <sub>t</sub>		-0.191***				
		(0.07)				
cons				-2.258*		
				(1.19)		
N	407	403	404	423	395	387
cent. R <sup>2</sup>	0.746	0.755	0.711		0.728	
F-stat	337	252	804		1629	5927
p-value Sargan						0.705
p-value Hansen					0.014	0.611
p-value AR(1)						0.004
p-value AR(2)						0.440

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01, heteroskedastic and autocorrelation robust standard errors reported in brackets. FD refers to first difference estimators, MG stands for Mean Group estimator, A&H is the Anderson and Hsiao (1982) estimator and GMM refers to the difference GMM estimator. p-value Sargan/Hansen refer to overidentification tests and p-value AR represent Arellano-Bond autocorrelation tests.

decisions. Stock prices have small and statistically insignificant effects in the static specifications. A considerable part of total capital formation relies on household spending decisions and therefore partially explains zero or positive effects of the wage share on total investment as well as negative effects 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. In some specifications we obtain positive elasticities which seem to be the result of positive wage share effects on capital formation in the

construction sector. Our preferred specification yields effectively zero long-run effects of the wage share. 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 and the income Gini coefficient, is either not statistically significant or exhibits a negative effects, not supporting Veblen effects.

### 5.3 External sector

The external sector was modelled by estimating an export as well as an import equation. Both proved to be robust with respect to different estimation procedures. For brevity Table 4 only reports the FD estimator and the dynamic A&H estimator. The long-run elasticity of exports with respect to foreign demand ( $Y^f$ ) is about 2, independent of the specification. These export elasticities seem 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 lies between -0.16 and -0.25. 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 negative impact on exports of about 0.1 which can be interpreted as their contribution to domestic inflation and thus increasing export costs.

The income elasticity of imports is about 1.3. The effect of the wage share is not statistically significant and about 0. 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 0.35. 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.

**Table 4. Foreign sector, dependent variables:  $\log(X_t)$  and  $\log(M_t)$**

	(1)	(2)	(3)	(4)
	X: FD	X: A&H	M: FD	M: A&H
lagged dep. var.		0.249 (0.25)		-0.170 (0.21)
$\text{Log}(Y^f)_t$	2.450*** (0.18)	2.585*** (0.27)		

Log(Y <sup>f</sup> ) <sub>t-1</sub>	-0.493*** (0.18)	-1.098* (0.65)		
Log(Y) <sub>t</sub>			1.306*** (0.19)	1.419*** (0.31)
Log(WS) <sub>t</sub>			0.09 (0.09)	0.176 (0.13)
Log(WS) <sub>t-1</sub>	-0.247** (0.11)	-0.161 (0.10)	-0.087 (0.06)	-0.124 (0.08)
Log(EX) <sub>t</sub>	-0.185*** (0.02)	-0.196*** (0.03)	0.159** (0.06)	0.142* (0.08)
Log(EX) <sub>t-1</sub>	-0.115*** (0.04)	-0.053 (0.07)		
Log(PP) <sub>t</sub>	-0.104*** (0.03)	-0.089*** (0.03)	0.186*** (0.04)	0.152** (0.06)
Log(PP) <sub>t-1</sub>			-0.098*** (0.03)	
Log(X) <sub>t</sub>			0.443*** (0.05)	0.421*** (0.08)
Log(X) <sub>t-1</sub>			-0.091** (0.04)	0.016 (0.15)
N	481	468	496	483
cent. R <sup>2</sup>	0.728	0.547	0.806	0.791
F-stat	198	373	265	328
p-value Hansen		0.940		0.031

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

#### 5.4 Demand regimes and the drivers of growth

Table 5 summarises the key results regarding demand regimes. It is based on the preferred FD estimates (specification 1 in Table 3, 4 and 5). Elasticities have been transformed into marginal effects and normalized by income to make them comparable.<sup>12</sup> Row 4 adds the effect of a 1%-point change in the

<sup>12</sup> The marginal effect of the wage share reported in Table 5 is computed in the following way:

