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A Post-Kaleckian analysis of the effect of income distribution, public spending and taxes on growth, investment, and budget balance: The case of Europe

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This paper develops a multi-country Post-Kaleckian model augmented by a government sector with public spending and taxes on consumption, labour and capital and estimates it for the EU15 countries. We estimate country specific equations to find the effect of income distribution and public spending on each component of private aggregate demand (i.e., consumption, investment, and net exports) for the EU15 countries. Next, we calculate a Europe-wide multiplier based on the responses of each country to changes not only in domestic income distribution, taxation and government expenditure but also to changes in the other European countries' wage share, taxes and public spending. One novelty of this paper is that it goes beyond an isolated country-by-country analysis and integrates cross-country effects of a simultaneous change in the wage share on demand in Europe in a government augmented Post-Kaleckian model. The fiscal multiplier effects are much stronger when policies are implemented simultaneously, and wage, tax and public spending policies are integrated into the policy mix. The paper brings concerns of equality and targeted public spending to the core of the analysis, which can guide public spending policy and wage policy to achieve a policy mix for an equitable development strategy.

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1. Introduction

The outbreak of the great recession and sluggish growth in the aftermath in most European countries has rekindled interest in the effect of fiscal policy on growth, as evidenced in the vast literature on fiscal multiplier effects (Blanchard and Leigh, 2013; Gechert, 2015). The dominance of austerity policies has led to a negative effect on both public and private investment setting the stage for continued stagnation in Europe (Cozzi et al., 2016). The issue of low levels of investment has been recognised and tried to be incorporated by recent initiatives such as an 'Investment Plan for Europe' which intends to mobilise funding of € 315bn in a 3 year period (EC, 2014).

At the same time inequality has increased significantly with a simultaneous fall in the share of labour income in national income and a rise in top income shares in the post 1980s in all the major developed and developing countries (Stockhammer, 2015). The negative impact of inequality on growth has been well evidenced in empirical research based on both supply side growth models (Barro, 2000; Berg et al. 2012; Daudey and Garcia-Penalosa, 2007) as well as Post-Keynesian demand-led growth models (Onaran and Galanis, 2014; Onaran and Obst, 2016; Stockhammer et al, 2009; Hein and Vogel, 2008; Naastepad and Storm, 2006). The empirical impact of income inequality has been extensively researched in the Post-Keynesian literature, but to the best of our knowledge the role of public spending and taxation has not been integrated in this empirical research in the context of distribution driven demand-led growth models.

In the Post-Keynesian literature several authors (e.g. Dutt, 2013; Mott and Slattery, 1994; Palley, 2013; Seguino, 2012) discuss the issue of tax policy and integrate different types of government expenditure into the Kaleckian distribution and growth model. Some studies also examine the impact of expansionary fiscal policy on the sustainability of public debt. However, most papers focus either on tax and transfer policies or government expenditure and they do not include the interactions between government activities and net exports. Most importantly, they do not estimate empirically the effects of government expenditures and taxes and how these effects interact with the impact of income distribution on demand.

The first novelty of this paper is to present a multi-country Post-Kaleckian model that incorporates a government sector within an open economy context. The model includes taxes on labour, capital and consumption as well as government expenditure (capital and current spending) and is estimated econometrically for the EU15 countries. We estimate country

specific equations to find the effect of income distribution and fiscal policy on each component of private aggregate demand (i.e. consumption, investment, and net exports) for the EU15 countries. The second novelty is to calculate a Europe-wide multiplier based on the responses of each country to changes in not only domestic income distribution, taxation and government expenditure but also changes in other European countries' income distribution, taxes and public spending. While Onaran and Galanis (2014) and Onaran and Obst (2016) presented the impact of simultaneous changes in income distribution in the G20 and EU15, they have not integrated the impact of public spending and taxes. From a policy perspective, the most important contribution is to present a theoretical model based on which we empirically estimate the impact of a policy mix that combines policies for pro-labour pre-distribution aiming at a rise in the wage share, more progressive redistributive tax policies and fiscal expansion. A related theoretical and policy relevant contribution is to analyse the impact of this policy mix on not only growth but also investment, budget balance, trade balance and inflation. The paper brings concerns of equality and targeted public spending to the core of the analysis, which can guide public spending policy and wage policy to develop a policy mix for an equitable development strategy.

The rest of the paper is organised as follows. Section 2 reviews the literature on the role of fiscal policy. Section 3 outlines data sources, scope and stylised facts. Section 4 outlines the theoretical model. Section 5 outlines the estimation methodology. Section 6 presents and discusses the estimation results. Section 7 discusses an alternative policy mix and the implications for growth, private investment, trade balance, and budget balance. Finally, section 8 concludes.

2. Theoretical Background – the role of fiscal policy in the Kaleckian model

Most Post-Kaleckian models leave government activity aside or include it only partially (Lavoie, 2014). However, there is a growing literature that theoretically integrates fiscal policy into the Kaleckian distribution and growth model. We distinguish two strands. The first one discusses tax policies in the context of a demand-led growth model (e.g. Blecker, 2002; Mott and Slattery, 1994; Laramie, 1991; Palley, 2014). The second one examines the effect of government expenditure on growth and discusses the sustainability of public debt following expansionary fiscal policy (e.g. Commendatore, 2011; Dutt, 2013; Palley, 2013; Tavani and

Zamparelli, 2015). Moreover, some of these articles also differentiate between long run and short run analysis[1].

Following Kalecki (1971 [1937]) who based his theory of taxation on Keynes's theory of effective demand[2] several Post-Keynesian authors have taken his analytical apparatus and extended the theoretical framework.

When looking at taxation most authors consider taxes on capital and labour and how tax shifting might alter the likelihood of an economic regime to be wage-led or profit-led (Blecker, 2002; Laramie 1991; Laramie and Mair, 1996; Palley, 2014). Tax rates on labour and capital affect the propensity to consume out of pre-tax incomes, and hence the demand regime of the economy. Furthermore, taxation on consumption is introduced and the impact on firm's pricing behaviour examined (Mott and Slattery, 1994). The analysis of these studies usually operates within a framework of a closed economy with a balanced budget.

A more progressive tax system[3] potentially stimulates demand, capital accumulation, and hence growth (Blecker, 2002; Laramie, 1991; Palley, 2014). A reduction of the effective tax rate on wages would add a stimulus to the economy through the national income multiplier[4] and hence support a wage-led economic regime, whereas a more regressive tax system would help growth in a profit-led regime.

The majority of the studies argue that firms consider after-tax profits when making investment decisions (Rowthorn, 1981; Mott and Slattery, 1994). However, the introduction of different kinds of taxation on profit income[5] and allowing for an effect of profits on investment, leaves the total effect on growth ambiguous. As in the Post-Kaleckian model without government, the total effect will depend on whether the positive effects of redistribution from profits to wages on output outweigh the possibly negative effect of

[1] In this paper we focus on the short run analysis conducting comparative static analysis.

[2] Kalecki's work (1971[1937]) provides the basis for Post-Keynesian theory of the incidence and macroeconomic effects of taxation while at the same time marks a break from orthodox public finance theory. In this paper we focus primarily on the macroeconomic effects of taxation on growth.

[3] Taxes on capital increasing while those on labour decreasing.

[4] Assuming a balanced budget multiplier, an increase in taxation will increase government purchases and cause the level of national income to expand. However, this abstracts from the impact of taxation on the distribution factors (Laramie, 1991). Here, in addition to the multiplier effect, a change in income distribution (e.g. increasing the share of wages in national income) will lead to a wage-led outcome due to the paradox of costs, as typically assumed in the stagnationist literature.

[5] Palley (2014) for instance introduces a corporate tax rate as well as a tax on distributed profits arguing that a reduction in the corporate tax rate makes investment more sensitive to the profit share and hence increases the likelihood of a profit-led regime. In the same vain, Mott and Slattery (1994) argue that a higher corporate profit tax might be harmful for investment reducing the expansionary effect coming from the positive capacity utilisation effect.

reduced profits on investment spending[6]. Hence, the issue of the impact of taxation on output becomes an empirical one. Taxation on consumption is usually introduced in form of an industry wide increase of commodity taxes such as a value added tax. Firms might respond in different ways but one of the more sensible responses is to add the tax to the price of their output (Mott and Slattery, 1994)[7].

The Post-Keynesian literature crystallizes different transmission channels between an increase in government expenditure and growth, assuming a closed economy with excess capacity and surplus labour. In this context, there are positive demand effects as well as positive crowding in effects. Most articles consider different types of public spending distinguishing productive (government capital spending) from unproductive expenditure (government current spending). Palley (2013) and Dutt (2013) for instance classify productive expenditure as public investment in technology and infrastructure and argue that it is leading to positive crowding in effects on private investment[8]. Seguino (2012), however, further distinguishes between public investment in physical and social infrastructure[9] arguing that both enhance the business environment and hence private investment. Furthermore, some studies argue in favour of current public spending because of the full first-round effect on demand through the multiplier mechanism (Commendatore et al. 2011; Seguino, 2012). In contrast to mainstream analysis (e.g. Barro, 1990; Agenor, 2008) this literature therefore adds changes on the demand side (e.g. a change in income distribution) to those working on the supply side (e.g. improving business environment).

Some of the studies that integrate government spending also discuss the implications of expansionary fiscal policy on the sustainability of public debt and hence loosen the assumption of a balanced budget. The integration of government debt has ambiguous effects in the short run, depending on whether positive expansionary effects on growth outweigh the negative financial crowding out effects. Palley (2013), Tavani and Zamparelli (2015) as well as You and Dutt (1996) argue that a bond financed increase in public debt raises interest

[6] Mott and Slattery (1994) argue that the qualitative effects of differing tax policy changes depend solely on the relative magnitudes of the propensity to save out of wages and profits and the propensity to invest following a change in income distribution. Hence, while the integration of taxes affect the parameters of the model the total outcome is indeterminate. In the same spirit, Seguino (2012) argues that state-level policies can affect the relative strengths of these effects.

[7] Assuming imperfect competition, prices might be more quickly and easily rolled over when the commodity tax (e.g. value added tax) affects all firms.

[8] Hence, private investment and public investment are complementary and not substituted as in the mainstream literature.

[9] Public investment in social infrastructure for instance includes spending on health and education.

payments that accrue to capitalists and hence increase their disposable income, aggregate demand (AD), and capacity utilisation. The increase in capacity utilisation in turn can increase capital accumulation through the accelerator effect.

Moreover, Dutt (2013) argues that the additional AD effect financed by an increase in government debt directly increases capital accumulation through crowding in effects on private investment. In contrast, if the deficit was financed by an increase in tax rates this would reduce capacity utilisation because of a reduction in consumption spending[10]. In contrast to You and Dutt (1996) he allows for adverse effects of government debt accumulation on long-term interest rates. Hence, the relative strength of these two opposing effects determines the total effect on growth which is an empirical matter. Tavani and Zamparelli (2015) also introduce the mainstream notion of crowding-out effects of an increase in public debt on private investment. However, they argue that this is at most a short run phenomenon. Whereas an increase in the public debt to capital ratio and the interest rate lower the equilibrium level of activity, an increase in the government deficit increases the value of the growth multiplier following an increase in autonomous spending. Thus, the total effect is ambiguous.

Integrating the government into the Post-Kaleckian distribution and growth model can alter the growth rate and hence the nature of a given wage-led or profit-led regime. The issue of fiscal policy is linked to the relationship between a change in income distribution, AD, and economic growth[11]. A change in income distribution (e.g. lowering effective taxes on wages) as well as an increase in government spending can stimulate the economy in different ways. It further shows that an economy's character is influenced by policy making and hence endogenous to the structure of the tax system as well as constellations of public spending (Palley, 2014).

3. Data and Stylised Facts

The data used in the econometric estimation comes from the annual macro-economic database of the European Commission and the OECD national accounts, in most cases for the period between 1960 and 2013. The definition of the new variables and details of data sources are explained in appendix A. Our model includes the following variables: *C, I, X, M, Yp, D, W,*

[10] Income taxes also represent 'leakages' from income-expenditure flows.
[11] The literature incorporates income-based equity concerns from the start. Equalising the income distribution through tax policies may stimulate aggregate demand, investment, and growth.

and R are private consumption expenditures, private investment expenditures, exports, imports, private GDP, general government consolidated gross debt, pre-tax adjusted wages, and pre-tax adjusted profits respectively, all variables in real terms.

We augment our model by introducing implicit tax rates (ITR) on capital (t_r), labour (t_w), and consumption (t_c). Our tax data relates to the dataset provided in Onaran et al. (2012) and Eurostat (2015), which includes ITRs for capital, labour and consumption for the EU14 countries[12] and is mostly available between 1970 and 2012[13]. We also integrate general government gross capital formation (I_g), general government final consumption expenditure (Gt_c), which can be further broken down into government individual consumption spending (G_i), and government collective consumption spending (G_C). In our analysis, the sum of gross capital formation (capital spending) and general government final consumption expenditure (current spending) is equal to government expenditure (G)[14].

Appendix B outlines the ITR on consumption, labour and capital in the EU14 countries. Figure B1 shows the evolution of the ITRs on consumption in the EU14 countries. The ITR on consumption[15] overall shows an increasing trend in most of the EU14 countries, particularly since the 1980s. The exceptions are Austria, Belgium, France, and Ireland. Figure B2 indicates that the tax burden on labour started growing significantly in the early 1970s. Taxes on labour[16] have increased since then and this trend holds true in all EU14 countries. However, the level of ITR on labour remained relatively stable between 1980 and 2012 in Denmark (35%), Netherlands (36%), Sweden (42%) and the UK (25%). Figure B3 outlines

[12] Due to unavailable data regarding capital tax in Luxembourg we include the estimations of our previous paper (Onaran and Obst, 2016). Hence, we estimate the EU14 countries including a government sector and integrate Luxembourg without the integration of a government sector into the empirical analysis presented here.

[13] The tax rates are based on the dataset provided by Onaran et al. (2012) which itself draws on data by the European Commission (2000) as well as Eurostat online database with data ranging between 1970 and 2007. We extend this dataset to 2012 using the growth rate of the data provided by Eurostat online database (2015).

[14] It should be mentioned that in the real data the total government expenditure is higher than the sum of government final consumption and public investment. The total government expenditure also includes other categories such as the social benefits in cash. On average, G_{tc} and I_g constitute roughly 50 per cent of total government expenditure in our sample. Including benefit payments and other current transfers would increase this figure to approximately 80 per cent of total government expenditures (AMECO, 2016). However, due to limited data availability (e.g. social benefits in cash start only in 1995 for most EU15 countries) we will only integrate G_c , G_i and I_g into our time series analysis where data is available between 1960 and 2013 (AMECO, 2016).

[15] For Germany and the UK we have calculated data from 1970 back to 1965 using growth rates based on consumption tax rates provided in the study by Mendoza et al. (1997). For Sweden from 1980 to 1970. For Austria and Finland from 1980 back to 1965. Data starts only in 1980 in Greece, Portugal and Spain.

[16] For Germany, and the UK we have calculated data back from 1970 to 1965, for Austria and Finland from 1980 to 1970 and 1965 respectively, and for Sweden from 1980 to 1970 using growth rates based on labour tax rates provided by Mendoza et al. (1997). Data starts only in 1980 in Greece, Portugal, and Spain.

the development of the ITR on capital income[17] in the EU14 countries. The evolution of ITR on capital is diverse across countries. It has increased in Denmark, Finland, France, Greece, Italy, Portugal, Spain and Sweden, but has fallen in Ireland and the UK. It remained relatively stable in Austria and Germany. In Spain, ITR on capital income has significantly fallen after the outbreak of the crisis in 2007 from 42% to roughly 26%.

Figure 1 shows the evolution of government expenditure (G), as a ratio to real GDP, between 1960 and 2013. Average levels of G/GDP have stayed remarkably stable over the last 5 decades. In 1960 government expenditure in the EU15 countries was roughly 26% of GDP and in 2013 it was approximately 25%. However, individual countries show diverse trends. In the UK G/GDP has significantly declined from 33% in 1960 to only 24% in 2012. The same pattern holds true for Sweden where the level of G/GDP dropped from its peak level of 40% in 1993 down to roughly 30% in 2012. Only two countries show a significant upswing in G/GDP. In Spain, it increased from 16% to 22% between 1960 and 2012. In Portugal, the level of G/GDP rose from 12% to 23% over the last 5 decades.

In similar lines with the government expenditure, the trend in collective consumption expenditure has been relatively stable across the EU14 countries (see figure B5 in appendix B)[18]. However, individual consumption expenditure, as a ratio to real GDP, shows an upward trend in the EU14 countries between 1970 and 2013, with a drop after the outbreak of the great recession in most countries (see figure B6 in appendix B)[19]. The trend in gross capital formation by the general government, as a ratio to real GDP, is shown in appendix B figure B7[20]. Interestingly, public investment declined slightly from average levels of almost 4% in 1960 to roughly 3% in 2012. However the drop is more significant in Sweden (from 7% to 4.5% between 1960 and 2012) and in Greece (from almost 6% to 2.5% between 1960 and 2012).

[17] For Luxembourg there is no data on ITR on capital. For Greece, data is not available after 2007 and for Denmark 2012 is unavailable. For Austria and Sweden we have calculated data back from 1980 to 1970, for Germany and the UK from 1970 to 1965, and for Finland from 1979 to 1965 using growth rates based on capital tax rates provided in the study by Mendoza et al. (1997). Data starts only in 1980 in Greece, Portugal, and Spain.

[18] Collective government consumption expenditure consists of the following COFOG groups (EC, 2011): General public services; defence: public order and safety; economic affairs; environmental protection; housing and community amenities; general administration, regulation, dissemination of general information and statistics (all 10 functions); research and development (all divisions).

[19] Individual consumption expenditure is conceptually identical with social transfers in kind provided to individual households. Clustered by function it includes the following groups (EC, 2011): Housing; health; recreation and culture; education; and social protection.

[20] Data for Austria starts in 1995 and for Luxembourg in 1990. For Belgium, Denmark, Italy, Ireland, Netherlands, Spain and Sweden it starts in 1970. We have extended the data back to 1960 in these countries assuming the ratio of general government gross capital formation to total investment stayed constant.

Figure 2 shows the development of public debt, as a ratio to nominal GDP, which has increased in all EU14 countries in the period under examination. The most important rise has been reported in Denmark, Italy and Greece. After the outbreak of the global financial crisis, there was a sharp rise in the public debt-to-GDP ratio. This rise was more important in Greece, Italy, Portugal, Spain and Ireland.

Figure 1
Figure 2

4. PK/Post-Kaleckian Macro Model with Government

In this section we present our augmented multi-country demand-led growth model for the EU15 countries. The model is based on a post-Kaleckian framework[21]; however, the behavioural functions also encompass standard Keynesian models (e.g. Blanchard, 2006). We integrate fiscal policy (tax rates, government expenditure, public debt) into the private sector open economy model regarding the consumption, investment, domestic price, export prices, and import functions, which was presented in Onaran and Obst (2016).

The motivation behind integrating tax policy is twofold: On the one hand, we want to interpret after-tax income shares. On the other hand, we assume that firms consider after-tax profits in their investment decisions. In addition, we integrate changes in taxes on consumption / value added tax (VAT) to evaluate its effects on prices. We integrate public spending (capital and current spending) and analyse its effects on demand and private investment. We expect positive crowding in effects on private investment consisting of a demand effect and an additional positive effect on the business environment. We further examine the impact of expansionary policy on the budget balance.

We model the effects of a change in the profit share and fiscal policy by means of analysing the country level effects on private aggregated demand: Consumption, investment, exports and imports. We then estimate European interactions through integrating the effects of a change in the profit share as well as fiscal policy of other EU15 countries.

Consumption (C) is a function of after-tax adjusted profits $((1-t_r)R)$ and after-tax adjusted wages $((1-t_w)W)$.

$$log\ C = c_0 + c_r \log((1-t_r)R) + c_w(log((1-t_w)W) + \log \mathrm{B} + \log(\mathrm{CTO})) \qquad (1)$$

[21] Our model is a version of the Bhaduri and Marglin (1990). Theoretically, aggregate demand can be either wage-led or profit-led depending on how the effects on C, I, and NX add up.

where we extend the standard consumption equation by introducing ITR on capital income (t_r) and labour income (t_w). $R' = (1 - t_r)R$ is after-tax adjusted profits, $W' = (1 - t_w)W$ represents after-tax adjusted wages. We are interested in the consumption differential between profit and wage income testing whether workers have a higher marginal propensity to consume (MPC) than capitalists. We hypothesise that a more progressive tax system (taxes on capital increasing while those on labour decreasing) supports a wage-led economic regime, whereas a more regressive tax system would help growth in a profit-led regime. This specification models the MPC out of after-tax income which is a new feature in our model. Theoretically, we further extend the specification by integrating social benefits in cash (B) and other current transfers (CTO) which augments disposable income of households. We do not include interest payments on debt as discussed in You and Dutt (1996) or Dutt (2013)[22].

In order to sum up the individual effects across different components of demand and find the change in GDP growth ($\partial Y/Y$) as a response to a 1-percentage point increase in the profit share (R/Y) we convert elasticities into marginal effects as outlined in Onaran and Obst (2016). The difference in MPC out of profits and wages, are expected to be negative.

Private investment is modelled based on two alternative specifications. First, we model private investment (I) as a behavioural function of private output (Y_p)[23], the after-tax adjusted profit share $\pi' = (1 - t_r)(R/Y)$, government expenditure (G), as well as the ratio of domestic government debt to GDP (D/Y):

$$logI = i_a + i_y \log(Y_P) + i_\pi \log((1 - t_r)\pi) + i_g \log(G) + i_d \log(\frac{D}{Y}) \qquad (2)$$

where (i_a) is autonomous investment and captures the effects of 'animal spirits', the effects of Y_p and $(1 - t_r)\pi$ are expected to be positive and the effect of (D/Y) negative[24]. We have integrated three extensions: First, we assume that firms consider after-tax profits in making investment decisions as widely assumed in the literature (Rowthorn, 1981; Blecker, 2002; Seguino, 2012). Second, including public debt as a ratio to GDP allows us to take into

[22] There is no long time series data available on interest payments for the EU14 countries. We expect the quantitative effect of an increase of disposable household income (assuming this part of income mainly accrues to high income households with a low MPC) to be small and hence it should not render the results of our analysis.

[23] Private output is calculated as total GDP (Y) minus total government expenditure ($G = I_g + G_c + G_i$).

[24] Profit share is an indicator for expected profitability as well as the availability of internal finance. GDP is a proxy for capacity utilisation with positive accelerator effects on private investment. Keynesian as well as neoclassical investment functions depend on output and the long-term real interest rate or some other measure of the cost of capital (Chirinko, 1993). Here, we replace the interest rate with the public-debt-to-GDP ratio since the former is a function of the latter.

account possible financial crowding out effects which, according to Dutt (2013) among others, is an empirical matter. Third, regarding total government expenditure we expect positive crowding-in effects as shown in Palley (2013) and Commendatore et al. (2011) assuming that it improves business environment and increases future output[25].

In the second specification, as a robustness check, we disaggregate government expenditure further into government spending in individual consumption spending (G_i), collective consumption spending (G_c) and public investment in fixed capital (I_g). We extend our investment function by integrating the three different types of government expenditure:

$$logI = i_a + i_y \log(Y_P) + i_\pi \log((1 - t_r)\pi)$$
$$+ \mathrm{i}_i \log(I_g) + \mathrm{i}_{gc} \log(G_c) + \mathrm{i}_{gi} \log(G_i) + i_d \log\left(\frac{D}{Y}\right) \qquad (2')$$

Dutt (2013) shows theoretically that different types of government spending have different effects on economic growth. Crowding in effects primarily occur through public investment in infrastructure and technology. Our analysis differentiates government expenditure further such as in Seguino (2012) who also clusters government expenditure into investment in physical and social infrastructure, both reflecting different types of positive crowding in effect [26]. Examples for investment in physical infrastructure include: transportation, construction, and other physical capital. This is equivalent to our variable public investment.

For investment in social infrastructure we use the individual consumption spending of the government (G_i) in the government statistics, which includes categories such as health, social care, and education, which is conventionally seen as part of current and not capital spending (EC, 2013). Additionally, we also include collective consumption spending of the government (G_c) which includes government spending on defence, public order and safety, environmental protection etc. This specification allows for different effects of different types of public spending on private investment and growth.

However, due to severe data limitations with rather short time series and multicollinearity issues, this detailed specification is unlikely to capture potentially significant effects of

[25] The authors assume government enhances productivity by purchasing goods and services that are provided to the private sector. Government expenditure thus has a positive externality effect on the business environment. Empirical evidence of the positive effects of public investment on private investment can be found in Aschauer (1989) and Munnell (1990).

[26] However, in her theoretical model the latter is not part of government consumption.

different types of public spending; therefore we present the empirical results of this specification only as a robustness check and interpret them as indicative results[27].

As outlined in Onaran and Obst (2016) we convert elasticities into marginal effects regarding the effect of the profit share on private investment (I/Y).

In order to integrate the effects of expansionary fiscal policy on growth in the EU14 MS we define an exogenous increase in government expenditures as a fraction of national income (GDP)[28]:

$$G = \kappa_g Y \tag{3}$$

In disaggregated form this exogenous increase is equal to:

$$I_g = \mathrm{K}_{ig} Y \tag{3'}$$

$$G_c = \mathrm{K}_{gc} Y \tag{3''}$$

$$G_i = \mathrm{K}_{gi} Y \tag{3'''}$$

The total primary government expenditure (G_{tot}) is identical to:

$$G_{tot} = G + B + CTO \tag{4}$$

Taxes[29] (T) can be expressed as:

$$T = t_w W + t_r R + t_c C \tag{5}$$

where (t_cC) are taxes on private consumption and (t_c) is VAT on domestic prices. The interest rate on government debt (r) is:

$$r = f\left(\frac{D}{Y_{-1}}\right) \tag{6}$$

The national income identity (Y) is given by:

$$Y = C + I + I_g + G_c + G_i + X - M \tag{7}$$

The total wage bill is given by:

$$W = W_p + W_g \tag{8}$$

where (W_P) is wage bill in the private sector and (W_g) denotes total wage bill in the government sector. Private sector's operating surplus (firm's profits) (R) are identical to:

$$R = C + I + I_g + G_c + G_i + X - M - W \tag{9}$$

[27] This also implies that for the multiplier estimations we only consider equation (2) that integrates government expenditure (G).

[28] We assume that the government decides on expansionary fiscal policy targets taking into account the share of (G) in national income (GDP) rather than the absolute value.

[29] However, the tax intake only represents a (crucial) part of government revenues leaving aside other revenue streams such as property income or national insurance payments.

Furthermore, we extend the PK/Post-Kaleckian model by integrating domestic debt of the government sector (Dutt, 2013; Palley 2013; Tavani and Zamparelli, 2015) which is equal to:

$$D = D_{-1} + G_{tot} + rD_{-1} - T \quad (10)$$

where (D_{-1}) denotes debt of the previous period and (rD_{-1}) are the interest payments on government debt of the previous period. We assume that the entire government deficit is financed through issuing debt and hence ignore monetary and other assets. In alignment with the PK literature (Dutt, 2013; Tavani and Zamparelli, 2015; You and Dutt 1996) we are interested in the sustainability of the public debt (in our model we assess the effects on budget balance) to GDP ratio,$(T - G)/Y$). It is an empirical question whether the positive accelerator and multiplier effects of expansionary fiscal policy on AD, capacity utilisation and growth outweigh the negative effects of financial crowding out on investment (Dutt, 2013). We integrate the issue of government debt into our open economy model, which, to the best of our knowledge, has not been done before in the PK literature integrating government into the analysis.

We model the effects of distribution on net exports using a stepwise approach that follows Stockhammer et al. (2009), Onaran et al. (2011) and Onaran and Galanis (2014). First, domestic prices (P) and export prices (P_x) are a behavioural function of nominal unit labour costs, (ulc), and import prices (as a proxy for non-labour input costs), (Pm), based on a mark-up pricing model in an imperfectly competitive economy. We extend the specification of domestic and export prices by including VAT at home and abroad respectively (t_c and t_{cfi}) into the equations:

$$\log P = p_0 + p_{ulc}\log(ulc) + p_{tc}log(1 + t_c) + p_m\log(Pm) \quad (11)$$

$$\log P_x = px_0 + p_{xulc}\log(ulc) + p_{cf}\log(1 + t_{cfi}) + p_{xm}\log(Pm) \quad (12)$$

Exports (X) are a behavioural function of relative prices of exports to imports (Px/Pm) and GDP of the rest of the world (Y_{rw}):

$$log\ X = x_0 + x_{pxm}\log(Px/Pm) + x_{Yrw}\log(Y_{rw}) + x_e\log(E) \quad (13)$$

We include exchange rate (E) as a control variable. Imports (M) are a function of domestic prices relative to import prices (P/Pm) and GDP:

$$\log M = m_0 + m_{ppm}\log(\tfrac{P}{Pm}) + m_Y\log(Y_p) + m_g\log(G) + m_e\log(E) \quad (14)$$

Again, we include the exchange rate (E) as a control variable. We extend the model by including total government expenditures (G) to account for the import content in government

spending as suggested by Palley (2009)[30]. We calculate the marginal effect of a change in the profit share on exports/GDP and imports/GDP as outlined in Onaran and Obst (2016).

In parallel to the alternative investment specification, we also estimate an alternative specification where we disaggregate government expenditure into the three different types in the import function:

$$\log M = m_0 + m_{ppm}\log(P/P_m) + m_y \log(Y_p) + m_i \log(I_g) + m_{gc} \log(G_c) + m_{gi} \log(G_i) + m_e \log(E) \quad (14')$$

The sum of partial effects of a change in π on consumption, investment, and net exports ($NX = X - M$) is the effect on private excess demand. This, in turn, will further affect consumption, investment, and imports through the multiplier mechanism[31].

4.1. Effects of a simultaneous change in the profit share and fiscal policy

Until now, we have ignored the effects following a simultaneous change in distribution in Europe; however, this overestimates the positive effects of a fall in the wage share on net exports. European economies are integrated and, as recommended by the EC, all countries are trying to compete on the basis of wage costs. Therefore, while higher openness of an economy increases the relevance of the positive effects of a fall in the wage share, the simultaneous implementation of the same wage moderation strategy in a variety of European countries diminishes the positive effects on net exports. Given the high economic integration of the European economy[32], a full understanding of the simultaneous fall in the wage share requires an integrated Europe-wide analysis. Following the modelling strategy in Onaran and Obst (2016) we simulate the effects of a simultaneous decline in the wage share on growth in Europe. Hence, the European multiplier mechanism incorporates the effects of a change in the profit share on AD of each economy through the changes in import prices and the GDP of trade partners. For the case of 15 countries, the percentage change in GDP of each country is given by:

[30] Palley (2009) argues that appropriately accounting for imports has significant implications for the size of the expenditure multiplier and fiscal policy.
[31] See appendix C for the derivation of the national multiplier integrating fiscal policy.
[32] In 2013, the greater proportion of EU MS's total trade in goods was with partners within the EU-28 with an average of 62% of total exports (Eurostat, 2015).

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = E_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} + H'_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + P_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{n15} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (15)$$

The matrices E and H' represent the effects of a change in each country's own profit share on demand in that particular country. E is a matrix, whose diagonal elements are the effect of a change in profit share in country j on private excess demand $((C + I + G + NX)/Y)$ in country j. Matrix H' reflects the national multiplier effects and hence shows the effect of an autonomous change in private excess demand on AD. Matrix P illustrates the effect of a change in trade partners' profit share on import prices and hence on net exports in each country. Finally, matrix W shows effects of a change in trade partners' GPD on exports of each country. The details are in appendix C.

Solving equation (15) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - H'_{15x15} - W_{15x15})^{-1}(E_{15x15} + P_{15x15}) \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} \quad (16)$$

Moreover, in order to take into account the simultaneous change in public spending we model the impact of a 1% point increase in government expenditure (G) as a ratio to GDP on the percentage change in GDP of each country is given by:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = Eg_{15x15} \begin{bmatrix} \Delta\kappa_{g_1} \\ \vdots \\ \Delta\kappa_{g_{15}} \end{bmatrix} + Hg_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (17)$$

The matrices Eg and Hg represent the effects of a change in each country's own public spending on demand in that particular country. Eg is a matrix, whose diagonal elements are the effect of a change in κ_g in country j on excess demand $(C + I + NX + G)$ in country j[33]. Matrix Hg reflects the national multiplier effects and hence shows the effect of an autonomous change in excess demand $(C + I + NX + G)$ on AD via national multiplier effects. The details are in appendix C.

[33] An increase in public spending produces an increase in the wages of the public sector employees, affecting the wage share. For simplicity, we assume away this effect. If this effect was taken into account, an increase in public spending would provide a further boost to economic activity. We account for an effect on private investment (I) twice since there is a direct positive effect of an increase in public spending on private investment (crowding in) as well as a direct negative effect of an increase in public debt on private investment (crowding out).

Solving equation (17) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect of public spending[34]:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - Hg_{15x15} - W_{15x15})^{-1}(Eg_{15x15}) \begin{bmatrix} \Delta\kappa_{g_1} \\ \vdots \\ \Delta\kappa_{g_{15}} \end{bmatrix} \quad (18)$$

Finally, we consider a change in tax policy and hence model the impact of a 1% point increase change in the ITR on capital income:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = Etr_{15x15} \begin{bmatrix} \Delta t_{r1} \\ . \\ \Delta t_{r15} \end{bmatrix} + Ht_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (19)$$

The matrices Etr and Ht represent the effects of a change in each country's own taxation on demand in that particular country. Etr is a matrix, whose diagonal elements are the effect of a change in t_r in country j on excess demand $(C + I + NX + G)$ in country j. Matrix Ht reflects the national multiplier effects and hence shows the effect of an autonomous change in excess demand $(C + I + NX + G)$ on AD. The details are given in appendix C.

Solving equation (19) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect of a change in ITR on capital income[35]:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}(Etr_{15x15}) \begin{bmatrix} \Delta t_{r_1} \\ \vdots \\ \Delta t_{r_{15}} \end{bmatrix} \quad (20)$$

4.2 Policy mix and total effects on budget balance, investment, net exports and inflation

Next, we model the effects of a policy mix (cpm) that combines (a) a change in income distribution and government expenditure; (b) a change in ITR on capital income and ITR on labour income; (c) a combined change in income distribution, government expenditure, and ITR on capital and labour income in all countries integrating both national and cross-country multiplier effects, which is a novelty of this paper.

For policy mix (a) we model a 1% fall in the profit share and 1% increase in public spending. The total European multiplier effect on equilibrium AD of each country is given by:

[34] We do the same method for disaggregated government expenditure (I_g, G_i, G_c) and estimate a European multiplier effect. The details are also given in appendix C.

[35] We follow the same approach for a change in ITR on labour income which is outlined in appendix C.

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Hg_{15x15} - W_{15x15})^{-1}((E_{15x15} + P_{15x15})\begin{bmatrix}\Delta\pi_1 \\ \vdots \\ \Delta\pi_{15}\end{bmatrix} + Eg_{15x15}\begin{bmatrix}\Delta k_{g1} \\ \vdots \\ \Delta k_{g15}\end{bmatrix}) \quad (21)$$

For policy mix (b) we model a progressive tax policy based on a 1% increase in the ITR on capital income and a 1% fall in the ITR on labour income. The total European multiplier effect on equilibrium AD of each country is given by:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}(Etr_{15x15}\begin{bmatrix}\Delta tr_1 \\ \vdots \\ \Delta tr_{15}\end{bmatrix} + Etw_{15x15}\begin{bmatrix}\Delta tw_1 \\ \vdots \\ \Delta tw_{15}\end{bmatrix}) \quad (22)$$

For policy mix (c) we model the joined effect of all 4 policy changes. The total European multiplier effect on AD of each country is:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}((E_{15x15} + P_{15x15})\begin{bmatrix}\Delta\pi_1 \\ \vdots \\ \Delta\pi_{15}\end{bmatrix} + Eg_{15x15}\begin{bmatrix}\Delta k_{g1} \\ \vdots \\ \Delta k_{g15}\end{bmatrix} + Etr_{15x15}\begin{bmatrix}\Delta tr_1 \\ \vdots \\ \Delta tr_{15}\end{bmatrix} + Etw_{15x15}\begin{bmatrix}\Delta tw_1 \\ \vdots \\ \Delta tw_{15}\end{bmatrix}) \quad (23)$$

The details are given in appendix D.

Next, we calculate effects of the policy mix on investment and the budget balance integrating both national and cross-country multiplier effects[36]. The total effect on investment ultimately depends on the character of the accumulation regimes (Onaran and Obst, 2016). The total effect of a change in income distribution, government expenditure, and ITRs on capital and labour income on investment is as follows:

$$\frac{\Delta I/Y}{\Delta\pi} + \frac{\Delta I/Y}{\Delta k_g} + \frac{\Delta I/Y}{\Delta dt_r} + \frac{\Delta I/Y}{\Delta dt_w} = \frac{\partial I/Y}{\partial\pi} + \frac{\partial I/Y}{\partial k_g} + \frac{\partial I/Y}{\partial t_r} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial D/Y}{\partial k_g} + \frac{\partial D/Y}{\partial t_r} + \frac{\partial D/Y}{\partial t_w}\right) + \frac{\partial I}{\partial Y}\left(\frac{\partial Y^*/Y}{\partial\pi} + \frac{\partial Y^*/Y}{\partial k_g} + \frac{\partial Y^*/Y}{\partial t_r} + \frac{\partial Y^*/Y}{\partial t_w}\right) \quad (24)$$

We estimate the total effects of a simultaneous change in income distribution, government expenditures, and ITRs on capital and labour income on the budget balance as follows:

$$\frac{\Delta BAL/Y}{\Delta\pi} + \frac{\Delta BAL/Y}{\Delta k_g} + \frac{\Delta BAL/Y}{\Delta dt_r} + \frac{\Delta BAL/Y}{\Delta dt_w} = \left(\frac{\partial T}{\partial Y} - \frac{\partial G}{\partial Y}\right)\left(\frac{\partial Y^*/Y}{\partial\pi} + \frac{\partial Y^*/Y}{\partial k_g} + \frac{\partial Y^*/Y}{\partial t_r} + \frac{\partial Y^*/Y}{\partial t_w}\right) + \frac{\partial T/Y}{\partial t_r} + \frac{\partial T/Y}{\partial t_w} - \frac{\partial G/Y}{\partial k_g} \quad (25)$$

5. Estimation Methodology

[36] The modelling of further effects of individual policy changes on investment, net exports and inflation is outlined in appendix D.

We analyse the effects of a change in income distribution and public investment on economic growth by means of estimating separate single equations for consumption, investment, exports, imports, and domestic prices and export prices.

The caveats and qualifications concerning the single equation approach (SEA) have been discussed in Onaran and Obst (2016). We chose the SEA approach over systems estimations such as vector autoregressive models (VAR). The applied estimation approach has the convenience of having a clearer interpretation of the results but might introduce some bias resulting from endogeneity issues and single-equation-based estimations. The main alternative of using a VAR model, however, comes with its own issues.

Unit root tests suggest that most of our variables are integrated of order one[37]. The profit share is stationary in Denmark, Greece, Spain, Sweden and the UK. Hence we use this variable in its level in these countries. ECM are applied wherever statistically significant.

In the short run specifications we start with general specification with both contemporaneous values as well as first lags of the variables and include lagged dependent variables. We only keep those variables, which are statistically significant. In order to test for autocorrelation we use the Breusch-Godfrey test due to severe limitations in the Durbin Watson test statistic. In case of autocorrelation, either we keep the lagged dependent variable or add an AR(1) term. As outlined in Onaran and Obst (2016) we derive the long-term coefficients (elasticities) using two different methods depending on whether there is a short-run (differenced form) or long-run relationship (ECM) among the variables.

6. Estimation Results

The estimation results for consumption are given in table 1. After-tax wages and after-tax profits[38] show significant expected effects in all EU14 countries, except in Spain (negative effect of profit income on consumption) and Sweden (positive but insignificant effects of profit income on consumption). However, estimating a reduced sample size between 1960 and 2007 without the crisis years shows that the perverse effects in Spain are driven by the significant policy changes in capital tax[39] after the outbreak of the Great Recession in 2007[40].

[37] Results are available upon request.

[38] After-tax profits are calculated by multiplying profit income with $(1 - t_r)$. We extended data for Greece and Portugal from 1980 back to 1970 assuming a constant tax ratio and for Spain and Sweden back to 1960. We did the same for after-tax wage income assuming a constant tax ratio on labour (t_w) for the same set of countries. After-tax wages are calculated by multiplying the wage bill with $(1 - t_w)$.

[39] The ITR on capital was significantly reduced from 42% to 26% in that short time period.

The hypothesis that the MPC out of profit income is larger than out of wage income is confirmed in all countries.

Table 1.

Table 2 presents the effects on private investment based on equation (2)[41] including total government expenditure (G). In order to take into account the lag structure of the effect we have run investment specification with (G) in contemporaneous and lagged form[42]. There are positive significant effects of G in 9 EU MS: Austria, Finland, Greece, Germany, Ireland, Netherlands, Portugal, Spain, and Sweden. This presents the vast majority of our sample and hence indicates the importance of a public investment stimulus. Only in France, the effects of total government expenditure on private investment are negative[43]. We find strong and significant accelerator effects of private GDP on private investment in all countries. Regarding the after-tax profit share[44] the effects are more varied. It has no statistically significant effect in 9 countries: Austria, Denmark, Finland, Germany, Greece, Ireland, Portugal, Spain and the UK[45]. In these cases, the effects are treated as zero when we calculate the total effects on private excess demand. We find significant negative effects of an increase in public debt on private investment which represents evidence of crowding out effects in 8 countries: Belgium, Finland, France, Ireland, Portugal, Spain, Sweden and the UK.

The estimation results for domestic prices, export prices, exports, and imports are given in tables 3 to 6[46]. We include VAT into domestic and export prices[47] as well as total government expenditure in the import function. The results are in line with our expectations, however,

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[40] We have run a robustness check for all EU14 countries estimating the reduced sample size 1970-2007. However, our results hold robust for all countries. Hence, we only take the reduced sample size for Spain.

[41] We present further robustness checks of our results regarding private investment in appendix F and discuss the results in section 6.3 below.

[42] Moreover, in order to avoid issues with only a few degrees of freedom we estimated G in moving sum of 3 and 5 years. However, our results are robust.

[43] We also found negative significant effects for the UK in the full sample 1960-2012. However, when running a robustness check with a reduced sample size (1960-2007) the significant negative effects in UK do not hold true. Hence, we dropped (G) here. For France, the negative effects of (G) hold true also in the reduced sample, hence we keep the original estimation. The results are presented in Appendix F table F4.

[44] We have calculated after-tax profit share by multiplying profit share with $(1 - t_r)$. We have extended data back to 1960 for all countries assuming a constant tax ratio on capital.

[45] When we compare our results to previous findings in the empirical literature (Onaran and Obst, 2016) we find a general breakdown of the profit-investment nexus since the start of the Great Recession in 2007. Taking after-tax profits this issue becomes even more apparent. Only 5 EU MS have a statistically significant profitability effect.

[46] Our export equation has not been modified, hence the results are identical to table 5 in Onaran and Obst (2016).

[47] In the export price function $(1 + t_{cf})$ is a weighted average calculated by multiplying (t_c) in country j multiplied with the share of exports (in total exports) of country i that are exported to country j.

there are no significant effects of export prices relative to import prices on exports in Belgium, Ireland, Luxembourg, the Netherlands and Portugal. We also find no statistically significant effects of domestic prices relative to import prices in Denmark, Finland, Germany, Greece, Luxembourg, and the UK. Appendix E summarises the effects of a change in profit share on X/Y and M/Y.

The total effect does not only depend on the elasticity of exports and imports on relative prices and the pass-through from labour costs on prices but also on the relative size of each component in GDP. Therefore, in small open economies the effects are likely to be much larger compared to large relatively closed economies. Regarding VAT we find statistically significant effects on domestic prices in 7 countries: Finland, Ireland, Italy, Portugal, Spain, Sweden, and the UK. In regards to export prices we find statistically significant effects in only 3 countries: Denmark, Germany and Italy. An increase in government expenditure leads to an increase in imports in 6 countries: Belgium, Germany, Ireland, Portugal, Sweden and the UK.

Table 2.

Table 3.

Table 4.

Table 5.

Table 6.

6.1. National Effects

Table 7 summarises the effects of a 1% increase in the profit share on components of private AD: consumption, investment, exports and imports. The first column reports the partial effects on consumption. In comparison to our estimates for the EU15 countries presented in Onaran and Obst (2016), which do not take the role of taxes into account, the difference in MPC is significantly larger in the majority of countries with differences ranging from -0.34 (Ireland) to -0.86 (Spain). Only for Belgium and Italy we find surprisingly low (but significant) differences in MPC of -0.17 and -0.21 respectively. On average, our mean differential is 0.44[48].

Table 7.

The second column gives the partial effects on private investment. A 1% increase in π in the EU14 countries leads to a partial positive effect on private investment with the effect ranging between 0.09% (Italy) and 0.34% (Belgium) as a ratio to GDP. The marginal effects

[48] Marglin and Bhaduri (1992) find a mean differential of 0.37 for a sample of 16 OECD countries. For Luxembourg the MPC is based on pre-tax wages and pre-tax profits.

of public spending are positive in the majority of countries and range between 0.32 (Germany) and 0.63 (Sweden). France is the only countries with a negative effect of -0.36%. Public debt has a significant negative effect in 8 countries with effects ranging between -0.05 (Spain) and -0.28 (Finland). In comparison, the negative crowding out effects are thus much lower than the positive effects of public spending.

If we sum up the effects of an increase in π on domestic private demand, the negative effect on consumption is substantially larger than the positive effect on investment in absolute values in 14 out of 15 countries[49]. Thus, domestic demand in the EU15 is clearly wage-led.