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

wage share on private excess demand,  $Y^{PED}$ , which is numerator of equation (5),  $f_1$ , and determines the sign of the effect of changes in distribution on equilibrium demand. It can be thought of as the first round effect or the sum of the partial effect, 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 5. Marginal effect of 1 percentage point shift of WS in % of GDP on private excess demand**

	PANEL	US	FR	DE	AT	NL
C	0.12	0.14	0.11	0.12	0.11	0.10
I	0.01	0.01	0.01	0.01	0.01	0.01
NX	-0.05	-0.02	-0.06	-0.08	-0.10	-0.15
$Y^{PED}$	0.08	0.12	0.06	0.04	0.02	-0.05
openness	21%	11%	24%	33%	42%	61%

Effects are based on coefficients from specification (1) in Table 1 and Table 2 and specifications (1) and (3) in Table 3. Elasticities are converted into marginal effects using GDP weighted sample averages. Openness is computed as the average of nominal import and export shares:  $(P_M M + P_X X)/2P_Y Y$ .

There are several interesting patterns. First, the domestic effects of the wage share on consumption and investment are similar across countries. 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<sup>13</sup>. A large and relatively closed economy like the USA has a small net export effect and is overall strongly wage led. Medium sized open economies like France, or Germany have substantially smaller effects. In small open economies like Austria or the Netherlands the negative external sector effects become so large that the total demand regime can become profit led.

Finally we want turn to the question which variables have been the main drivers of growth in the decade prior to the 2007 crisis. Table 6 reports to what extent the change of explanatory variables, explain the change in consumption and investment spending in the period 1997-2007. In addition to the full panel

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$\hat{\beta}_{WS}$  is the estimated elasticity of consumption, investment spending, exports or imports with respect to the wage share.  $\bar{\frac{C}{Y}}$  represents the average over the sample period of the GDP weighted average of the consumption-to-income ratio of the 18 countries included in the panel and similarly  $\bar{WS}$  is the sample period average of the GDP weighted average of the wage share. So first GDP weighted averages of  $C/Y$ ,  $I/Y$ ,  $X/Y$  and  $M/Y$  over the panel countries are computed for each year. In a second step GDP weighted averages (based on PPPs) of these yearly averages is computed.

<sup>13</sup> 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.

we also take a look at four country groups: Anglo-Saxon (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 Anglo-Saxon countries and the southern European countries and an export-driven model in the Nordic countries (Stockhammer 2009; Hein 2012b). This distinction should lead to distinct pattern of demand formation.

**Table 6. Growth contributions**

		change 1997-2007	Panel	Anglo	€-North	Non-€-North	€-South
		$\Delta C$	31%	42%	13%	29%	29%
		$\Delta I$	34%	46%	18%	48%	52%
		$\Delta Y$	28%	35%	22%	28%	29%
<b>C</b>	(1)	$\Delta C - \beta_Y \Delta Y$	10.7%	17.4%	-2.4%	8.8%	8.8%
	(2)	$\beta_{WS} \Delta WS$	-0.5%	-0.2%	-0.8%	-0.4%	-0.6%
	(3)	$\beta_A \Delta A$	9.4%	12.8%	3.6%	10.2%	20.4%
	(4)	$\beta_Q \Delta Q$	0.2%	0.2%	0.1%	0.1%	0.1%
<b>I</b>	(5)	$\Delta I - \beta_Y \Delta Y - \beta_i \Delta i$	-4.9%	-2.5%	-12.5%	8.5%	11.8%
	(6)	$\beta_{WS} \Delta WS$	-0.1%	0.0%	-0.1%	0.0%	-0.1%
	(7)	$\beta_A \Delta A$	6.3%	11.9%	0.3%	11.4%	-2.2%
	(8)	$\beta_Q \Delta Q$	0.0%	0.0%	0.0%	0.0%	0.0%
<b>NX</b>	(9)	$\beta_{Y^f} \Delta Y^f - \beta_Y \Delta Y$	-0.4%	-9.2%	8.1%	-0.7%	-1.2%
	(10)	$\beta_{WS} \Delta WS$	0.5%	0.2%	1.0%	0.4%	0.7%
	(11)	$\beta_{PP} \Delta PP$	-8.1%	-12.8%	-2.0%	-11.1%	-9.1%
<b>Y-SR</b>	(12)	$\beta_{WS} \Delta WS$	-0.17%	-0.08%	-0.07%	-0.02%	-0.16%
	(13)	$\beta_A \Delta A$	5.32%	8.72%	1.25%	2.78%	8.64%
	(14)	$\beta_Q \Delta Q$	0.10%	0.11%	0.06%	0.04%	0.06%
<b>Y-LR</b>	(15)	$\beta_{WS} \Delta WS$	0.14%	0.24%	0.02%	0.01%	0.10%
	(16)	$\beta_A \Delta A$	9.42%	18.84%	1.39%	3.03%	13.21%
	(17)	$\beta_Q \Delta Q$	0.17%	0.24%	0.06%	0.05%	0.10%