The integration of the foreign sector has a crucial role to play in determining whether an economy is wage-led or profit-led. The effects of an increase in π range between 0.06% in Belgium and 0.4% in Austria, as a ratio to GDP. Column F sums up the partial effects on private excess demand when the π increases in each country in isolation. Strikingly, the integration of the foreign sector does not lead to a change of the demand regime. Belgium already had profit-led domestic demand due to low consumption differentials and high investment effects.

Column G reports the multiplier, which was calculated using the elasticities of C, I, M and G with respect to Y (see appendix C)[50]. As expected, the multipliers are above one and range between 1.04 in Belgium and 5.05 in Greece[51]. In comparison to the multipliers estimated in Onaran and Obst (2016) when integrating fiscal policy[52] the multiplier becomes significantly larger. For countries with multipliers larger than one the effect of a change in distribution on demand becomes amplified. Column H reports the percent change in equilibrium demand after the multiplier mechanism.

Table 8 presents 3 fiscal policy changes including (1) an increase in public spending by 1% point of GDP; (2) a 1% point increase in ITR on capital income, (3) a 1% point decrease in ITR on labour income, first in each country in isolation and then in all countries simultaneously. For the details on the calculations see Appendix C.

[49] Belgium is the exception in our sample. This finding is in alignment with our estimations in Onaran and Obst (2016). However, domestic demand in Denmark is now wage-led.
[50] The results illustrate short run multiplier effects.
[51] The results for Luxembourg (0.560) do not include government sector in the calculation but are based on the estimations in Onaran and Obst (2016). Stockhammer et al. (2009) find multipliers ranging between 1.4 and 2.7 for the Euro area (hypothetical aggregate of EU12 countries).
[52] We augment the multiplier by taking into account the effects of public spending and public debt on private investment as well as the effects of (G) on imports. Moreover, we account for the effect of output on government expenditure.

Table 8.

As a response to increasing public spending in each country in isolation, $excess\ demand\ /\ Y$ (Column A) is increasing in all countries with effects ranging between 0.52 (Belgium) and 1.51 (Austria). Column B shows the multipliers that take into account positive accelerator effects of output as well as negative crowding out effects of an increase in public debt. As expected, multipliers following a change in public spending are larger on average compared to multipliers following a change in income distribution (Table 7 Column G). The total effects on AD are significantly positive for all countries as can be seen in column C. Following an isolated 1% points increase in G/Y equilibrium AD increases by roughly 3% in Austria or 7% in Greece.

As a result of a rise in taxes on capital in each country in isolation, $excess\ demand\ /\ Y$ (Column E) declines in all countries with effects ranging between -0.07 (Finland) and -0.17 (Belgium). An increase in taxation on profits will have negative effects on consumption as well as investment (through reducing profitability). The multipliers take into account the direct effect of a change in ITR on capital income on tax revenues as well as the indirect accelerator effects of output on government expenditure and possible negative public debt effects on private investment (see appendix C for details). When the multiplier mechanism is taken into account these effects become amplified leading to a significant decline of equilibrium AD in all counties (Column G). For instance, equilibrium AD decreases by 0.50 in the Netherlands and by 0.66 in Greece.

In response to a 1%-point decline in taxes on labour in each country in isolation, $excess\ demand\ /\ Y$ (Column I) increases in all countries with effect ranging between 0.26 (Belgium) and 0.64 (Spain). The decrease in ITR on labour income will induce consumption and hence increase demand in the economy. When the multiplier mechanism is taken into account the effects become amplified with effects ranging between 0.30 (Belgium) and 2.86 (Spain).

Appendix G table G1 shows the effects of a 1% fall in the profit share, a 1%-point increase in G/Y and tr as well as 1% decrease in tw on investment. The investment regime is wage-led, e.g. the effect of a fall in π on I/Y is positive in Austria, Denmark, Finland, Germany, Greece, Ireland, Portugal, Spain and the UK. The effects are ranging from strong positive effects in wage-led countries such as Spain (0.62) to moderate negative effects in profit-led countries such as Belgium (-0.38).

The effects of a 1% fall in π on the trade balance is negative with effects ranging between 0.08 in Italy and 0.44 in |Austria. Belgium is an exception due to low positive net export effects via the price channel and a strong fall in imports following the fall in AD as a profit led country.

As expected, the effects of a 1% increase in G on investment are positive and range between 0.27 in France[53] and 2.0 in Finland capturing both positive crowding in and demand effects as well as negative debt effects on private investment. The effects on the trade balance are negative in all countries due to increased demand for imports.

The effects of an increase in ITR on capital income on private investment are negative in all countries with the effects ranging between 0.03 (Austria) and 0.13 (Greece). On the contrary, a fall in ITR on labour income would lead to positive effects on private investment. The effects are strong in countries with high consumption differentials such as in Portugal (0.84).

Table G3 in appendix G shows the effects on budget balance if the policies are implemented in isolation. A 1% fall in the profit share leads to an improvement in the budget balance in all countries except in Belgium. Since 14 EU MS are wage-led an increase in the wage share has positive effects on GDP growth. An increase in public spending, however, leads to a deterioration of the budget balance with effects ranging from -0.49%-point (Austria) to -0.98%-point (Greece). A 1% increase in taxation on capital income as well as a 1% fall in taxation on wages both lead to an improvement in the budget balance with the latter having significantly larger positive effects. Overall, a combined change in the 4 policies leads to in improvement in the majority of the countries except in Belgium, Greece and Ireland.

6.2. Europe-wide Effects

Next we analyse the effects of a simultaneous 1% point increase in the profit share in all EU15 countries. Column I in Table 7 presents the results. Most strikingly, all countries start to contract after the incorporation of further effects on their net exports. Comparing columns H and I, wage-led economies experience even stronger negative effects on demand. Demand decreases by between 0.39% (Italy) and 3.80% (Spain). Belgium, the only profit-led country, also starts contracting (0.39%) after a race to the bottom in the wage share in Europe. Overall,

[53] France had a negative partial effect of government expenditure and also a significant negative effect of public debt effect on I.

a simultaneous decline in the wage share in all countries leads to a decline in EU15 GDP by 1.45%[54].

Furthermore, we analyse the effects of a simultaneous 1% point increase in public spending in all EU15 countries. Column D in table 8 presents the results. Indeed, all countries would experience significant positive effects on equilibrium AD with values ranging between 2.09% (UK) and 10.04% (Finland). Overall, EU15 GDP increases by 3.82% indicating the significant positive effects of an increase in public spending on output through the multiplier mechanism. The effects of fiscal expansion is now stronger compared to fiscal expansion in one country in isolation due to high cross country spill overs.

Taking into account taxation policies we analyse the effects of a simultaneous 1% point increase in the ITR on capital income as well as a simultaneous 1% point decrease in the ITR on labour income. The former leads to negative effects in all countries ranging with values ranging between 0.18 (Ireland) and 0.80 (Netherlands). Overall, EU 15 GDP would decrease by 0.36%. However, the positive effects on demand following a simultaneous decrease in ITR on wages are significantly larger in comparison. AD increases by 0.93 in Italy or 3.66 in Spain. EU15 GDP overall increases by 1.79%. We will contrast these effects directly with each other in section 7.

Next, we report the effects on investment and net exports following a simultaneous change in income distribution, government expenditure, and implicit tax rates on capital and labour income[55] (appendix D).

Table G2 shows that effects of a simultaneous 1% point fall in the profit share on investment are positive in 13 countries (now also including France, Netherlands and Sweden). Only Belgium and Italy have a profit-led investment regime in this case. On average, private investment increases by 0.20%, as a ratio to GDP. This is a striking finding, indicating that the accumulation regime is wage-led in the vast majority of the EU15 MS when we take simultaneous policy changes into account.

Regarding net exports, in all countries, the total effects of a simultaneous fall in profit share is lower compared to an isolated change of the profit share. A fall in the profit share by

[54] Onaran and Obst (2016) found a decline in EU15 GDP by 0.30% following a 1%-point fall in the wage share in Europe.

[55] We do not model the impact of a change in ITR on capital and labour income on net exports. Also, for modelling the impact of G on NX we only use the M and W matrices as there are only income effects following an increase in public spending.

1% point leads to an improvement of the trade balance in Belgium, Denmark, Finland, France, Italy, Luxembourg, Netherlands, and Sweden.

Regarding the effect of a rise in public spending table G2 shows that the effects on private investment are strongly positive in all countries with values ranging between 0.429 (UK) and 2.97 (Finland). Overall, a 1% point increase in public spending leads to an increase in private investment of 0.92% points. Again the effect is stronger when fiscal policy is implemented in coordination as opposed to in isolation. The effects on the trade balance are still negative in Germany, Ireland, Netherlands, Portugal, Sweden, Spain, and the UK; however the negative effect on trade balance is now smaller in absolute value thanks to the cross border spill over effects of higher demand on exports. In the other countries of the EU15 MS the effects are positive with values ranging between 0.06 in Finland and 0.23 in Greece due to strong international demand effects increasing exports more than the increase in imports.

Finally, we analyse the effects of a simultaneous change in implicit tax rates on capital and labour income on investment. As expected, a simultaneous 1% point increase in ITR on capital leads to slightly stronger negative effect on private investment in all countries with values ranging between 0.03 (UK) and 0.18 (NL), compared to a change in isolation. On average, private investment declines by 0.08% points. In contrast, a simultaneous 1% point fall in ITR on labour income leads to stronger positive effects on private investment due to increased consumption and hence investment demand. The values range between 0.17 (Italy) and 0.96 (Finland) and are larger compared to an isolated change in ITR on labour income.

6.3. Robustness Checks

We have run a series of robustness checks for our consumption and investment function. For our consumption function[56] we have checked the robustness of our results using different sample sizes (1960-2007; 1980-2007; 1980-2012). Our results are robust for the EU14 countries, except for Spain. Here, we did either find insignificant or perverse effects of net profit income on consumption for the full sample, which is at odds with our previous estimations and the empirical literature presented in Onaran and Obst (2016). Hence, we have

[56] Since our tax data for ITR on capital and labour income) comes from different data sources we have also checked correlations between before tax and after tax profit share and wage share as well as before tax and after tax adjusted profits and wages to check for the validity of our calculated after-tax wage and profit bill as well as after-tax profit share.

kept the full sample size for all EU14 countries, but reduced it to the pre-crisis period for Spain.

Appendix F illustrates the tables for different investment functions we have estimated to test the robustness of our results. Table F1 presents the results for the private investment specification which includes after-tax profit share $(1-t_r)\pi$, total GDP (Y) and the real long-term interest rate (r). In comparison to our estimations of the investment function in Onaran and Obst (2016) (from now on called "benchmark specification") the results are robust. We have a statistically significant profit marginal in half of the EU14 countries: Austria, Belgium, France, Italy, Ireland, Netherlands, and Sweden. In all countries, private GDP has strong and significant accelerator effects. The profitability effect is significantly larger in the Netherlands with 0.26% points (0.08% points in benchmark specification) as well as in Belgium with 0.55% points (0.21% points in benchmark specification) and France with 0.25% points (0.10% points). However, we find no statistically significant effects in Denmark (0.17% points in benchmark specification).

Table F2 presents the effects on private investment when G is integrated in the specification as moving sum of 3 years. As can be seen, total government expenditure is significant in 6 countries: Belgium, Finland, France, Netherlands, Sweden and the United Kingdom. We find positive effects in Finland, Netherlands, and Sweden. We find negative effects on private investment in Belgium, France and the UK. However, when we estimated a reduced sample size (1960-2007) only the positive government expenditure effects in Finland, Netherlands and Sweden remain. In Belgium, France and UK the effects become statistically insignificant and are hence not robust.

Table F3 shows the results for private investment based on equation (2') where I is a function of public investment (I_g), government spending in social infrastructure (G_i) and other government spending (G_c), after-tax profit share $((1-t_r)\pi)$, private GDP (Y_p) and public debt as a ratio to GDP (D/Y).[57]

The results mostly confirm our theoretical expectations for different types of government expenditure. In alignment with the expected positive demand and additional crowding in effects of public investment, I_g shows indeed positive effects in the short run as well as in the

[57] Theoretically this specification is closest to our preferred investment specification outlined in section 3. However, due to the short sample size and multicollinearity issues we report it as a robustness check only. Nevertheless, the results for different government expenditure categories confirm and further explain our estimated effects of total G on private investment (table 2 in section 4).

long run in 8 countries. However, we also find significant negative effects in three countries (Belgium, France and Spain). Regarding our variables G_i and G_c our theoretical assumptions are also visible in the data. We find positive effects in 5 countries for both government spending categories. On average, investment in social infrastructure shows larger effects compared to other government spending where the positive effects (elasticities) are smaller. This result seems plausible since we expect that other government spending primarily increases output through multiplier effects, but does not lead to additional crowding in effects enhancing private investment such as investment in social infrastructure does.

However, other government spending also shows large effects in the Netherlands. In the UK other government spending has a negative impact. In Greece investment in social infrastructure has a negative impact[58].

There is a group of countries that have strong and significant positive effects of different types of government expenditure on private investment including Austria, Finland, Greece, Netherlands, and Sweden. For instance in Austria both I_g and G_i have positive effects on private investment. In Greece, both I_g and G_c have positive effects but G_i has a negative effect.

There is another group of countries with mixed effects of government expenditure: Belgium, France, Spain and the UK. In Belgium, surprisingly, I_g has negative effects in the long as well as in the short run. However, G_i has a strong and significant positive effect in the long run. In the UK, I_g has the expected positive and significant effects, however, G_c has a negative effect on private investment. In an alternative long-run specification for the UK, I_g and G_c are insignificant but G_i has a strong positive and significant effect. However, the effect of G_i is not robust across specifications.

Moreover, we estimated the effects of each variable (I_g;G_i; G_c) on excess demand / Y, the multiplier effects and how equilibrium AD changes following a 1% point increase in isolation as well as following a simultaneous change (see appendix D for details). The results are presented in table G5 in appendix G. In the first scenario, all countries increase public investment by 1% point. The total effects on AD are significantly positive for all countries. Following an isolated 1% points increase in (I_g) equilibrium AD increases by 1.00% in Belgium or 5.10$ in Greece, as a ratio to GDP (Column C). Similarly, in the second scenario,

[58] We have run a robustness check with reduced sample size (1960-2007) and the results are overall robust. Only in Denmark G_c has become insignificant and in Greece I_g has become insignificant.

where all countries increase government spending in social infrastructure (Column G), the effects are strongly positive on equilibrium AD ranging between 1.07 (Ireland) and 3.41 (Finland). Moreover, in the third scenario, where all countries increase other government spending the multiplier effects are large leading to an increase in equilibrium AD (Column K) with values ranging between 1.08 (Belgium) and 6.25 (France).

Following a simultaneous rise in I_g by 1%-point as a ratio to GDP, EU15 GDP would increase by 3.71%; following a simultaneous change in G_i it increases by 3.80% and following a simultaneous rise in G_c it increases by 5.15%.

7. Policy mix scenarios for egalitarian growth and sustainable fiscal policies

In this section, we set out an alternative scenario of a policy mix that includes 4 policies implemented simultaneously in each country: (a) a pro-labour wages policy and expansionary fiscal policy based on 1%-point increase in the pre-tax wage share and a 1%-point increase in public spending; (b) a progressive tax policy based on a 1%-point fall in the tax rate on wages; and a 1%-point increase in the tax rate on profits, c) Finally, a policy mix that combines the effects of all 4 policies, i.e. pro-labour pre-distribution and redistribution and fiscal expansion. See appendix F for details.

Table 9 (Column A) shows that a combined increase in the wage share and government expenditure has large positive effects on equilibrium AD of each national economy with values ranging between 2.29 (Ireland) and 13.67 (Finland). Overall, EU15 GDP would increase by 5.56%.

Column B presents the effects of a more progressive tax policy on equilibrium AD in each national economy. The positive effects of a fall in ITR on labour income on consumption outweigh the negative effects of a rise in ITR on capital income on private investment as well as consumption. All countries experience positive effects with values ranging between 0.52% in Ireland and 3.22% in Spain[59]. Overall, EU15 GDP increases by 1.43%.

Finally, we combine the 4 policy changes in income distribution, public spending, and taxation. The effects of this policy mix are strongest Finland (11.71), Greece (14.47) and Spain (15.49). These countries had high consumption differentials, no significant effect of profit share but significant government expenditure effects on private investment. Overall,

[59] Spain has the largest MPC of -0.858 and hence experiences a significant increase in consumption when taxation on wages is reduced.

EU15 GDP increases by 6.63% illustrating the importance of a more comprehensive policy mix of wage, taxation and investment policies.

Moreover, we estimate the total effect of a combined policy mix on investment. (Column D in table 9). Following a simultaneous and combined change in wage and fiscal policies private investment increases in all countries. Hence, despite negative effects coming from an increase in ITR on capital the strong the positive effects coming from a fall in ITR on wages, as well as a fall in the profit share and an increase in public spending lead to an average increase in private investment by 1.46%, as a ratio to GDP. The effects are strongest in countries with significant effect of G on I; for instance (I/Y) increases by 2.06 in Austria or 4.19 in Finland. The effects are weaker in countries without significant effect of G on I but with significant negative effect of public debt such as in Belgium (0.82) or in the UK (0.85).

Table 9.

Next, we estimate the impact of each fiscal policy change on the budget balance $(T - G)$ as a ratio to GDP. Table 10 outlines the results[60] when there is a simultaneous change in fiscal policy in all countries. A 1% point simultaneous fall in the profit share leads to an improvement in the budget balance due to the fact that 14 EU MS are wage-led and hence an increase in the wage share has positive effects on GDP growth. The effects range from 0.007%-points (Greece) to 0.62%-points (Spain). An increase in public spending by 1% point, however, leads to a deterioration of the budget balance with effects ranging from -0.02%-points (Finland) and -0.98% points (Greece). Surprisingly, expansionary fiscal policy in Spain is self-sustaining indicated by a positive effect in Spain (0.36) due to strong multiplier effects.

A 1% point simultaneous increase in taxation on capital income has positive effect on the budget balance. The improvement ranges between 0.18 in the Netherlands and 0.36 in Greece. However, the effects of a 1% point fall in the implicit tax rate on wages leads to an even larger improvement in the budget balance with effects ranging between 0.55 in Greece and 1.21 in Spain. Overall, when we combine the 4 policies there is an improvement in the budget balance in all countries except in Greece and Ireland. Here, the budget balance deteriorates slightly by -0.06 and -0.05 respectively. On average, however, the budget balance in the EU15 MS improves by 0.84% points[61].

Table 10.

[60] See appendix D for details.

[61] As stated in section 3 we define public spending as $(G = I_g + G_c + G_i)$.Hence, social cash benefits are absent here.

Finally, we analyse to what extent a wage stimulus in the EU15 countries would exert inflationary pressures. Table G4 in appendix G shows the effects for an isolated as well as simultaneous 1% increase in the wage share on inflation in the EU15 countries. Annual inflation increases by roughly 1.3% following an isolated increase and by 1.5% following a simultaneous 1% point increase in the wage share. As a result, the majority of the countries would experience inflation rates well below the ECB target inflation rate (2%).

8. Conclusion

This paper developed a multi-country Post-Kaleckian model augmented by a government sector. We introduced public spending and taxes on consumption, labour and capital in a demand-led growth model and estimated it for the EU15 countries.

The empirical analysis in this paper has shown that a simultaneous decline in the wage share in a highly integrated European economy leads to a decline in growth. There is room to stimulate demand in an economic climate of sluggish growth: A 1% simultaneous increase in the wage share at the European model could lead to a 1.45% increase in EU15 GDP.

The negative effects of a fall in the wage share on consumption overpower the positive effects on investment in 14 European countries. When considering after-tax income the difference in MPC is significantly larger in the majority of the EU15 countries, compared to the previous empirical literature. Moreover, when firms consider after-tax profits the general breakdown of the profit-investment nexus becomes even more apparent. Hence, domestic demand is clearly wage-led in the EU15. Interestingly, integrating the foreign sector does not lead to a regime shift in the EU15 since domestic demand is strongly wage led. Therefore, in isolation, we find 14 countries to be wage led and 1 country to be profit led.

We find evidence for both crowding in and (financial) crowding out effects of fiscal variables on private investment. On the one hand, government expenditure enhances private investment in 9 EU MS, which presents the majority of our sample. On the other hand, public debt has a negative effect on private investment in 8 countries. However, the negative effects of public debt are small compared to the positive effects of public spending, indicating that private investment is overall positively affected by fiscal expansion.

When we disaggregate public spending into three parts the empirical results confirm our theoretical expectations for different types of government expenditure. Public investment shows significant positive effects on private investment in the majority of the EU15 countries.

Moreover, both public spending in social infrastructure and other government spending show significant positive effects in 5 countries each. These results are very important from an economic policy making perspective. However, due to data limitations and econometric issues (e.g. multicollinearity) these results are at best only indicative and require further research in the future.

Integrating public spending and public debt into the model increases the multiplier (on average) compared to the multipliers estimated in the private sector open economy model in the previous empirical literature. Moreover, fiscal multipliers following an increase in public spending are larger on average than multipliers following a change in income distribution since they integrate impacts of public debt and taxation as well.

As expected, all multiplier effects are much stronger when policies are implemented simultaneously. A combined and simultaneous change of a 1% increase in the pre-tax wage share and 1% increase in public spending leads to a significant increase of 5.56% in the EU15 GDP and hence indicates the importance of a comprehensive policy mix that combines wage-led and public investment policies in Europe, The impact of egalitarian wage policies are positive but small; however when mixed with the much stronger impact of fiscal expansion, the overall stimulus is much more effective in achieving both targets of income equality and strong job creation,

The hypothesis that a more progressive tax system potentially stimulates demand (e.g. through national multiplier effects) is confirmed in our empirical estimations. A redistributive policy of a 1% point fall in ITR on labour income and a simultaneous 1% point increase in ITR on capital income leads to an increase in EU15 GDP of 1.43%, as a ratio to GDP. The positive effects of a reduction of the tax rate on wages significantly induces consumption and thus outweigh the negative effects on investment spending (and consumption demand) due to an increase of taxation on profit income.

Finally we estimated the impact of a combined policy mix that includes pre-distribution, redistribution and public spending based on a 1% point increase in the wage share, a 1% point increase in public spending, a 1% increase in ITR on capital income, and a 1% fall in ITR on labour income in all countries. As expected, a combined policy mix that takes into account wage policy, public spending, and progressive taxation leads to much stronger growth effects and increases EU15 GDP by 6.63%, as a ratio to GDP.

This paper also analysed the impact of expansionary fiscal policy on budget balance. A targeted public spending policy, together with a more progressive tax policy and a pro-labour wage policy, leads to an improvement in the budget balance in the majority of the EU15 MS. In these countries the positive accelerator and multiplier effects on demand and growth lead to a rise in taxes that outweighs the adverse effects of higher government spending on the budget balance. Following a simultaneous change in incomes and fiscal policy only Greece and Ireland experience a negligible deterioration of the budget balance. The only countries in which this is not the case are Greece and Ireland. On average, the budget balance improves by 0.84% points in the EU15 MS. Hence, expansionary fiscal policy is sustainable when wage and public spending policies are combined with progressive tax policy; the impact is stronger when these policies are implemented in a coordinated fashion across Europe due to strong positive spill over effects on demand.

As an outcome of a wage-led recovery scenario (e.g. wage share increasing by 1% point), the majority of the countries would experience increasing inflation rates but well below the ECB target inflation rate of 2%. In fact, the results indicate that a wage stimulus in the EU15 would help to keep the European economy away from deflation.

Extending the Post-Kaleckian private sector open economy model by taxes on capital and labour has shown to increase the likelihood of a wage-led economic regime. Integrating public spending increases the multiplier effects and amplifies the wage-led outcome. Hence, the analysis of this paper highlights the importance to link fiscal policy with policies targeting a more equal income distribution.

Combining egalitarian labour market and tax policies with public spending policies are important not only for achieving higher growth, investment and sustainable debt levels but also for other important social targets such as lowering carbon emissions via green investments or improving gender equality via public spending in social infrastructure. Similarly, public investment policies are key to achieving structural change, higher productivity in tradable sectors and keeping trade balance under control while still managing an egalitarian economic model.

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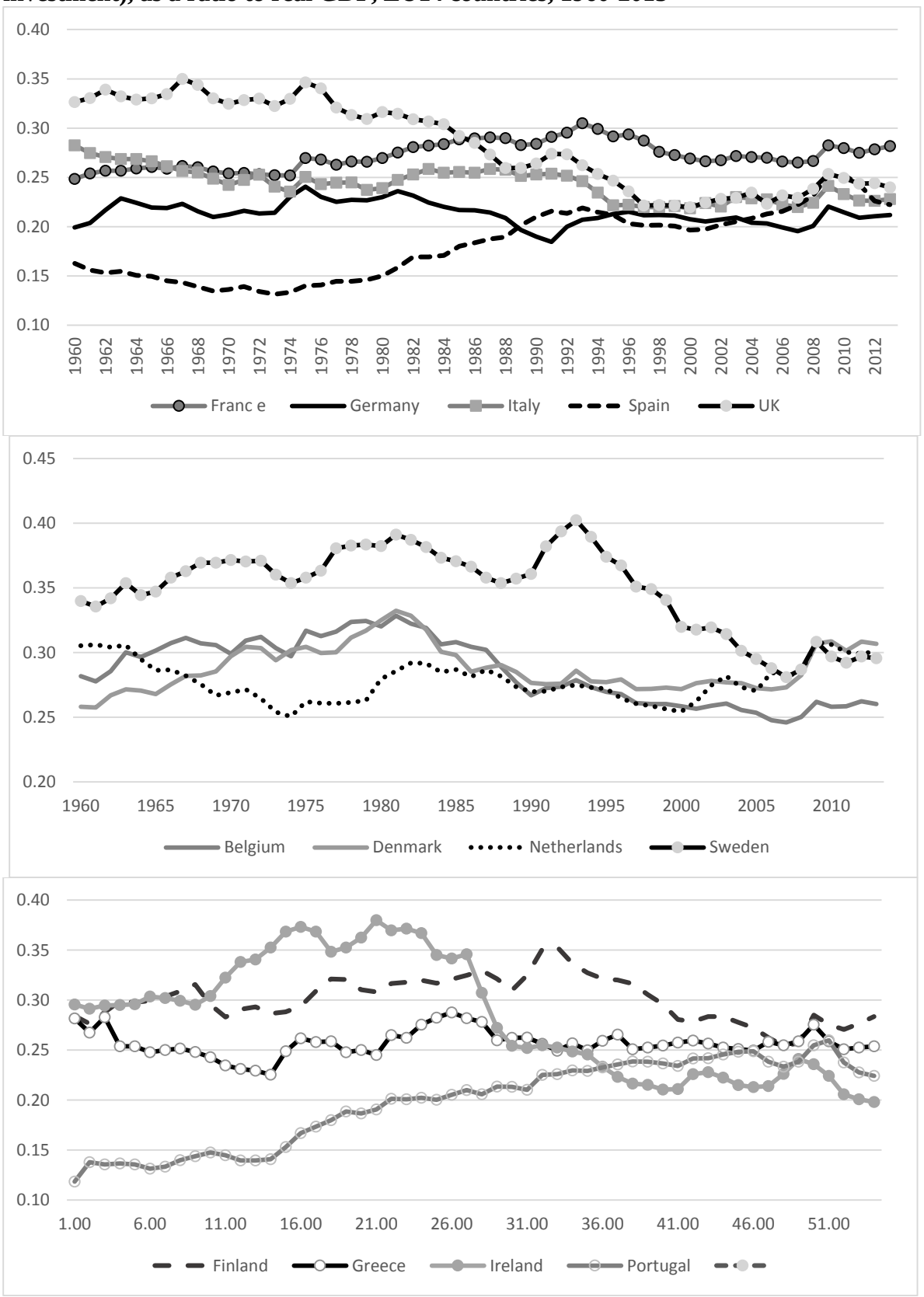
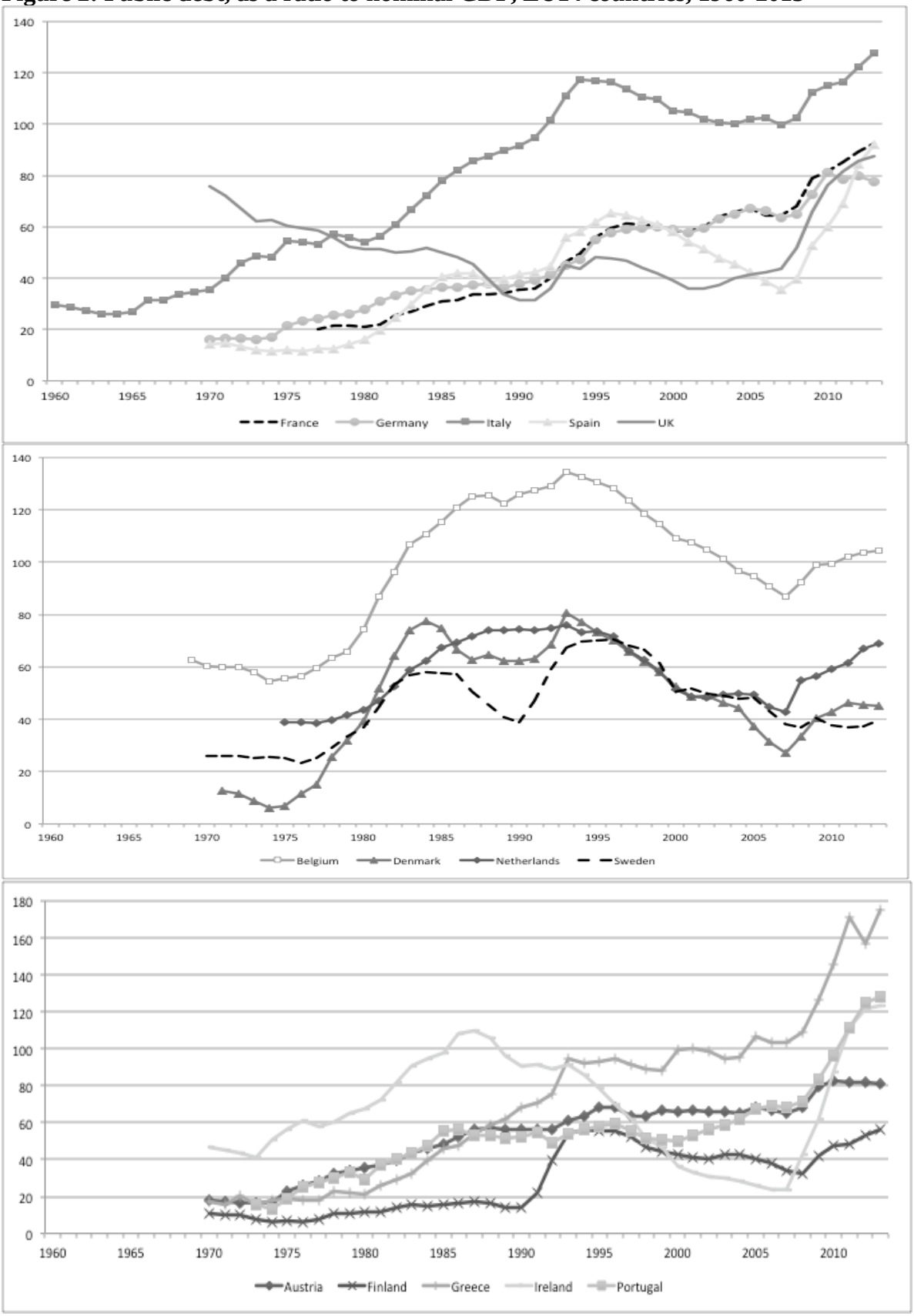
Figure 1: Government expenditure (government final consumption and public investment), as a ratio to real GDP, EU14 countries, 1960-2013



Source: AMECO online (2016). Author's calculations.

Figure 2: Public debt, as a ratio to nominal GDP, EU14 countries, 1960-2013



Source: AMECO online (2016). Author's calculations.

Table 1. Consumption: dependent variable $d\ ln\ (C)$

	c	$dlog(1-t_r)R_t$	$dlog(1-t_w)W_t$	$dlog(C_t-1)$	$(AR1)$		DW	$R2$	Sample
A	0.010	0.113	0.588				2.073	0.544	1971-2012
	(3.760) ***	(3.792) ***	(5.950) ***						
B	0.015	0.094	0.289				1.638	0.339	1971-2012
	(5.795) ***	(2.152) **	(4.071) ***						
DK	0.007	0.087	0.519				1.668	0.211	1971-2011
	(1.434)	(1.987) **	(3.089) ***						
FIN	0.017	0.106	0.439				1.814	0.553	1966-2012
	(5.386) ***	(4.455) ***	(6.445) ***						
F	0.014	0.086	0.515				1.608	0.535	1971-2012
	(6.307) ***	(3.100) ***	(5.802) ***						
D	0.005	0.067	0.381	0.419			1.810	0.634	1966-2012
	(1.576)	(1.731) *	(3.711) .***	(3.726) ***					
GR	0.018	0.190	0.399		0.375	0.000	1.957	0.735	1972-2013
	(3.396) ***	(3.902) ***	(5.619) ***		2.102 **				
IRL	0.011	0.129	0.457				1.989	0.472	1971-2012
	(2.036) **	(3.110) ***	(5.058) ***						
I	0.014	0.112	0.311		0.568		1.890	0.657	1972-2012
	(2.867) **	(4.810) ***	(3.596) ***		3.855 ***				
L	0.016	0.103	0.350				1.741	0.350	1961-2013
	(4.087) ***	(3.451) ***	(4.920) ***						
NL	0.000	0.095	0.338	0.519			1.921	0.668	1971-2012
	-(0.040)	(3.340) ***	(3.673) ***	(4.878) ***					
P	0.018	0.089	0.574				1.821	0.591	1971-2012
	(4.495) ***	(5.287) ***	(6.867) ***						
E	0.009	0.072	0.753				2.449	0.847	1961-2007
	(3.510) ***	(2.136) **	(15.132) ***						
S	0.010	0.019	0.236	0.258			1.865	0.282	1962-2012
	(2.640) **	(0.666)	(2.701) ***	1.924 *					
UK	0.011	0.072	0.626		0.310		2.038	0.682	1967-2012
	(3.268) ***	(4.288) ***	(6.761) ***		(2.051) **				

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 2. Private investment: dependent variable $d\ln(I)$ with total government expenditure (G)

	c	$dlog((1-t_r)\pi_{t-1})$	$dlog((1-t_r)\pi_t)$	$\log((1-t_r)\pi_{t-1})$	$dlog(Yp_t)$	$dlog(Yp_{t-1})dlog(I_t-1)$	$dlog(G_t)$	$dlog(G_{t-1})$	$dlog(DY_t)$	$dlog(DY_{t-1})$	$\log(I_t-1)$	$\log(Yp_t-1)$	$log(G_{t-1}))$	$log(DY_{t-1}))$	$(AR1)$	DW	$R2$	Sample
A	-0.017	0.138			1.285		0.630		-0.168							1.935	0.570	1971-2013
	-(1.415)	(1.433)			(4.131) ***		1.724 *		-1.612									
B	-0.004	0.397			1.429				-0.393							1.607	0.640	1970-2012
	-(0.402)	2.667 ***			(5.137) ***				-2.766 ***									
DK	0.075			0.064	2.342											2.245	0.754	1961-2012
	(0.855)			1.142	(10.928) ***													
FIN	-0.510		-0.027		1.344				-0.140	-0.231	-0.483	0.265	0.336	-0.105		1.884	0.915	1972-2012
	-(3.811) ***		-0.394		(6.958) ***				-2.436 **	-4.213 ***	-5.203 ***	3.081 ***	3.925 ***	-4.063 ***				
F	0.017	0.177			1.390			-0.528	-0.335							1.975	0.912	1978-2013
	(2.638) ***	(3.002) ***			(9.538) ***			-(3.076) ***	-5.365 ***									
D	-0.364	0.0002			1.642	0.187		0.327			-0.217	0.217				2.001	0.792	1962-2012
	-(3.457) ***	(0.002)			(10.578) ***	2.228 **		1.808 *			-2.974 *	3.397 ***						
GR	0.033			0.084	1.696		0.498								-0.259	2.090	0.615	1961-2013
	(0.585)			(1.613)	(7.160) ***		1.829 *								-(1.648) *			
IRL	0.184	0.171				0.575			-0.440		-0.445	0.161	0.280	-0.124		1.721	0.629	1971-2012
	(1.038)	(0.970)				1.339			-4.148 ***		-3.262 *	1.958 *	1.915 *	-3.007 ***				
I	-0.018	0.129			1.374										0.333	1.924	0.640	1962-2012
	-(2.251) **	(1.722) *			(8.303) ***										(2.413) **			
L	-0.029	0.160			1.728											2.410	0.273	1963-2013
	-(1.420)	(0.675)			(4.172) ***													
NL	-0.033	0.254			1.549		0.538									1.802	0.578	1962-2013
	-(2.979) ***	2.644 ***			(7.732) ***		1.864 *											
P	-1.979	-0.069			2.424	0.717	0.588				-0.622	0.993		-0.179		2.074	0.728	1974-2012
	-(3.969) ***	-(1.398)			(6.286) ***	1.838 *	1.965 **				-3.732 **	3.684 ***		-2.510 **				
E	-1.301			0.094	2.565			0.408		-0.231	-0.359	0.500			0.398	1.770	0.939	1972-2013
	-(2.528) **			(1.171)	(13.832) ***			2.518 **		-3.408 ***	-3.792 **	3.540 ***			(2.291) **			
S	0.164			0.152	1.617		1.235		-0.206							1.629	0.772	1971-2013
	(1.869) *			(2.206) **	(7.229) ***		2.465 **		-2.593 ***									
UK	-0.659			0.053	1.697					-0.203	-0.388	0.403				2.173	0.785	1972-2012
	-(2.377) **			(1.321)	(9.743) ***					-2.392 **	-(3.680) **	(3.542) ***						

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 3. Price deflator: dependent variable $dlog(P)$

	c	$dlog(Pm_t)$	$dlog(Pm_t - 1)$	$dlog(P_t - 1)$	dlog ULC_t	$dlog(ULC_t - 1)$	$dlog(1 + tc_t)(AR1)$		DW	$R2$	Sample
A	0.005	0.146		0.453	0.286				1.920	0.851	1962-2013
	(2.433) **	(3.715) ***		(5.320) ***	(4.952) ***						
B	0.019	0.158	0.129			0.214		0.573	2.139	0.813	1962-2013
	(3.985) ***	(6.721) ***	(4.197) ***			(2.456) ***		(3.662) ***			
DK	0.008	0.183		0.465		0.249			2.029	0.865	1962-2013
	(2.423) **	(5.266) ***		(4.037) ***		(2.698) ***					
FIN	0.009	0.236		0.198	0.416		0.742		1.966	0.860	1966-2012
	(2.299) **	(5.712) ***		(2.128) **	(5.399) ***		(2.336) **				
F	0.004	0.094		0.633		0.194			1.795	0.907	1962-2013
	(1.718) *	(3.580) ***		(4.635) ***		(1.624) *					
D	0.017		0.032		0.366			0.697	2.105	0.841	1962-2013
	(4.498) ***		(1.635) *		(7.781) ***			(8.452) ***			
GR	0.019	0.462			0.423 0.000				1.758	0.810	1962-2013
	(2.870) ***	(6.435) ***			(5.932) ***						
IRL	0.030		0.235			0.334	1.003	0.404	2.120	0.753	1971-2012
	(2.418) **		(2.872) ***			(2.512) **	(2.309) **	(2.727) ***			
I	0.028	0.084			0.445		0.909	0.902	2.404	0.958	1971-2012
	(1.333)	(4.292) ***			8.934 ***		(3.251) ***	(11.479) ***			
L	0.024	0.523		-0.482	0.345				1.651	0.479	1962-2013
	(4.180) ***	(5.076) ***		-(3.605) ***	(3.284) ***						
NL	0.007	0.152		0.448		0.255			1.997	0.801	1962-2013
	(2.492) **	(4.599) ***		(3.656) ***		(2.687) ***					
P	0.005	0.206	0.199			0.668	0.768		1.645	0.921	1981-2012
	(0.982)	(3.418) ***	(3.584) ***			(9.214) ***	(1.870) *				
E	0.025		0.078		0.430		0.640	0.857	2.257	0.944	1981-2012
	(1.971) **		(2.700) ***		(5.281) ***		(2.335) **	(7.580) ***			
S	0.011	0.156	0.225			0.407	0.628		1.590	0.846	1971-2012
	(3.032) ***	(3.915) ***	(5.372) ***			(6.697) ***	(2.553) **				
UK	0.002	0.036		0.380	0.558		0.565		2.136	0.945	1966-2012
	(0.769)	(1.206)		(7.491) ***	(12.119) ***		(1.708) *				

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 4. Export price deflator: dependent variable $dlog(P_x)$

	c	$dlog(Pm_t)$	$dlog(Pm_{t-1})$	$dlog(PX_{t-1})$	$dlog(ULC_t)$	$dlog(ULC_{t-1})$	$dlog(1+tcf_t)$	$log(PX_{t-1})$	$log(ULC_{t-1})$	$log(Pm_{t-1})$	$log(tcf_{t-1})$	$(AR1)$	DW	$R2$	Sample
A	0.002	0.616			0.152								2.339	0.867	1961-2013
	(1.060)	(15.385) ***			(3.490) ***										
B	0.001	0.789			0.096								2.037	0.949	1961-2013
	(0.674)	(26.133) ***			(1.920) *										
DK	1.250	0.728					0.445	-0.630	0.384	0.213			1.989	0.922	1966-2012
	(3.965) ***	(18.834) ***					(1.661) *	-(4.344) ***	(4.262) ***	(3.904) ***					
FIN	-0.003	0.776			0.185								1.569	0.879	1961-2013
	-(0.811)	(15.279) ***			(2.612) ***										
F	-0.002	0.528		0.142		0.248							1.875	0.956	1962-2013
	-(1.025)	(21.465) ***		(3.074) ***		(4.124) ***									
D	0.636	0.378			0.193		0.407	-0.267	0.133	0.089	0.325		1.778	0.926	1966-2012
	(2.543) ***	(13.884) ***			(3.118) ***		(3.013) ***	-(3.281) *	(3.683) ***	(2.157) **	(3.207) ***				
GR	1.115	0.828			0.154			-0.511	0.297	0.192			1.880	0.914	1961-2013
	(3.237) ***	(12.355) ***			(1.631) *			-(4.341) ***	(3.536) ***	(3.250) ***					
IRL		0.708			0.171								2.004	0.810	1961-2013
	(0.009)	(10.398) ***			(1.946) *										
I	-0.001	0.530		0.213		0.202	0.705					-0.470	2.028	0.962	1966-2012
	-(0.240)	(33.334) ***		(3.370) ***		(2.886) ***	(1.757) *					-(3.515) ***			
L	0.024		-0.001		0.322								1.800	0.076	1962-2013
	(2.389) **		-(0.006)		(1.704) *										
NL	0.002		0.229			0.370							2.008	0.171	1962-2013
	(0.251)		(1.877) *			(1.823) *									
P	0.211	0.666	-0.247	0.151		-0.235		-0.486	0.427	0.044			2.192	0.956	1966-2013
	(1.617)	(15.640) ***	-(2.640) ***	(1.296)		-(3.867) ***		-(6.498) ***	(7.425) ***	(1.937) *					
E	0.011	0.407		0.130		0.320						0.482	1.593	0.881	1962-2013
	(1.071)	(9.092) ***		(1.329)		(3.712) ***						(3.905) ***			
S	-0.002	0.716			0.172								1.928	0.877	1961-2013
	-(0.616)	(16.126) ***			(2.509) ***										
UK	0.558	0.577			0.136			-0.486	0.377	0.101			1.667	0.928	1966-2012
	(3.051) ***	(13.998) ***			(2.084) **			-(4.725) ***	(4.975) ***	(3.172) ***					

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 5. Exports: dependent variable $dlog(X)$

	c	$dlog(Px/Pm)_{t-1}$	$dlog\ (Px/Pm)_t$	$dlog(Y_{rw_t})$	$dlog(e_t)$	$(AR1)$	DW	$R2$	Sample
A	-0.028		-1.728	2.314			1.778	0.676	1961-2013
	-(2.813) ***		-(5.717) ***	(9.008) ***					
B	-0.029		-0.185	2.315			1.876	0.669	1961-2013
	-(3.264) ***		-(0.728)	(10.045) ***					
DK	-0.004		-0.627	1.540			1.718	0.472	1961-2013
	-(0.483)		-(3.581) ***	(6.445) ***					
FIN	-0.068		-0.576	3.428		0.430	2.121	0.486	1962-2013
	-(3.074) ***		-(2.003) **	(6.415) ***		(3.077) ***			
F	-0.020		-0.439	2.155	0.158	0.371	2.194	0.725	1962-2013
	-(1.718) *		-(3.075) ***	(7.689) ***	(1.665) *	(2.684) ***			
D	-0.017	-0.379		2.136			2.022	0.372	1962-2013
	-(1.145)	-(1.876) *		(5.376) ***					
GR	-0.037	-0.729		2.917			1.664	0.305	1962-2013
	-(1.342)	-(1.805) *		(3.968) ***					
IRL	0.043		-0.178	1.041		0.351	1.896	0.189	1962-2013
	(2.223) **		-(0.903)	(2.155) **		(2.608) ***			
I	-0.053	-0.307		3.006			1.966	0.586	1962-2013
	-(3.811) ***	-(1.994) **		(8.285) ***					
L	-0.033	0.187		2.688		0.317	2.102	0.388	1963-2013
	-(1.621)	(0.789)		(4.893) ***		(2.064) **			
NL	-0.027		-0.290	2.445		0.559	2.194	0.725	1962-2013
	-(2.681) ***		-(1.318)	(10.955) ***		(4.761) ***			
P	-0.017	0.316		2.409		0.330	1.816	0.420	1963-2013
	-(0.799)	(1.354)		(4.401) ***		(2.383) **			
E	-0.012		-0.277	2.448			1.664	0.426	1961-2013
	-(0.815)		-(2.214) **	(6.029) ***					
S	-0.045		-0.508	2.715		0.497	2.037	0.575	1962-2013
	-(3.009) ***		-(2.915) ***	(7.877) ***		(3.832) ***			
UK	0.001		-0.518	1.174			1.562	0.453	1961-2013
	(0.152)		-(3.708) ***	(4.696) ***					