Rows (1) and (5) report the change of  $C$  and  $I$  between 1997 and 2007 not explained by changes in income (and the interest rate), respectively. Rows (2), (6) and (10) report the predicted change in  $C$ ,  $I$  and  $NX$ , based on the change in  $WS$  and the estimates from specifications (1) in Tables 2, 3 and 4. Rows (3) and (7) report the predicted change in  $C$  and  $I$  based on the changes and the corresponding coefficients of property and stock prices as well as household debt:  $\beta_A \Delta A = \beta_{PP} \Delta PP + \beta_{SP} \Delta SP + \beta_{DH} \Delta DH$ . Rows (4) and (8) report the predicted change in  $C$  and  $I$  based on the change in Top 1% income share changes. Row (9) contain the predicted change in  $NX$  due to the changes in  $Y$  and  $Y^f$ . Row (11) reports similar results but due to changes in  $PP$ . Rows (12) to (14) report short

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run total GDP effects based on  $f_2$  of equation (5) and rows (15) to (17) report the long run equivalents taking also into account the multiplier effect of  $f_1$  from equation (5).

Consumption and investment grew much slower in the Euro-North group than in the other groups. Rows 1 and 5 calculate the growth in consumption and investment that is not explained by income growth. While consumption expanded more slowly than income in the Euro-North group, there is a substantial unexplained gap in consumer spending by income for the other groups (17.4%, 8.8% and 8.8% of GDP for the Anglo-Saxon, Euro-South and non-Euro-North groups respectively). The unexplained gap spending for investment (row 5) amounts to 11.8% and 8.5% of GDP in case of Euro-South and non-Euro-North.<sup>14</sup> Changes in the wage share hardly explain any of these dynamics. The contributions are less than 1% for consumption (row 2) and effectively 0 for investment (row 6). The same holds true for the income share of the top 1% (rows 4 and 8). In contrast changes in property prices, stock prices and debt (row 3) explains a rise in consumer spending of 12.8%, 10.2% and 20.4% for the Anglo-Saxon, non-Euro-North and Euro-South groups. In the case of investment (row 7) these asset variables explain 11.9% and 11.4% for Anglo-Saxon and non-Euro-North while they did not affect or even diminished investment spending in the other two groups. Rows 9, 10 and 11 calculate the contributions of the differential between domestic and foreign demand, the wage share and property prices on net export. Rows 12-14 combine the consumption, investment and net export effects to compute a short-run private excess demand effect<sup>15</sup> that can be attributed to asset dynamics (row 13), the wage share (row 12) and personal income inequality (row 13). Rows 15-17, (based on equation 5)<sup>16</sup>, do the same for equilibrium income, which takes into account the multiplier mechanism. Asset effects contributed almost 20% to GDP growth in the Anglo-Saxon economies and 13% in Euro-South, but only 1.4% in Euro-North and 3% in non-Euro-North. The differences in the underlying multipliers are driven by the varying degrees of openness to trade. Anglo-Saxon and Euro-South which are more closed in comparison to the two North groups have larger multipliers.

The results summarised in Table 6 illustrate that the panel results that pool parameters can explain very different country group performances. These are due to varying degrees of openness and different asset

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<sup>14</sup> Row 5 calculates the part of investment growth that is not explained changes in income and the interest rate.