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 6. Imports: dependent variable $dlog(M)$

	c	$dlog(P/Pm)_t$	$dlog(P/Pm)_t{-}1)$	$dlog(m_t-1)$	$dlog(Yp_t)$	$dlog(Yp_t-1)$	$dlog(G_t)$	$dlog(G_{t-1})$	$dlog(E_t)$	$log(m_t-1)$	$log(P/Pm_t-1)$	$log(Yp_t-1)$	$log(G_t-1)$	$(AR1)$	DW	$R2$	Sample
A	-0.001		0.341		1.702										2.256	0.688	1962-2013
	-0.091		1.985 **		8.983 ***												
B	0.003		0.371	-0.291	1.293	0.584		0.299							2.111	0.740	1962-2013
	0.436		3.794 ***	-2.355 **	7.379 ***	2.373 **		1.757 *									
DK	0.014		0.060		1.510										2.050	0.637	1961-2013
	2.319 **		0.498		8.823 ***												
FIN	0.003		0.135		1.496										2.342	0.760	1962-2013
	0.474		1.273		12.448 ***												
F	0.014		0.169	-0.241	2.013										1.831	0.823	1962-2013
	2.486 **		2.388 **	-3.460 ***	11.838 ***												
D	0.012		0.072		1.504		0.284								1.548	0.661	1962-2013
	1.699 *		0.763		9.087 ***		1.657 *										
GR	0.001	0.103			1.038	0.442									1.752	0.572	1962-2013
	0.067	0.553			5.743 ***	2.497 **											
IRL	-0.493		0.401		0.632	0.479	0.270		0.320	-0.206		0.307			1.859	0.678	1962-2013
	-3.176 ***		3.925 ***		3.503 ***	2.248 **	1.835 *		2.570 **	-3.265 *		3.246 ***					
I	-0.006	0.210			1.983										2.182	0.689	1961-2013
	-0.710	2.329 **			10.521 ***												
L	0.010	-0.025			1.230										2.146	0.490	1961-2013
	1.107	-0.168			6.925 ***												
NL	-0.155	0.018	0.139		1.187										2.036	0.720	1962-2013
	-1.064	3.951 ***	1.821 *		9.365 ***												
P	-4.574				1.221	1.816	0.726		-0.314	-1.051	0.597	1.816		0.896	1.828	0.716	1961-2013
	-4.817 ***				3.683 ***	6.464 ***	2.986 ***		-2.598 ***	-7.969 ***	3.583 ***	6.464 ***		6.409 ***			
E	0.001		0.244		2.220										1.602	0.652	1962-2013
	0.096		2.271 **		8.222 ***												
S	-2.760				1.449		0.526			-0.481	0.223	0.621	0.202		1.971	0.763	1961-2013
	-5.148 ***				11.206 ***		1.690 *			-5.104 ***	4.262 ***	4.521 ***	3.951 ***				
UK	-3.542		0.051		1.263		0.788			-0.541		0.787	0.220		2.119	0.782	1962-2013
	-4.484 ***		0.826		10.153 ***		4.517 ***			-4.633 ***		4.720 ***	2.806				

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table 7. The effects of a 1%-point increase in the profit share

	The effect of a 1%-point increase in the profit share in only one country on:								
	C/Y	I/Y	X/Y	M/Y	NX/Y	Private excess demand / Y	Multiplier	% Change in aggregate demand (F*G)	The effect of a simultanous 1%-point increase in the profit share on % change in aggregate demand
	A	*B*	*C*	*D*	*E(C-D)*	*F(A+B+E)*	*G*	*H*	*I*
A	-0.534	0.000	0.234	-0.168	0.402	-0.132	2.048	-0.271	-1.547
B	-0.165	0.335	0.000	-0.057	0.057	0.226	1.044	0.236	-0.392
DK	-0.424	0.000	0.180	0.000	0.180	-0.243	2.191	-0.533	-1.199
FIN	-0.369	0.000	0.074	0.000	0.074	-0.295	2.471	-0.729	-1.749
F	-0.463	0.160	0.062	-0.036	0.098	-0.205	2.383	-0.489	-0.926
D	-0.689	0.000	0.063	0.000	0.063	-0.626	2.256	-1.413	-1.810
GR	-0.572	0.000	0.099	0.000	0.099	-0.473	5.055	-2.391	-3.410
IRL	-0.335	0.000	0.000	-0.140	0.140	-0.195	1.062	-0.207	-0.697
I	-0.207	0.086	0.037	-0.043	0.080	-0.042	1.718	-0.071	-0.395
L	-0.153	0.000	0.000	0.000	0.000	-0.153	0.560	-0.086	-0.919
NL	-0.367	0.170	0.000	-0.066	0.066	-0.131	2.760	-0.361	-1.683
P	-0.443	0.000	0.000	-0.317	0.317	-0.126	2.520	-0.318	-0.917
E	-0.858	0.000	0.034	-0.039	0.074	-0.784	3.990	-3.128	-3.800
S	-0.535	0.120	0.063	-0.137	0.200	-0.215	2.582	-0.554	-1.749
UK	-0.547	0.000	0.070	0.000	0.070	-0.477	2.065	-0.984	-1.253
*EU15 GDP **									-1.446

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

* Change in each country is multiplied by its share in EU15 GDP.

Table 8. Effects of changes in public spending, taxes on capital and labour on demand

	Change 1				Change 2				Change 3			
	All countries increase public spending by 1% point				All countries increase ITR on capital income by 1%				All countries decrease ITR on labour income by 1%			
	Excess Demand / Y	Multiplier	% change in aggregate demand (A*B)	The effects of a simultaneous 1%-point increase in public spending on % change in aggregate demand	Excess Demand / Y	Multiplier	% change in aggregate demand (E*F)	The effects of a simultaneous 1%-point increase in tr on % change in aggregate demand	Excess Demand / Y	Multiplier	% change in aggregate demand (I*J)	The effects of a simultaneous 1%-point increase in tw on % change in aggregate demand
	A	B	C	D	E	F	G	H	I	J	K	L
A	1.508	2.048	3.087	4.734	-0.087	2.048	-0.177	-0.335	0.512	2.048	1.049	1.825
B	0.517	1.185	0.612	2.238	-0.173	1.153	-0.199	-0.348	0.257	1.153	0.296	1.038
DK	1.000	2.191	2.191	3.431	-0.065	2.191	-0.142	-0.261	0.407	2.191	0.892	1.475
FIN	1.211	4.682	5.669	10.038	-0.071	3.357	-0.239	-0.543	0.362	3.357	1.215	2.708
F	0.497	3.395	1.689	2.951	-0.120	2.988	-0.359	-0.455	0.450	2.988	1.343	1.839
D	1.068	2.256	2.409	3.382	-0.090	2.256	-0.202	-0.297	0.581	2.256	1.311	1.754
GR	1.396	5.055	7.059	9.230	-0.131	5.055	-0.662	-0.868	0.337	5.055	1.703	2.737
IRL	0.826	1.176	0.971	1.652	-0.105	1.140	-0.120	-0.183	0.347	1.140	0.395	0.705
I	1.000	1.718	1.718	2.659	-0.126	1.718	-0.216	-0.303	0.279	1.718	0.479	0.932
L	1.000	0.560	0.560	2.758	-0.042	0.560	-0.023	-0.233	0.206	0.560	0.115	1.146
NL	1.340	2.760	3.699	6.936	-0.180	2.760	-0.498	-0.800	0.521	2.760	1.439	2.969
P	0.900	3.460	3.113	4.731	-0.072	3.187	-0.228	-0.371	0.460	3.187	1.465	2.164
E	1.413	4.680	6.615	8.367	-0.058	4.490	-0.259	-0.434	0.636	4.490	2.857	3.655
S	1.208	3.239	3.912	6.704	-0.054	2.938	-0.158	-0.404	0.280	2.938	0.822	2.033
UK	0.637	2.330	1.485	2.089	-0.075	2.238	-0.168	-0.223	0.491	2.238	1.099	1.360
*EU15 GDP**				*3.82*				*-0.36*				1.79

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L=Luxemburg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

* Change in each country is multiplied by its share in EU15 GDP. See Appendix C for details.

Table 9. The effects of a simultaneous change of the policy mix in all countries:

	The effect of a simultaneous 1% point fall in profit share and a 1% increase in public spending on equilibrium aggregate demand of each national economy ΔY/Y	The effect of a simulteaneous 1% point fall in ITR on labour income and a 1% point increase in ITR on capital income on equilibrium aggregate demand of each national economy ΔY/Y	Total European multiplier effect of a simultaneous combined change in income distribution, government expenditures and taxation on capital and labour income on equilibrium demand of each national economy ΔY/Y	Total European multiplier effect of a simulteanous combined change in income distribution, government expenditures and implicit tax rate on capital and labour income on private investment of each national economy ΔI/Y
	A	*B*	*C***	*D***
A	6.41	1.49	7.75	2.06
B	2.81	0.69	3.28	0.82
DK	4.73	1.21	5.83	0.85
FIN	13.68	2.17	11.72	4.19
F	4.35	1.38	5.13	1.01
D	5.28	1.46	6.63	1.47
GR	12.82	1.87	14.48	3.34
IRL	2.29	0.52	2.68	1.61
I	3.25	0.63	3.78	0.57
L	3.85	0.91	4.56	0.69
NL	8.89	2.17	10.74	2.02
P	6.12	1.79	7.29	2.92
E	12.96	3.22	15.49	3.84
S	9.12	1.63	9.67	2.54
UK	3.55	1.14	4.49	0.85
EU15 GDP*	**5.57**	**1.43**	**6.64**	**1.46**

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom.

* Change in each country is multiplied by its share in EU15 GDP.

** Combines both policy mixes of column A and column B - A 1% point fall in profit share; a 1% point increase in public spending; a 1% point fall in ITR on labour income; and a 1% increase in ITR on capital income (see appendix F for details).

Table 10. Total effects of a policy mix on budget balance following a simultaneous change in all countries

	1%-point fall in profit share	*1%-point increase in public spending*	*1%-point increase in taxation on capital income*	*1%-point fall in taxation on wage income*	*Combined effect on budget balance*
	A	***B***	***C***	***D***	***E***
Austria	0.254	-0.222	0.219	0.900	1.150
Belgium	0.046	-0.735	0.253	0.725	0.290
Denmark	0.192	-0.450	0.243	0.818	0.803
Finland	0.171	-0.017	0.228	0.874	1.257
France	0.154	-0.510	0.190	0.908	0.742
Germany	0.342	-0.362	0.257	0.932	1.168
Greece	0.007	-0.981	0.358	0.554	-0.062
Ireland	0.012	-0.972	0.303	0.602	-0.055
Italy	0.049	-0.673	0.290	0.702	0.367
Luxembourg	0.050	-0.851	0.397	0.582	0.178
Netherlands	0.208	-0.142	0.183	1.002	1.250
Portugal	0.115	-0.406	0.227	0.911	0.847
Spain	0.617	0.359	0.227	1.209	2.412
Sweden	0.114	-0.561	0.272	0.650	0.475
United Kingdom	0.119	-0.801	0.256	0.742	0.317
** Change in each country is multiplied by its share in EU15 GDP*					*0.839*

Appendix

Appendix A. Data Sources and Definitions

Time-series data	Variable	Definition	Source [Variable construction]	Time Period
Adjusted wage share	ws	*Compensation per employee as percentage of GDP at factor cost per person employed*	AMECO Database	1960-2013
Adjusted profit share	π		$[\pi = 1 - ws]$	1960-2013
GDP in market prices (real)	Y	*Gross domestic product at 2010 market prices*	AMECO Database	1960-2013
GDP at factor costs (real)	Y_f	*Gross domestic product at market prices minus taxes on production and imports, plus subsidies*	AMECO Database	1960-2013
Private Consumption (real)	C	*Private final consumption expenditure at constant prices*	AMECO Database	1960-2013
Adjusted compensation of employees (real)	W		$[W = ws * Y_f]$	1960-2013
Adjusted gross operating surplus (real)	R		$[R = \pi * Y_f]$	1960-2013
Private Investment (real)	I		$[I = I_t * I_{ps}]$	1960-2013
Total investment (real)	I_t	*Gross fixed capital formation at constant prices, total economy*	AMECO Database	1960-2013
Private investment (current prices)	I_{pr}	*Gross fixed capital formation at current prices, private sector*	AMECO Database	1960-2013
Ratio of private to total investment	I_{ps}		$[I_{ps} = I_{pr}/I_{tcurr}]$	1960-2013
Total investment (current prices)	I_{tcurr}	*Gross fixed capital formation at current prices, total economy.*	AMECO Database (2016)	1960-2013

GDP Deflator	P	*Price deflator gross domestic product at market prices*	AMECO Database	1960-2013
Import price deflator	P_m	*Price deflator imports of goods and services*	AMECO Database	1960-2013
Export price deflator	P_x	*Price deflator exports of goods and services*	AMECO Database	1960-2013
Exports (real)	X	*Exports of goods and services at constant prices*	AMECO Database	1960-2013
Imports (real)	M	*Imports of goods and services at constant prices*	AMECO Database	1960-2013
Foreign GDP (real)	Y_{rw}	*GDP of the rest of the world*	World Bank World Development Indicators (WDI) [World GDP (in constant 2005 US$) - own GDP (in constant 2005 US$)]	1960-2013
Imports from country j to country i	M_{ji}	*For each reporting country or group, all the trading partners are listed.*	IMF, Direction of Trade Statistics	1980-2012
Exports from country i to country j	X_{ji}	*For each reporting country or group, all the trading partners are listed.*	IMF, Direction of Trade Statistics	1980-2012
Exchange Rate	E	*Average of local currency per dollar, euro, and yen*	World Bank World Development Indicators (WDI)	1960-2013
Real unit labour costs	$rulc$		$[rulc = ws * Y_f/Y]$	1960-2013
Unit labour Costs	ulc		$[ulc = rulc * P]$	1960-2013
ITRC	t_c	*All consumption taxes divided by the final consumption expenditure of private households on the economic territory.*	European Commission Eurostat	1965-2012
ITRK	t_r	*Revenue from all*	European Commission	1965-

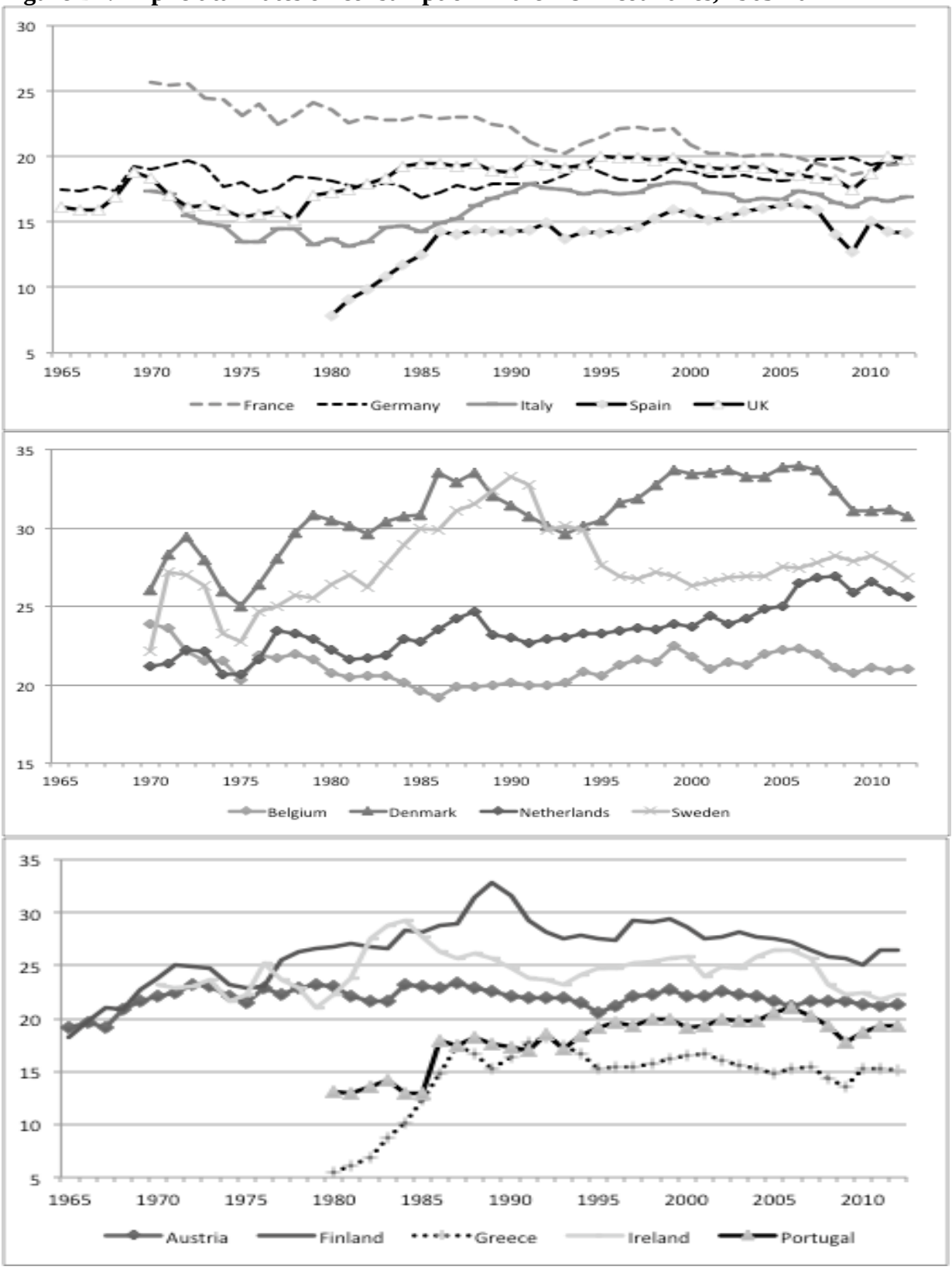
		capital taxes divided by all potentially taxable business and capital income in the economy.	Eurostat	2012
ITRL	t_w	*Sum of all direct and indirect taxes and employees and employers social contributions levied on employed labour income divided by the total compensation of employees working in the economic territory.*	European Commission Eurostat	1965-2012
Government Gross Capital Formation	I_g	*Gross fixed capital formation consists of resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are produced assets used in production for more than one year.*	$[I_t * (1 - Ips)]$	1960-2013
Government individual consumption spending	G_i	*Expenditures for individual consumption (health care, housing, education, etc.), reflect expenditures incurred by government on behalf of an individual household. This category of expenditure is equal to social transfers in kind from government to households and so includes expenditure by government on market goods and services provided to households.*	OECD, National Accounts (2016)	1970-2013

Government collective consumption spending	G_c	*Expenditures for collective consumption (defence, justice, etc.) which benefit society as a whole, or large parts of society, and are often known as public goods and services.*	OECD, National Accounts (2016)	1970-2013
General government consolidated gross debt	D	*Total gross debt at nominal value outstanding at the end of the year of the sector of general government.*	AMECO Database (2016)	1960-2013
Public Debt to GDP	DY	*Ratio of gross debt at nominal value to nominal GDP.*	**[**DY = D / nY]	1960-2013
General government consumption expenditure	GCE	*General government consumption expenditure, consists of expenditure incurred by government in its production of non-market final goods and services (except gross fixed capital formation) and market goods and services provided as social transfers in kind.*	OECD, National Accounts (2016)	1970-2013
General Government Final Consumption Expenditure	Gt_c	*Final consumption expenditure of general government = Individual consumption of general government + Collective consumption of general government.*	AMECO Database (2016)	1960-2013

Notes: Government individual and collective consumption expenditure, real: OECD data is linked with AMECO online data on General Government Final Consumption Expenditure. We take the ratio of (G_i/GCE) *and* (G_c/GCE) *respectively, and multiply with* (G_{tc})*.*

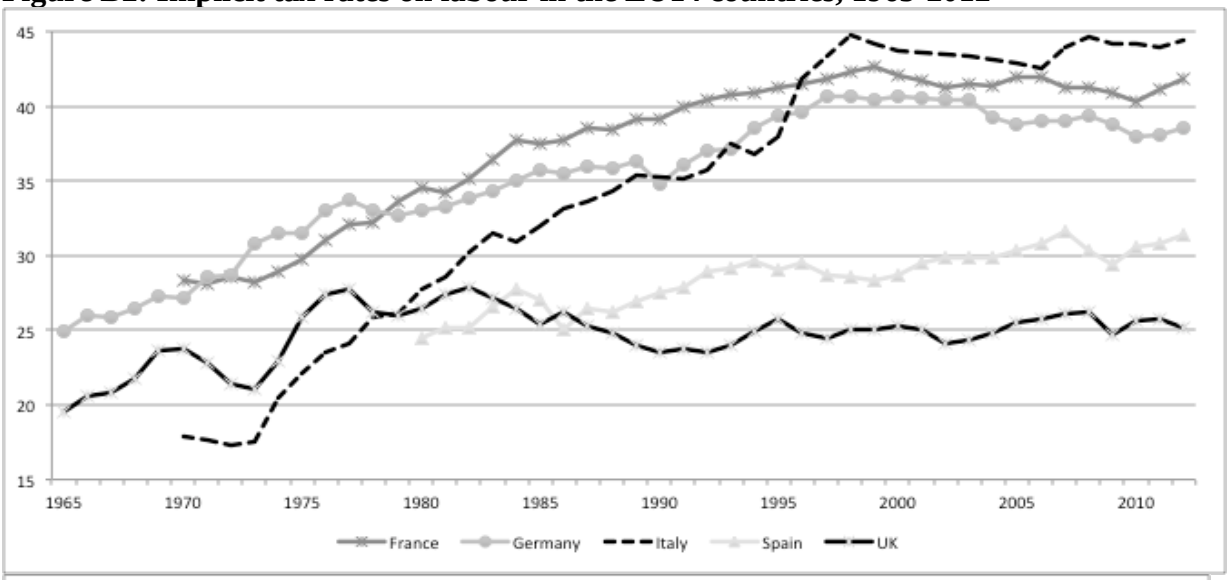
Appendix B. Implicit tax rates on consumption, labour, and capital

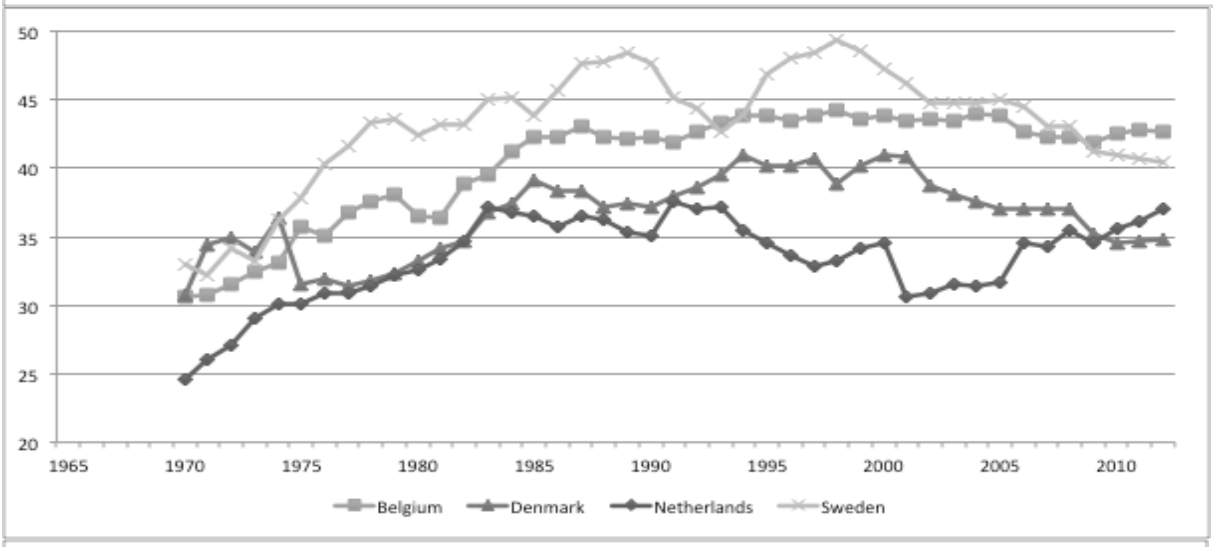
Figure B1: Implicit tax rates on consumption in the EU14 countries, 1965-2012

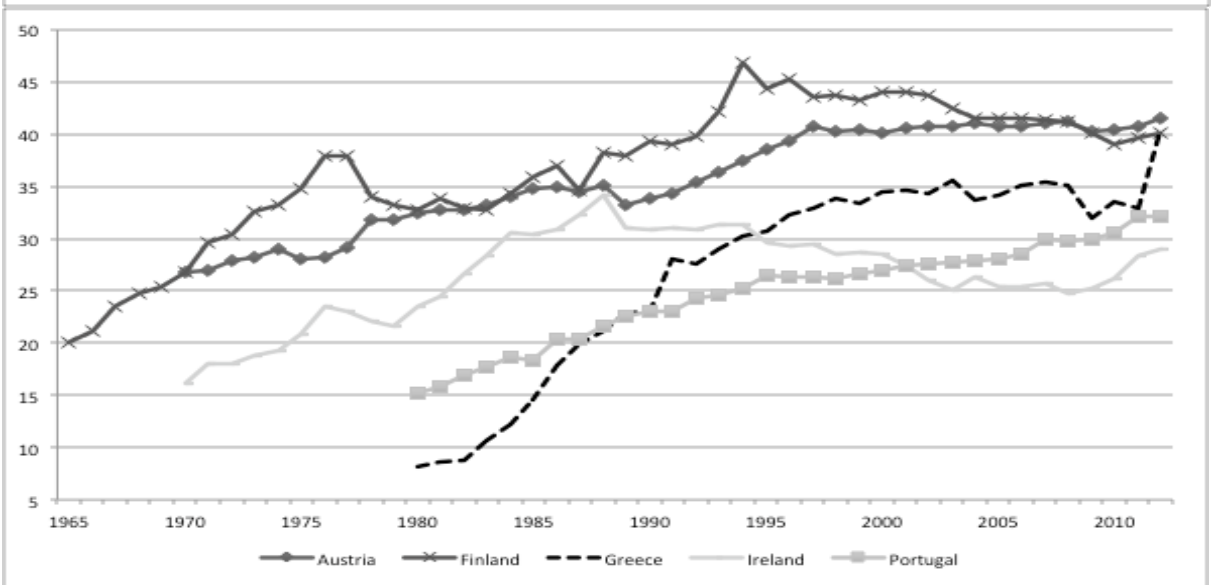


Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

Figure B2: Implicit tax rates on labour in the EU14 countries, 1965-2012

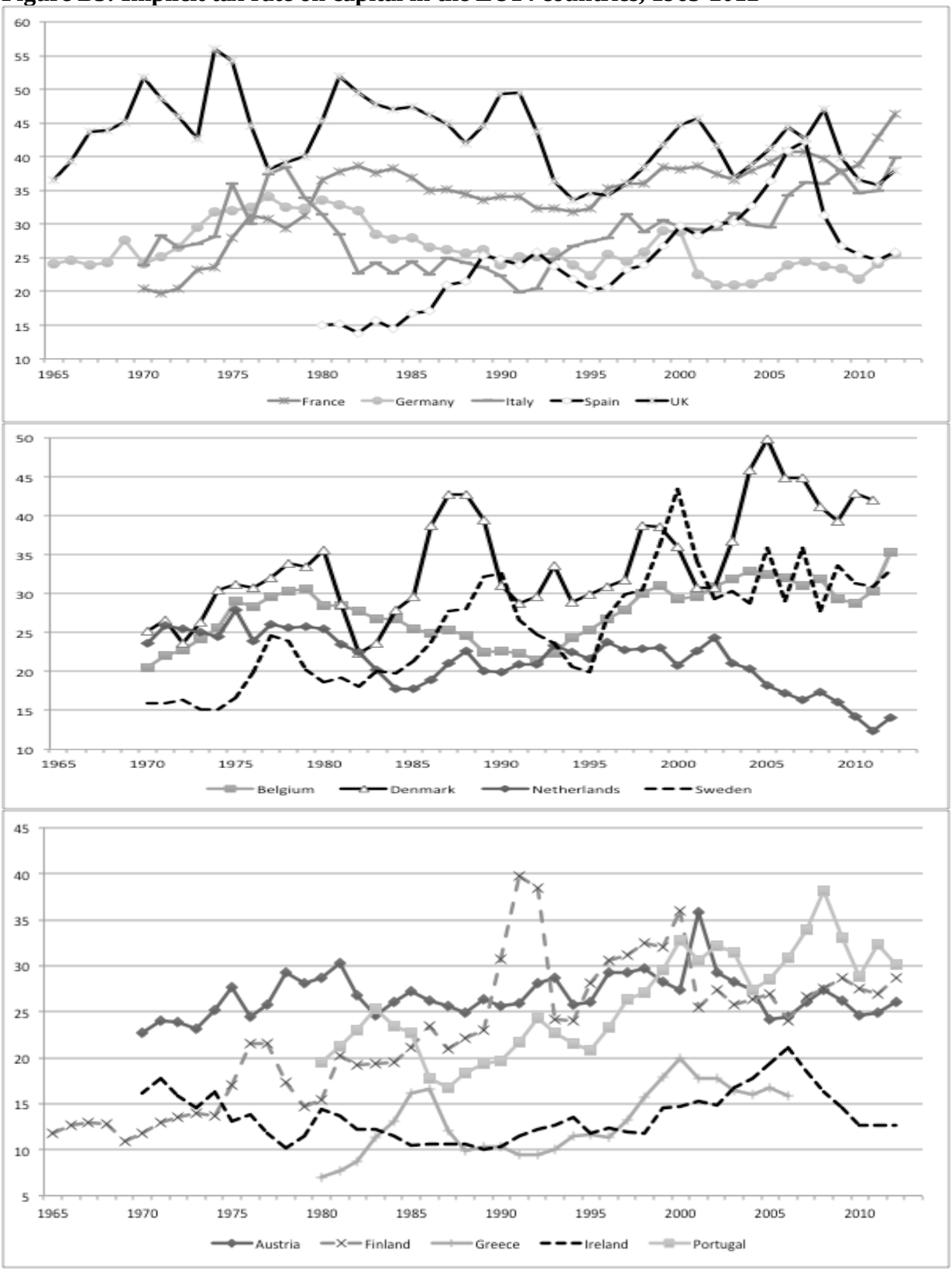






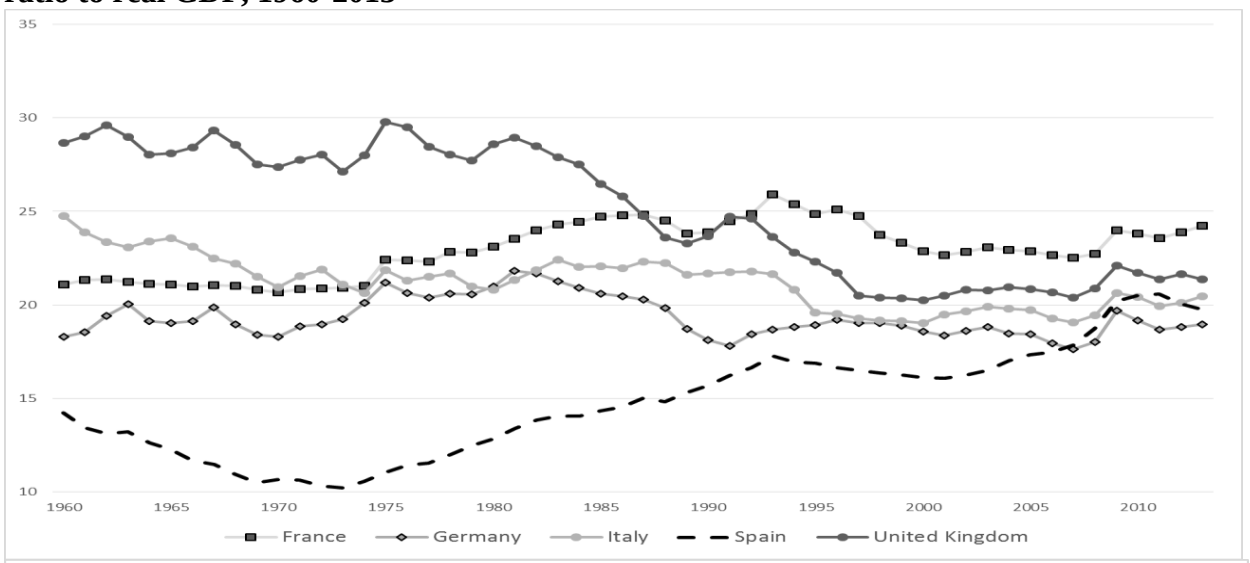
Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

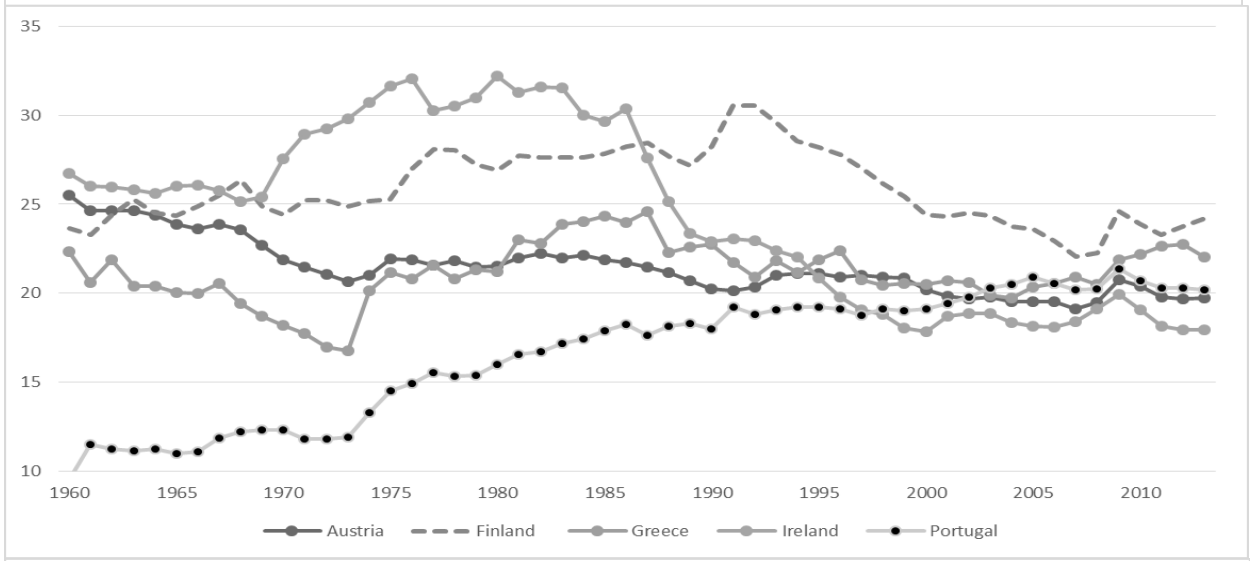
Figure B3: Implicit tax rate on capital in the EU14 countries, 1965-2012

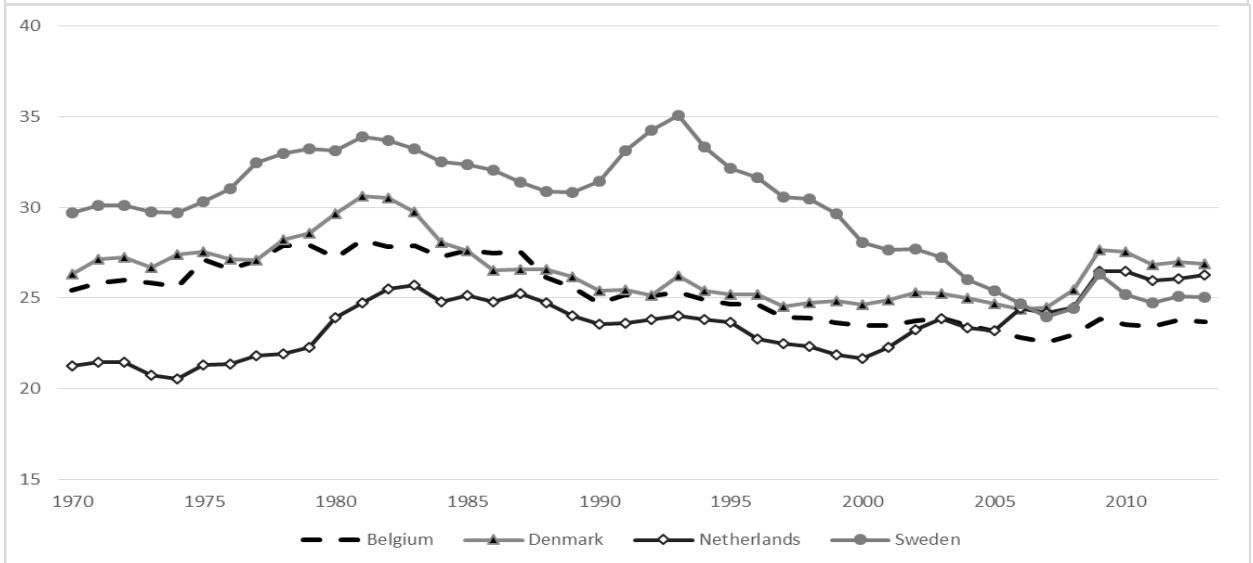


Source: Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

Figure B4: Total Government Consumption Expenditure in the EU14 countries, as a ratio to real GDP, 1960-2013

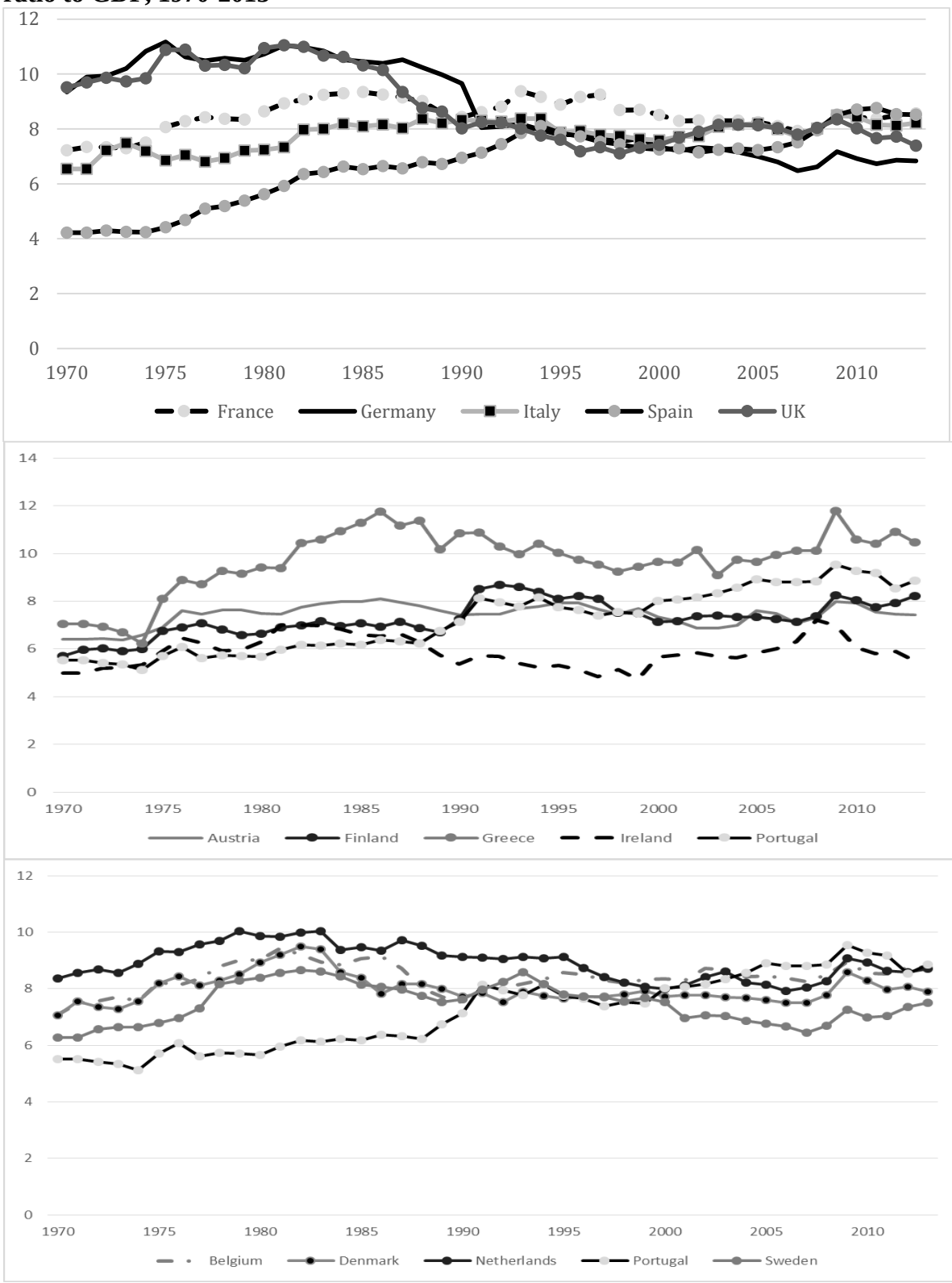






Source: AMECO online (2016). Author's calculations.

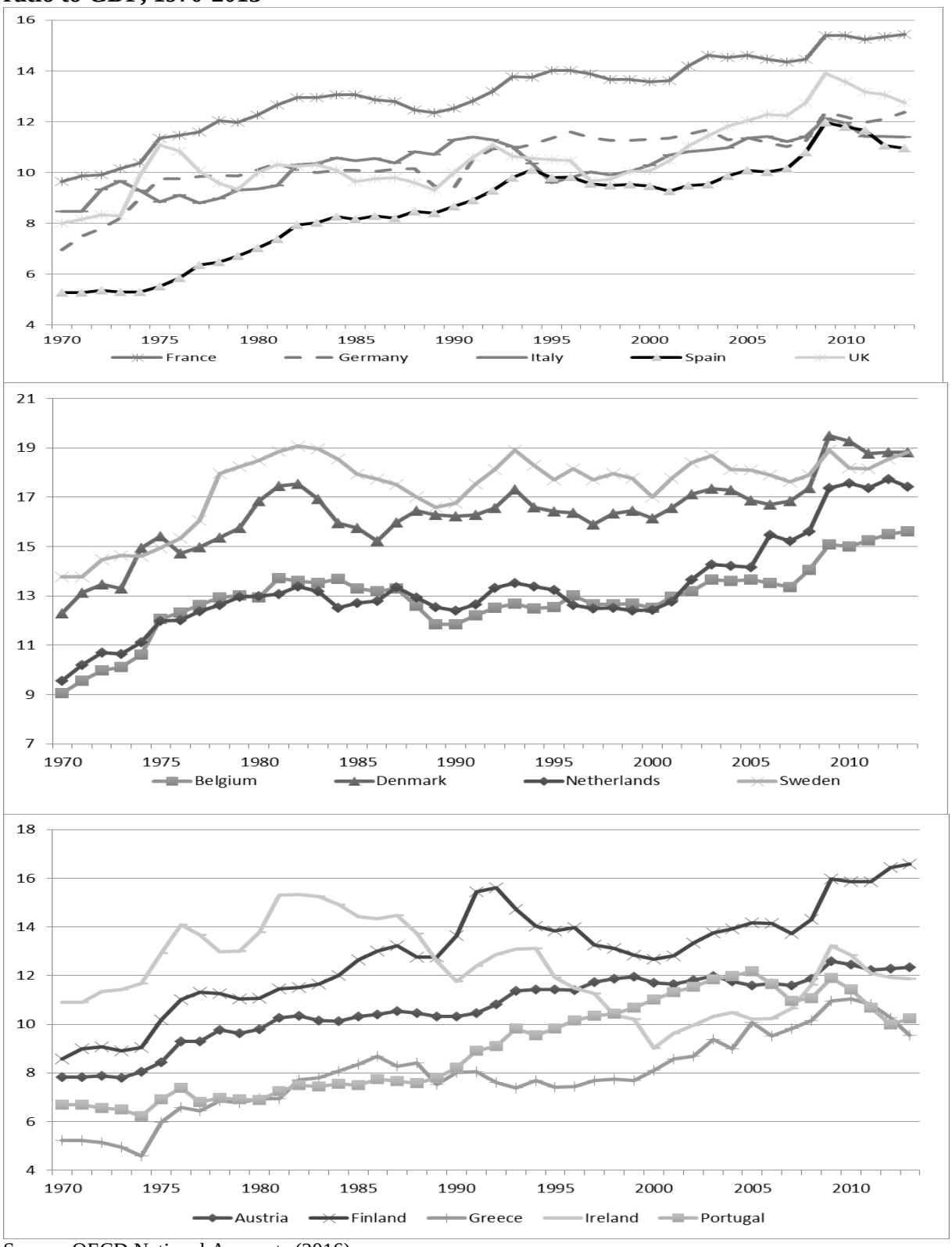
Figure B5: Government collective consumption expenditure in the EU14 countries, as a ratio to GDP, 1970-2013



Source: OECD National Accounts (2016).

Note: Data has been extrapolated using the growth rate of total government consumption expenditure for Austria 1970-75; Greece 1970-1994; Ireland 1974-1989; Italy 1970-1987; Portugal 1970-1987; Spain 1970-1994; Sweden 1970-1992.