<sup>15</sup> Y-SR is constructed by summing up the consumption, investment and net export effects weighted by consumption, investment and net exports relative to GDP.

<sup>16</sup> The multipliers are 1.77 for the overall panel and 2.16, 1.11, 1.09 and 1.53 for Anglo-Saxon, Euro-North, non-Euro-North and Euro-South, respectively. The long run effects (Y-LR) then result from the short run (Y-SR) effects times the corresponding multipliers.



price and debt dynamics. The direct effects of distributional shifts were negligible. Property prices and household debt played the dominant role in explaining growth prior to the crisis.

## 6 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 18 OECD countries for the period 1980-2013. We have four 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 fail to find effects for personal income distribution, measured by top incomes shares, Gini coefficients or a Theil index of sectoral wage dispersion. It is possible that negative effects of inequality due to lower consumption propensities of the rich are offset by positive imitation effects stressed by the Veblen tradition. Alternatively it might also be the case that consumers do care about consumption of their peers but rising property prices provided the necessary collateral to take on debt for financing these expenditure cascades.

Third, 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 fail to find different effects for debt as a stock and as flow variable. 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.

Forth, 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.

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## Appendix

Table A1. 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=100	AMECO
C	Private final consumption expenditure at 2005 prices (OCPH)	Billion, national currency	AMECO
PC	Price deflator private final consumption expenditure (PCPH)	2005=100	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=100	AMECO
PM	Price deflator imports of goods and services (PMGS)	2005=100	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=100	AMECO
i	Real long-term interest rates, deflator GDP	%	AMECO and OECD (MEI)
DH	Household and NPISH, all liabilities	% GDP	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=100	BIS and OECD
SP	share price index; CPI deflated	2005=100	IMF (International Financial Statistics) and OECD (MEI)
THEIL	estimated household income inequality	Theil Index	University of Texas Inequality Project
Y <sup>f</sup>	OECD real GDP	2005=100	OECD
IC	Gross fixed capital formation at 2005 prices: construction (OIGCO)	Billion, national currency	AMECO
GINI	gini coefficient (pre tax and post transfer) of the Standardized World Income Inequality		SWIID

Database			
TOP1	top 1% income share of the SWIID		SWIID
EX	Nominal effective exchange rate	2005=100	BIS



Table A2. Unit root tests following Choi (2001)

variable	inv. chi-squared	inverse logit	inverse normal	specification	transformation
C	0.511	0.756	0.768	trend	log-level
Y	0.989	1.000	1.000	trend	log-level
PP	0.156	0.408	0.455	trend	log-level
SP	0.043	0.108	0.094	trend	log-level
DHH	0.217	0.411	0.392	trend	log-level
TOP1	0.237	0.467	0.498	trend	log-level
DBUS	0.362	0.303	0.272	trend	log-level
inv	0.152	0.472	0.578	trend	log-level
X	0.991	1.000	1.000	trend	log-level
M	0.784	0.989	0.983	trend	log-level
WSfc	0.235	0.456	0.494	no trend	log-level
i	0.723	0.559	0.560	no trend	level
exnom	0.063	0.027	0.022	no trend	log-level
C	0.010	0.005	0.003	no trend	log-dif
Y (2 lags)	0.019	0.034	0.055	no trend	log-dif
PP	0.000	0.000	0.000	no trend	log-dif
SP	0.000	0.000	0.000	no trend	log-dif
DHH	0.062	0.026	0.021	no trend	log-dif
Top1	0.000	0.000	0.000	no trend	log-dif
DBUS	0.001	0.000	0.000	no trend	log-dif
inv	0.001	0.001	0.000	no trend	log-dif
X (2 lags)	0.071	0.054	0.047	no trend	log-dif
M	0.000	0.000	0.000	no trend	log-dif
WSfc	0.000	0.000	0.000	no trend	log-dif
i	0.000	0.000	0.000	no trend	dif
exnoml	0.000	0.000	0.000	no trend	log-dif