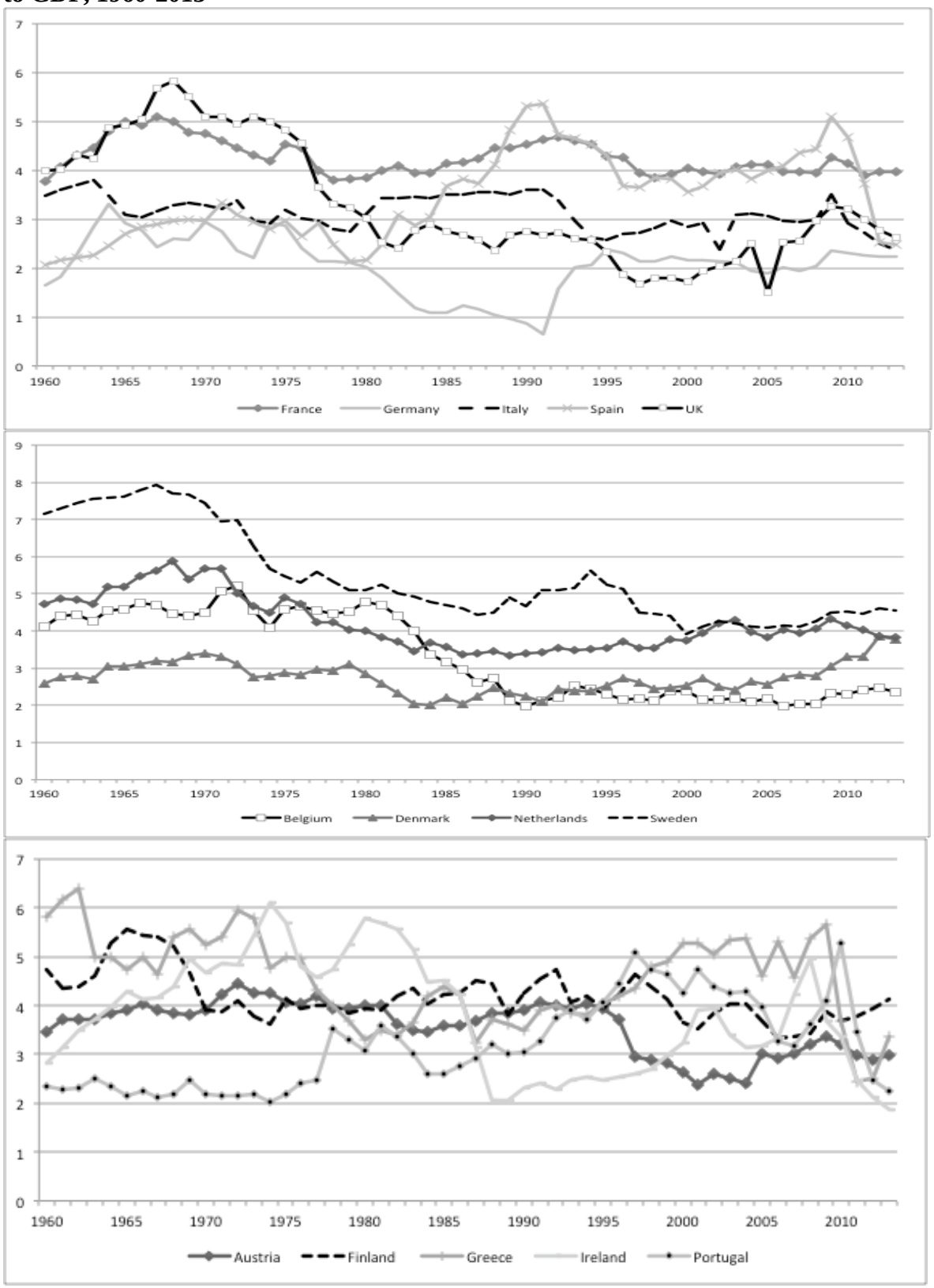
Figure B6: Government individual consumption expenditure in the EU14 countries, as a ratio to GDP, 1970-2013



Source: OECD National Accounts (2016).

Note: Data has been extrapolated using the growth rate of total government consumption expenditure for Austria 1970-75; Greece 1970-1994; Ireland 1974-1989; Italy 1970-1987; Portugal 1970-1987; Spain 1970-1994; Sweden 1970-1992.

Figure B7: General government gross capital formation in the EU14 countries, as a ratio to GDP, 1960-2013



Source: AMECO online (2016). Author's calculations.

Appendix C. National and European Multiplier Effects

Any change in private demand in country *i* will lead to a multiplier mechanism in that country, that is, it will affect consumption, investment, and imports. The total effect of a change in income distribution on equilibrium demand is given by:

$$\frac{dY}{d\pi} = \frac{dC}{d\pi} + \frac{dI}{d\pi} + \frac{dNX}{d\pi} + \frac{dG}{d\pi} \tag{26}$$

where:

$$\frac{dC}{d\pi} = \frac{\partial C}{\partial \pi} + \frac{\partial C}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{27}$$

$$\frac{dI}{d\pi} = \frac{\partial I}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{28}$$

$$\frac{dNX}{d\pi} = \frac{\partial NX}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{29}$$

$$\frac{dG}{d\pi} = \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{30}$$

Therefore (26) becomes:

$$\frac{dY^*/Y}{d\pi} = \frac{\frac{\partial C/Y}{\partial \pi} + \frac{\partial I/Y}{\partial \pi} + \frac{\partial NX/Y}{\partial \pi}}{1 - \partial C/\partial Y - \partial I/\partial Y - \partial NX/\partial Y - \partial G/\partial Y} \tag{31}$$

The marginal effects are given by:

$$\frac{\partial C}{\partial R} = \frac{\partial C/Y}{\partial \pi} = c_r \frac{C}{R} - c_w \frac{C}{W} \tag{32}$$

$$\frac{\partial I}{\partial R} = \frac{\partial I/Y}{\partial \pi} = i_r \frac{I}{R} \tag{33}$$

$$\frac{\partial X}{\partial R} = \frac{\partial X/Y}{\partial \pi} = \left(-e_{XPx}, e_{Pxulc}, \frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\right)\frac{X/Y}{rulc} \tag{34}$$

$$\frac{\partial M}{\partial R} = \frac{\partial M/Y}{\partial ws} = \left(-e_{MP}, e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\right)\frac{M/Y}{rulc} \tag{35}$$

$$\frac{\partial I}{\partial G} = \frac{\partial I/Y}{\partial K_g} = i_g \frac{I}{G} \tag{36}$$

$$\frac{\partial G}{\partial G} = \frac{\partial G/Y}{\partial K_g} = 1 \tag{37}$$

$$\frac{\partial NX}{\partial G} = \frac{\partial NX/Y}{\partial K_g} = -\frac{\partial M}{\partial G} = -m_g \frac{M}{G} \tag{38}$$

$$\frac{I}{Y_p} = i_y \frac{I}{Y_p} \tag{39}$$

$$\frac{\partial I/Y}{\partial D/Y} = i_d \frac{I/Y}{D/Y} = i_d \frac{I}{D} \tag{40}$$

$$\frac{\partial D/Y}{\partial Y} = \frac{\frac{\partial D}{\partial Y}Y + \frac{\partial Y}{\partial Y}D}{Y^2} = \frac{\partial D}{\partial Y}\frac{1}{Y} - \frac{D}{Y^2} = \left(\frac{\partial D}{\partial Y} - \frac{D}{Y}\right)\frac{1}{Y} = \left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)\frac{1}{Y} \tag{41}$$

$$\frac{\partial D}{\partial Y} = \frac{\partial (D_{-1} + G - T + rD_{-1})}{\partial Y} = \frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} \tag{42}$$

$$\frac{\partial T}{\partial Y} = \frac{\partial (t_w W + t_r R + t_c C)}{\partial Y} = t_w \frac{\partial W}{\partial Y} + t_r \frac{\partial R}{\partial Y} + t_c \frac{\partial C}{\partial Y} \tag{43}$$

$$\frac{\partial R}{\partial Y} = \frac{\partial \pi Y}{\partial Y} = \pi \tag{44}$$

$$\frac{\partial W}{\partial Y} = \frac{\partial (1-\pi)Y}{\partial Y} = 1 - \pi \tag{45}$$

$$\frac{\partial Y_p}{\partial Y} = \frac{\partial (Y - G)}{\partial Y} = \frac{\partial (Y - \kappa_g Y)}{\partial Y} = 1 - \kappa_g \tag{46}$$

$$\frac{\partial R/Y}{\partial Y} = \frac{\partial \pi}{\partial Y} = 0 \tag{47}$$

$$\frac{\partial C}{\partial Y}=\frac{\partial C}{\partial R}\frac{\partial R}{\partial Y}+\frac{\partial C}{\partial W}\frac{\partial W}{\partial Y}=c_r\frac{C}{R}\pi+c_w\frac{C}{W}(1-\pi)=(c_r+c_w)\frac{C}{Y} \tag{48}$$

$$\frac{\partial C}{\partial Y}=\frac{\partial C}{\partial R}\frac{\partial R}{\partial Y}+\frac{\partial C}{\partial W}\frac{\partial W}{\partial Y}=c_r\frac{C}{R}\pi+c_w\frac{C}{W}(1-\pi)=(c_r+c_w)\frac{C}{Y} \tag{49}$$

$$\frac{\partial NX}{\partial Y}=-\frac{\partial M}{\partial Y}=-\left(\frac{\partial M}{\partial Y_p}\frac{\partial Y_p}{\partial Y}+\frac{\partial M}{\partial G}\frac{\partial G}{\partial Y}\right)=-\left(m_y\frac{M}{Y_p}(1-\kappa_g)+m_g\frac{M}{G}\kappa_g\right)=-(m_y+m_g)\frac{M}{Y} \tag{50}$$

$$\frac{\partial G}{\partial Y}=\frac{\partial \kappa_g Y}{\partial Y}=\kappa_g \tag{51}$$

$$\frac{\partial I}{\partial Y}=\frac{\partial I}{\partial Y_p}\frac{\partial Y_p}{\partial Y}+\frac{\partial I}{\partial(1-t_r)\pi}\frac{\partial(1-t_r)\pi}{\partial Y}+\frac{\partial I}{\partial G}\frac{\partial G}{\partial Y}+\frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial Y}\ \text{or}$$

$$\frac{\partial I}{\partial Y}=i_y\frac{I}{Y_p}(1-\kappa_g)+i_g\frac{I}{G}\kappa_g+i_d\frac{I}{D/Y}\frac{\partial D/Y}{\partial Y}=(i_y+i_g)\frac{I}{Y}+i_d\frac{I/Y}{D/Y}\left(\frac{\partial G}{\partial Y}-\frac{\partial T}{\partial Y}-\frac{D}{Y}\right) \tag{52}$$

The term $1-\partial C/\partial Y-\partial I/\partial Y-\partial NX/\partial Y-\partial G/\partial Y$ has to be positive for stability.

Total European multiplier effects of a **change in the income distribution in all countries** on equilibrium aggregate demand of each national country are estimated as in equation (16).The details of each matrix are given by:

The diagonal elements of *E* are calculated as in equations (32)-(35).

$$E_{15\times15}=\begin{bmatrix}\frac{\partial C_1/Y_1}{\partial\pi_1}+\frac{\partial I_1/Y_1}{\partial\pi_1}+\frac{\partial NX_1/Y_1}{\partial\pi_1} & 0 & . & 0\\ 0 & . & . & .\\ . & . & . & .\\ 0 & 0 & . & \frac{\partial C_{15}/Y_1}{\partial\pi_{15}}+\frac{\partial I_{15}/Y_{15}}{\partial\pi_{15}}+\frac{\partial NX_{15}/Y_{15}}{\partial\pi_{15}}\end{bmatrix}$$

H' reflects the national multiplier:

$$H'_{15\times15}=\begin{bmatrix}\frac{\partial C_1}{\partial Y_1}+\frac{\partial I_1}{\partial Y_1}+\frac{\partial NX_1}{\partial Y_1}+\frac{\partial G_1}{\partial Y_1} & 0 & . & 0\\ 0 & . & . & .\\ . & . & . & .\\ 0 & 0 & . & \frac{\partial C_{15}}{\partial Y_{15}}+\frac{\partial I_{15}}{\partial Y_{15}}+\frac{\partial NX_{15}}{\partial Y_{15}}+\frac{\partial G_{15}}{\partial Y_{15}}\end{bmatrix}$$

W is:

$$W_{15\times15}=\begin{bmatrix}0 & e_{XYrw,1}\frac{X_1}{Y_1}\frac{Y_2}{Y_w} & . & e_{XYrw,1}\frac{X_1}{Y_1}\frac{Y_{15}}{Y_w}\\ e_{XYrw,2}\frac{X_2}{Y_2}\frac{Y_1}{Y_w} & . & . & e_{XYrw,2}\frac{X_2}{Y_2}\frac{Y_{15}}{Y_w}\\ . & . & . & .\\ e_{XYrw,15}\frac{X_{15}}{Y_{15}}\frac{Y_1}{Y_w} & e_{XYrw,15}\frac{X_{15}}{Y_{15}}\frac{Y_2}{Y_w} & . & 0\end{bmatrix}$$

P is:

$$P_{15\times15}=\begin{bmatrix} 0 & \frac{\partial\left(\frac{NX}{Y}\right)_1}{\partial\pi_2}\frac{M_{21}}{M_1} & \cdot & \frac{\partial\left(\frac{NX}{Y}\right)_1}{\partial\pi_{15}}\frac{M_{151}}{M_1} \\ \frac{\partial\left(\frac{NX}{Y}\right)_2}{\partial\pi_1}\frac{M_{12}}{M_2} & \cdot & \cdot & \cdot\cdot \\ \cdot & \cdot & \cdot & \cdot \\ \frac{\partial\left(\frac{NX}{Y}\right)_{15}}{\partial\pi_1}\frac{M_{115}}{M_{15}} & \frac{\partial\left(\frac{NX}{Y}\right)_{15}}{\partial\pi_2}\frac{M_{215}}{M_{15}} & \cdot & 0 \end{bmatrix}$$

$$P_{ij}=\frac{\partial\left(\frac{NX}{Y}\right)_i}{\partial\pi_j}\frac{M_{ji}}{M_i}=\left(e_{Pxj}\frac{1}{1-e_{Pj}}\frac{Y_{fj}}{Y_j}\frac{1}{rulc_j}\right)\frac{M_{ji}}{M_i}\left(e_{XPi}\frac{X_i}{Y_i}-e_{MPi}\frac{M_i}{Y_i}\right)$$

Total effects of a **change in government expenditures** on equilibrium aggregate demand:

$$\frac{dY^*}{dG}=\frac{dC}{dG}+\frac{dNX}{dG}+\frac{dG}{dG}+\frac{dI}{dG} \tag{53}$$

where:

$$\frac{dC}{dG}=\frac{\partial C}{\partial Y}\frac{\partial Y}{\partial G}$$

$$\frac{dNX}{dG}=\frac{\partial NX}{\partial G}+\frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial G}$$

$$\frac{dG}{dG}=\frac{\partial G}{\partial G}+\frac{\partial G}{\partial Y}\frac{\partial Y}{\partial G}$$

$$\frac{dI}{dG}=\frac{\partial I}{\partial G}+\frac{\partial I}{\partial Y}\frac{\partial Y}{\partial G}+\frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial G}$$

$$\frac{\partial D/Y}{\partial G}=\frac{\frac{\partial D}{\partial G}Y-\frac{\partial Y}{\partial G}D}{Y^2}=\frac{\partial D}{\partial G}\frac{1}{Y}-\frac{\partial Y}{\partial G}\frac{D}{Y^2}=\left(\frac{\partial D}{\partial G}-\frac{\partial Y}{\partial G}\frac{D}{Y}\right)\frac{1}{Y}$$

$$\frac{\partial D}{\partial G}=\frac{\partial\left(D_{-1}+G-T+rD_{-1}\right)}{\partial G}=1-\frac{\partial T}{\partial Y}\frac{\partial Y}{\partial G}$$

$$\frac{\partial D}{\partial G}=\frac{\partial(D_{-1}+G-T+rD_{-1})}{\partial G}=\frac{\partial G}{\partial G}-\frac{\partial T}{\partial Y}\frac{\partial Y}{\partial G}$$

Therefore (53) becomes:

$$\frac{dY^*}{dG}=\frac{\frac{\partial I}{\partial G}+\frac{\partial NX}{\partial G}+\frac{\partial G}{\partial G}+\frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial G}}{1-\frac{\partial C}{\partial Y}-\frac{\partial I}{\partial Y}-\frac{\partial NX}{\partial Y}-\frac{\partial G}{\partial Y}+\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y}+\frac{D}{Y}\right)} \tag{54}$$

Dividing (54) by Y we get:

$$\frac{dY^*/Y}{d\kappa_g} = \frac{\frac{\partial I/Y}{\partial \kappa_g} + \frac{\partial NX/Y}{\partial \kappa_g} + \frac{\partial G/Y}{\partial \kappa_g} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial G}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{55}$$

Total European multiplier effects of a **change in government expenditures in all countries** on equilibrium aggregate demand of each national country are estimated in equation (17) and (18). The details of each matrix are given by:

The diagonal elements of the E matrix are:

$$Eg_{15\times 15} = \begin{bmatrix} \frac{\partial I_1/Y_1}{\partial \kappa_{g1}} + \frac{\partial NX_1/Y_1}{\partial \kappa_{g1}} + \frac{\partial G_1/Y_1}{\partial \kappa_{g1}} + \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial G}{\partial G} & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial I_{15}/Y_{15}}{\partial \kappa_{g15}} + \frac{\partial NX_{15}/Y_{15}}{\partial \kappa_{g15}} + \frac{\partial G_{15}/Y_{15}}{\partial \kappa_{g15}} + \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial G}{\partial G} \end{bmatrix}$$

H reflects the national multiplier augmented by public spending and public debt effects:

$$Hg_{15\times 15} = \begin{bmatrix} \frac{\partial C_1}{\partial Y_1} + \frac{\partial I_1}{\partial Y_1} + \frac{\partial NX_1}{\partial Y_1} + \frac{\partial G_1}{\partial Y_1} - \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\left(\frac{\partial T_1}{\partial Y_1} + \frac{D_1}{Y_1}\right) & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial C_{15}}{\partial Y_{15}} + \frac{\partial I_{15}}{\partial Y_{15}} + \frac{\partial NX_{15}}{\partial Y_{15}} + \frac{\partial G_{15}}{\partial Y_{15}} - \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\left(\frac{\partial T_{15}}{\partial Y_{15}} + \frac{D_{15}}{Y_{15}}\right) \end{bmatrix}$$

Total effects of a **change in gross fixed capital formation of general government** [62] on equilibrium aggregate demand:

$$\frac{dY^*}{dI_g} = \frac{dC}{dI_g} + \frac{dNX}{dI_g} + \frac{dG}{dI_g} + \frac{dI}{dI_g} \tag{56}$$

where:

$$\frac{dC}{dI_g} = \frac{\partial C}{\partial Y}\frac{\partial Y}{\partial I_g}$$

$$\frac{dNX}{dI_g} = \frac{\partial NX}{\partial I_g} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial I_g}$$

[62] The same method is followed when estimating an exogenous increase in G_c and G_i.

$$\frac{dG}{dI_g} = \frac{\partial G}{\partial I_g} + \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial I_g}$$
$$\frac{dI}{dI_g} = \frac{\partial I}{\partial I_g} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial I_g} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial I_g}$$
$$\frac{\partial D/Y}{\partial I_g} = \frac{\frac{\partial D}{\partial I_g}Y - \frac{\partial Y}{\partial I_g}D}{Y^2} = \left(\frac{\partial D}{\partial I_g} - \frac{\partial Y}{\partial I_g}\frac{D}{Y}\right)\frac{1}{Y}$$
$$\frac{\partial D}{\partial I_g} = \frac{\partial\left(D_{-1} + G - T + rD_{-1}\right)}{\partial I_g} = \frac{\partial G}{\partial I_g} - \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial I_g}$$

Therefore (56) becomes:

$$\frac{dY^*}{dI_g} = \frac{\frac{\partial I}{\partial I_g} + \frac{\partial NX}{\partial I_g} + \frac{\partial G}{\partial I_g} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial I_g}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{57}$$

where:

$$\frac{\partial I}{\partial I_g} = \frac{\partial I/Y}{\partial I_g/Y} = i_i\frac{I}{I_g}$$
$$\frac{\partial NX}{\partial I_g} = \frac{\partial NX/Y}{\partial I_g/Y} = -m_i\frac{M}{I_g}$$
$$\frac{\partial G}{\partial I_g} = \frac{\partial G/Y}{\partial I_g/Y} = \frac{\partial\left(I_g + G_{gc} + G_{gi}\right)}{\partial I_g} = 1$$

Dividing (57) by Y we get:

$$\frac{dY^*/Y}{d\kappa_{ig}} = \frac{\frac{\partial I/Y}{\partial \kappa_{ig}} + \frac{\partial NX/Y}{\partial \kappa_{ig}} + \frac{\partial G/Y}{\partial \kappa_{ig}} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G/Y}{\partial \kappa_{ig}}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{58}$$

Total European multiplier effects of a **change in gross fixed capital formation of general government expenditures in all countries** on equilibrium aggregate demand of each national economy:

$$\left[\frac{dY}{Y}\right]_{15\times1} = \begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} = Eig_{15\times15}\begin{bmatrix} d\kappa_{ig1} \\ \cdot \\ \cdot \\ d\kappa_{ig15} \end{bmatrix} + Hg_{15\times15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} + W_{15\times15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} \tag{59}$$

$$\left[\frac{dY}{Y}\right]_{15\times1} = \left(I_{15\times15} - Hg_{15\times15} - W_{15\times15}\right)^{-1} Eig_{15\times15}\begin{bmatrix} d\kappa_{ig1} \\ \cdot \\ \cdot \\ d\kappa_{ig15} \end{bmatrix} \tag{60}$$

where

$$Eig_{15\times 15}=\begin{bmatrix} \frac{\partial I_1/Y_1}{\partial \kappa_{ig1}}+\frac{\partial NX_1/Y_1}{\partial \kappa_{ig1}}+\frac{\partial G_1/Y_1}{\partial \kappa_{ig1}}+\frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial G_1/Y_1}{\partial \kappa_{ig1}} & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial I_{15}/Y_{15}}{\partial \kappa_{ig15}}+\frac{\partial NX_{15}/Y_{15}}{\partial \kappa_{ig15}}+\frac{\partial G_{15}/Y_{15}}{\partial \kappa_{ig15}}+\frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial G_{15}/Y_{15}}{\partial \kappa_{ig15}} \end{bmatrix}$$

Total effects of a **change in implicit tax rate on capital income** on equilibrium aggregate demand:

$$\frac{dY^*}{dt_r}=\frac{dC}{dt_r}+\frac{dNX}{dt_r}+\frac{dG}{dt_r}+\frac{dI}{dt_r} \tag{61}$$

where:

$$\frac{dC}{dt_r}=\frac{\partial C}{\partial t_r}+\frac{\partial C}{\partial Y}\frac{\partial Y}{\partial t_r}$$

$$\frac{dNX}{dt_r}=\frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial t_r}$$

$$\frac{dG}{dt_r}=\frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_r}$$

$$\frac{dI}{dt_r}=\frac{\partial I}{\partial t_r}+\frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_r}+\frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial t_r}$$

$$\frac{\partial D/Y}{\partial t_r}=\frac{\frac{\partial D}{\partial t_r}Y-\frac{\partial Y}{\partial t_r}D}{Y^2}=\left(\frac{\partial D}{\partial t_r}-\frac{\partial Y}{\partial t_r}\frac{D}{Y}\right)\frac{1}{Y}$$

$$\frac{\partial D}{\partial t_r}=\frac{\partial\left(D_{-1}+G-T+rD_{-1}\right)}{\partial t_r}=\frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_r}-\frac{\partial T}{\partial t_r}-\frac{\partial T}{\partial Y}\frac{\partial Y}{\partial t_r}$$

Therefore (61) becomes:

$$\frac{dY^*}{dt_r}=\frac{\frac{\partial C}{\partial t_r}+\frac{\partial I}{\partial t_r}-\frac{\partial I/Y}{\partial D/Y}\frac{\partial T}{\partial t_r}}{1-\frac{\partial C}{\partial Y}-\frac{\partial I}{\partial Y}-\frac{\partial NX}{\partial Y}-\frac{\partial G}{\partial Y}-\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y}-\frac{\partial T}{\partial Y}-\frac{D}{Y}\right)} \tag{62}$$

where:

$$\frac{\partial C}{\partial t_r}=\frac{\partial C}{\partial R'}\frac{\partial R'}{\partial t_r}=c_r\frac{C}{(1-t_r)R}(-R)=-c_r\frac{C}{(1-t_r)}$$

$$\frac{\partial I}{\partial t_r}=\frac{\partial I}{\partial \pi'}\frac{\partial \pi'}{\partial t_r}=i_\pi\frac{I}{(1-t_r)\pi}(-\pi)=-i_\pi\frac{I}{(1-t_r)}$$

$$\frac{\partial C}{\partial R'}=\frac{\partial C}{\partial(1-t_r)R}=c_r\frac{C}{(1-t_r)R}$$

$$\frac{\partial R'}{\partial t_r}=\frac{\partial(1-t_r)R}{\partial t_r}=-R$$

$$\frac{\partial I}{\partial \pi'} = \frac{\partial I}{\partial (1-t_r)\pi} = i_\pi \frac{I}{(1-t_r)\pi}$$
$$\frac{\partial \pi'}{\partial t_r} = \frac{\partial (1-t_r)\pi}{\partial t_r} = -\pi$$

Dividing (62) by Y we get:

$$\frac{dY^*/Y}{dt_r} = \frac{\frac{\partial C/Y}{\partial t_r} + \frac{\partial I/Y}{\partial t_r} - \frac{\partial I/Y}{\partial D/Y}\frac{\partial T/Y}{\partial t_r}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} - \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)} \tag{63}$$

where:

$$\frac{\partial C/Y}{\partial t_r} = -c_r \frac{C/Y}{(1-t_r)}$$
$$\frac{\partial I/Y}{\partial t_r} = -i_\pi \frac{I/Y}{(1-t_r)}$$
$$\frac{\partial T}{\partial t_r} = \frac{\partial (t_w W + t_r R + t_c C)}{\partial t_r} = R \text{ or } \frac{\partial T/Y}{\partial t_r} = \frac{R}{Y}$$

Total European multiplier effects of a **change in implicit tax rate on capital income in all countries** on equilibrium aggregate demand of each national economy are estimated in equation (19) and (20). The details of each matrix are given by:

$$Etr_{15\times 15} = \begin{bmatrix} \frac{\partial C_1/Y_1}{\partial t_{r1}} + \frac{\partial I_1/Y_1}{\partial t_{r1}} - \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial T_1/Y_1}{\partial t_{r1}} & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial C_{15}/Y_{15}}{\partial t_{r15}} + \frac{\partial I_{15}/Y_{15}}{\partial t_{r15}} - \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial T_{15}/Y_{15}}{\partial t_{r15}} \end{bmatrix}$$

$$Ht_{15\times 15} = \begin{bmatrix} \frac{\partial C_1}{\partial Y_1} + \frac{\partial I_1}{\partial Y_1} + \frac{\partial NX_1}{\partial Y_1} + \frac{\partial G_1}{\partial Y_1} + \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\left(\frac{\partial G_1}{\partial Y_1} - \frac{\partial T_1}{\partial Y_1} - \frac{D_1}{Y_1}\right) & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial C_{15}}{\partial Y_{15}} + \frac{\partial I_{15}}{\partial Y_{15}} + \frac{\partial NX_{15}}{\partial Y_{15}} + \frac{\partial G_{15}}{\partial Y_{15}} + \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\left(\frac{\partial G_{15}}{\partial Y_{15}} - \frac{\partial T_{15}}{\partial Y_{15}} - \frac{D_{15}}{Y_{15}}\right) \end{bmatrix}$$

Total effects of a **change in implicit tax rate on labour income** on equilibrium aggregate demand:

$$\frac{dY^*}{dt_w} = \frac{dC}{dt_w} + \frac{dNX}{dt_w} + \frac{dG}{dt_w} + \frac{dI}{dt_w} \tag{64}$$

where:

$$\frac{dC}{dt_w} = \frac{\partial C}{\partial t_w} + \frac{\partial C}{\partial Y}\frac{\partial Y}{\partial t_w}$$

$$\frac{dNX}{dt_w}=\frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial t_w}$$
$$\frac{dG}{dt_w}=\frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_w}$$
$$\frac{dI}{dt_w}=\frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_w}+\frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial t_w}$$
$$\frac{\partial D/Y}{\partial t_w}=\frac{\frac{\partial D}{\partial t_w}Y-\frac{\partial Y}{\partial t_w}D}{Y^2}=\left(\frac{\partial D}{\partial t_w}-\frac{\partial Y}{\partial t_w}\frac{D}{Y}\right)\frac{1}{Y}$$
$$\frac{\partial D}{\partial t_w}=\frac{\partial\left(D_{-1}+G-T+rD_{-1}\right)}{\partial t_w}=\frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_w}-\frac{\partial T}{\partial t_w}-\frac{\partial T}{\partial Y}\frac{\partial Y}{\partial t_w}$$

Therefore (64) becomes:

$$\frac{dY^*}{dt_w}=\frac{\frac{\partial C}{\partial t_w}-\frac{\partial I/Y}{\partial D/Y}\frac{\partial T}{\partial t_w}}{1-\frac{\partial C}{\partial Y}-\frac{\partial I}{\partial Y}-\frac{\partial NX}{\partial Y}-\frac{\partial G}{\partial Y}-\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y}-\frac{\partial T}{\partial Y}-\frac{D}{Y}\right)} \tag{65}$$

where:

$$\frac{\partial C}{\partial t_w}=\frac{\partial C}{\partial W'}\frac{\partial W'}{\partial t_w}=c_w\frac{C}{(1-t_w)W}\left(-W\right)=-c_w\frac{C}{(1-t_w)}$$
$$\frac{\partial C}{\partial W'}=\frac{\partial C}{\partial(1-t_w)W}=c_w\frac{C}{(1-t_w)W}$$
$$\frac{\partial W'}{\partial t_w}=\frac{\partial(1-t_w)W}{\partial t_w}=-W$$

Dividing (65) by Y we get:

$$\frac{dY^*/Y}{dt_w}=\frac{\frac{\partial C/Y}{\partial t_w}-\frac{\partial I/Y}{\partial D/Y}\frac{\partial T/Y}{\partial t_w}}{1-\frac{\partial C}{\partial Y}-\frac{\partial I}{\partial Y}-\frac{\partial NX}{\partial Y}-\frac{\partial G}{\partial Y}-\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y}-\frac{\partial T}{\partial Y}-\frac{D}{Y}\right)} \tag{66}$$

where:

$$\frac{\partial C/Y}{\partial t_w}=-c_w\frac{C/Y}{(1-t_w)}$$
$$\frac{\partial T}{\partial t_w}=\frac{\partial(t_wW+t_rR+t_cC)}{\partial t_w}=W\ or\ \frac{\partial T/Y}{\partial t_w}=\frac{W}{Y}$$

Total European multiplier effects of a **change in implicit tax rate on labour income in all countries** on equilibrium aggregate demand of each national economy:

$$\left[\frac{dY}{Y}\right]_{15\times1}=\begin{bmatrix}\frac{dY_1}{Y_1}\\ \cdot\\ \cdot\\ \frac{dY_{15}}{Y_{15}}\end{bmatrix}=Etw_{15\times15}\begin{bmatrix}dt_{w1}\\ \cdot\\ \cdot\\ dt_{w15}\end{bmatrix}+Ht_{15\times15}\begin{bmatrix}\frac{dY_1}{Y_1}\\ \cdot\\ \cdot\\ \frac{dY_{15}}{Y_{15}}\end{bmatrix}+W_{15\times15}\begin{bmatrix}\frac{dY_1}{Y_1}\\ \cdot\\ \cdot\\ \frac{dY_{15}}{Y_{15}}\end{bmatrix} \tag{67}$$

$$\left[\frac{dY}{Y}\right]_{15\times 1} = \left(I_{15\times 15} - Ht_{15\times 15} - W_{15\times 15}\right)^{-1} Etw_{15\times 15} \begin{bmatrix} dt_{w1} \\ . \\ . \\ dt_{w15} \end{bmatrix} \tag{68}$$

where

$$Etw_{15\times 15} = \begin{bmatrix} \frac{\partial C_1/Y_1}{\partial t_{w1}} - \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial T_1/Y_1}{\partial t_{w1}} & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial C_{15}/Y_{15}}{\partial t_{w15}} - \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial T_{15}/Y_{15}}{\partial t_{w15}} \end{bmatrix}$$

Appendix D Policy mix and further effects

Total European multiplier effects of a **change in income distributions and government expenditures in all countries** on equilibrium aggregate demand of each national economy:

$$\left[\frac{dY}{Y}\right]_{15\times1} = E_{15\times15}\left[d\pi\right]_{15\times1} + P_{15\times15}\left[d\pi\right]_{15\times1} + \\ + Eg_{15\times15}\left[d\kappa_g\right]_{15\times1} + Hg_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad (69)$$

Total European multiplier effects of a **change in implicit tax rate on capital income and implicit tax rate on labour income** in all countries on equilibrium aggregate demand of each national economy:

$$\left[\frac{dY}{Y}\right]_{15\times1} = Etr_{15\times15}\left[dt_r\right]_{15\times1} + Etw_{15\times15}\left[dt_w\right]_{15\times1} \\ + Ht_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad (70)$$

Total European multiplier effects of a **change in income distributions, government expenditures, implicit tax rate on capital income and implicit tax rate on labour income in all countries** on equilibrium aggregate demand of each national economy:

$$\left[\frac{dY}{Y}\right]_{15\times1} = E_{15\times15}\left[d\pi\right]_{15\times1} + P_{15\times15}\left[d\pi\right]_{15\times1} \\ + E_{g15x15}\left[dk_g\right]_{15x1} + Etr_{15x15}[dt_r]_{15x1} + Etw_{15x15}[dt_w]_{15x1} \\ + Ht_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad (71)$$

We calculate the **total effects of a change in the income distribution on investment** as follows:

$$\frac{dI}{d\pi} = \frac{\partial I}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \pi} \\ \frac{dI/Y}{d\pi} = \frac{\partial I/Y}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} \quad (72)$$

We calculate the **total effects of a change in government expenditures on investment** as follows:

$$\frac{dI}{d\kappa_g} = \frac{\partial I}{\partial \kappa_g} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \kappa_g} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial \kappa_g} \\ \frac{d\,I/Y}{d\kappa_g} = \frac{\partial\, I/Y}{\partial \kappa_g} + \frac{\partial I}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial D/Y}{\partial \kappa_g} \quad (73)$$

where:

$$\frac{\partial D/Y}{\partial \kappa_g} = \frac{\partial D}{\partial G} - \frac{\partial Y}{\partial G}\frac{D}{Y}$$

We calculate the **total effects of a change in implicit tax rate on capital income on investment** as follows:

$$\frac{dI}{dt_r} = \frac{\partial I}{\partial t_r} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_r} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial t_r}$$
$$\frac{d\,I/Y}{dt_r} = \frac{\partial\, I/Y}{\partial t_r} + \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial t_r} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial D/Y}{\partial t_r} \quad (74)$$

We calculate the **total effects of a change in implicit tax rate on labour income on investment** as follows:

$$\frac{dI}{dt_w} = \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_w} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial t_w}$$
$$\frac{d\,I/Y}{dt_w} = \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial t_w} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial D/Y}{\partial t_w} \quad (75)$$

We calculate the **total effects of a change in income distributions, government expenditures, implicit tax rate on capital income and implicit tax rate on labour income on investment** as in equation (24) in the main text.

We calculate the **total effects of a change in the income distribution on net exports** as follows:

$$\frac{dNX}{d\pi} = \frac{\partial NX}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \pi}$$
$$\frac{dNX/Y}{d\pi} = \frac{\partial NX/Y}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y*/Y}{\partial \pi} \quad (76)$$

We calculate the **total effects of a change in government expenditures on net exports** as follows:

$$\frac{dNX}{d\kappa_g} = \frac{\partial NX}{\partial \kappa_g} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \kappa_g}$$
$$\frac{d\,NX/Y}{d\kappa_g} = \frac{\partial\, NX/Y}{\partial \kappa_g} + \frac{\partial NX}{\partial Y}\frac{\partial Y*/Y}{\partial \kappa_g} \quad (77)$$

Following Onaran and Obst (2016) we calculate the post-multiplier net export effects as

$$\begin{bmatrix} \frac{\Delta NX/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta NX/Y_n}{\Delta \pi_n} \end{bmatrix} = (NX_{nxn} + P_{nxn}) \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_n \end{bmatrix} + (W_{nxn} - M_{nxn}) \begin{bmatrix} \frac{\Delta Y/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta Y/Y_n}{\Delta \pi_n} \end{bmatrix} \quad (78)$$

where

$$NX_{nxn} = \begin{bmatrix} \frac{\frac{\Delta NX}{Y_1}}{\Delta \pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \vdots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\frac{\Delta NX}{Y_n}}{\Delta \pi_n} \end{bmatrix} \tag{79}$$

and

$$M_{nxn} = \begin{bmatrix} \frac{\Delta M_1}{\Delta Y_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \cdots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta M_n}{\Delta Y_n} \end{bmatrix} \tag{80}$$

where NX_{ii} is $\frac{\frac{\Delta X}{Y_1}}{\Delta \pi_1} - \frac{\frac{\Delta M}{Y_1}}{\Delta \pi_1}$ calculated as in Equations (13) and (14) and M_{ii} is calculated as $e_{MYi}\frac{M_i}{Y_i}$.

We calculate the **total effects of a change in the income distribution on budget balance** as follows:

$$\frac{dBAL}{d\pi} = \frac{dT}{d\pi} - \frac{dG}{d\pi} = \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial \pi} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial \pi}$$
$$\frac{d\,BAL/Y}{d\pi} = \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} \tag{81}$$

We calculate the **total effects of a change in government expenditures on budget balance** as follows:

$$\frac{dBAL}{dk_g} = \frac{dT}{dk_g} - \frac{dG}{dk_g} = \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial k_g} - \frac{\partial G}{\partial k_g} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial k_g}$$
$$\frac{d\,BAL/Y}{d\kappa_g} = \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} - \frac{\partial G/Y}{\partial k_g} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} \tag{82}$$

We calculate the **total effects of a change in ITR on capital income on budget balance** as follows:

$$\frac{dBAL}{dt_r} = \frac{dT}{dt_r} - \frac{dG}{dt_r} = \frac{\partial T}{\partial t_r} + \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial t_r} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_r}$$

$$\frac{d\,BAL/Y}{dt_r} = \frac{\partial T/Y}{\partial t_r} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} \tag{83}$$

We calculate the **total effects of a change in ITR on labour income on budget balance** as follows:

$$\frac{dBAL}{dt_w} = \frac{dT}{dt_w} - \frac{dG}{dt_w} = \frac{\partial T}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_w}$$

$$\frac{d\,BAL/Y}{dt_w} = \frac{\partial T/Y}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} \tag{84}$$

We calculate the **total effects of a change in income distributions, government expenditures, ITR on capital income and ITR on labour income on budget balance** as in equation (25) or as follows:

$$\begin{aligned}\frac{d\,BAL/Y}{d\pi} + \frac{d\,BAL/Y}{d\kappa_g} + \frac{d\,BAL/Y}{dt_r} + \frac{d\,BAL/Y}{dt_w} &= \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} - \frac{\partial G/Y}{\partial k_g} \\ - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} + \frac{\partial T/Y}{\partial t_r} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} + \frac{\partial T/Y}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w}\end{aligned} \tag{85}$$

We calculate the **total effects of a change in the income distribution on the percentage change in the domestic price level** as follows:

$$\frac{dP}{dws} = \frac{\partial \log P}{\partial \log ws}\frac{P}{ws} = \frac{\partial \log P}{\partial \log ulc}\frac{\partial \log ulc}{\partial \log rulc}\frac{\partial \log rulc}{\partial \log ws}\frac{P}{ws}$$

$$\frac{dP}{dws} = e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{ws}{rulc}\frac{P}{ws} = e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{P}{rulc}$$

$$\frac{dP}{d\pi} = -e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{P}{rulc}$$

$$\frac{dP/P}{d\pi} = -e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{1}{rulc}$$

$$\frac{d\log P}{d\pi} = -e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{1}{rulc} \tag{86}$$

where:

$$e_{Pulc} = \frac{\partial \log P}{\partial \log ulc} = \frac{\partial \log(ulc/rulc)}{\partial \log ulc} = \frac{\partial \log ulc}{\partial \log ulc} - \frac{\partial \log rulc}{\partial \log ulc} = 1 - \frac{\partial \log rulc}{\partial \log ulc}$$

$$\frac{\partial \log rulc}{\partial \log ulc} = 1 - e_{Pulc}$$

$$\frac{\partial \log ulc}{\partial \log rulc} = \frac{1}{1-e_{Pulc}}$$

$$\frac{\partial \log rulc}{\partial \log ws} = \frac{\partial rulc}{\partial ws}\frac{ws}{rulc} = \frac{\partial\left(\frac{ws \times Y_f}{Y}\right)}{\partial ws}\frac{ws}{rulc} = \frac{Y_f}{Y}\frac{ws}{rulc}$$

$$ws = \frac{rulc \times Y}{Y_f} \rightarrow rulc = \frac{ws \times Y_f}{Y}$$

$$rulc = \frac{ulc}{P}$$

Following Onaran and Obst (2016) we calculate the price effects of a simultaneous change in each country as:

$$\begin{bmatrix} \frac{\Delta logP}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta logP}{\Delta \pi_n} \end{bmatrix} = \left(DP_{nxn} \begin{bmatrix} \Delta \pi_1 \\ \vdots \\ \Delta \pi_n \end{bmatrix} + PM_{nxn} \begin{bmatrix} 0 & \Delta \pi_2 & \cdots & \Delta \pi_n \\ \Delta \pi_1 & \ddots & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ \Delta \pi_1 & \Delta \pi_2 & \cdots & 0 \end{bmatrix} \begin{bmatrix} p_{m1} \\ \vdots \\ p_{mn} \end{bmatrix} \right) \quad (87)$$

where

$$DP_{nxn} = \begin{bmatrix} \frac{\Delta logP}{\Delta \pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta logP}{\Delta \pi_n} \end{bmatrix} \quad (88)$$

and

$$PM_{nxn} = \begin{bmatrix} 0 & \frac{\Delta log(P_x)_2}{\Delta \pi_2} \frac{M_{21}}{M_1} & \cdots & \frac{\Delta log(P_x)_n}{\Delta \pi_n} \frac{M_{n1}}{M_1} \\ \frac{\Delta log(P_x)_1}{\Delta \pi_1} \frac{M_{12}}{M_2} & 0 & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\Delta log(P_x)_1}{\Delta \pi_1} \frac{M_{1n}}{M_n} & \frac{\Delta log(P_x)_2}{\Delta \pi_2} \frac{M_{2n}}{M_n} & \cdots & 0 \end{bmatrix} \quad (89)$$

where DP_{ii} is $\frac{logP}{\Delta \pi}$ as calculated in equation (17) and $PM_{ij}$is calculated as:

$$PM_{ij} = \frac{\Delta log(P_x)_j}{\Delta \pi_j} \frac{M_{ji}}{M_i} = -(e_{Pxj} \frac{1}{1-e_{pj}} \frac{Yf_j}{Y_j} \frac{1}{rulc_j}) \frac{M_{ji}}{M_i} \quad (90)$$

Appendix E

Table E1. The marginal effect of a 1%-point increase in the profit share on net exports

	Exports								**Imports**					**Sum**
	$e(P)$	$\frac{1}{1-e(P)}$	$e(PX)$	$e(XP)$	$eX.rulc$	$rulc$	Y_f/Y	X/Y	$\frac{\partial X/Y}{\partial \pi}$	$e(M,P)$	$e(M,rulc)$	(M/Y)	$\frac{\partial M/Y}{\partial \pi}$	$\frac{\partial NX/Y}{\partial \pi}$
	A	B	C	D	E (B*C*D)	F	G	H	I(-E*G*H/F)	J	K(A*B*J)	L	M(-K*G*L/F)	I-M
A	0.524	2.099	0.152	-1.728	-0.551	0.599	0.874	0.291	0.234	0.341	0.375	0.306	-0.168	0.402
B	0.214	1.272	0.096	0.000	0.000	0.603	0.897	0.491	0.000	0.287	0.078	0.487	-0.057	0.057
DK	0.465	1.870	0.338	-0.627	-0.397	0.582	0.866	0.305	0.180	0.000	0.000	0.261	0.000	0.180
FIN	0.518	2.076	0.185	-0.576	-0.221	0.608	0.890	0.230	0.074	0.000	0.000	0.244	0.000	0.074
F	0.529	2.121	0.289	-0.439	-0.269	0.602	0.869	0.161	0.062	0.136	0.153	0.163	-0.036	0.098
D	0.366	1.577	0.333	-0.379	-0.199	0.600	0.913	0.207	0.063	0.000	0.000	0.195	0.000	0.063
GR	0.423	1.734	0.377	-0.729	-0.476	0.547	0.908	0.125	0.099	0.000	0.000	0.179	0.000	0.099
IRL	0.334	1.501	0.171	0.000	0.000	0.588	0.896	0.455	0.000	0.401	0.201	0.456	-0.140	0.140
I	0.445	1.802	0.257	-0.307	-0.142	0.586	0.913	0.165	0.037	0.210	0.169	0.165	-0.043	0.080
L	0.232	1.303	0.322	0.000	0.000	0.521	0.930	1.190	0.000	0.000	0.000	0.999	0.000	0.000
NL	0.461	1.855	0.370	0.000	0.000	0.634	0.916	0.428	0.000	0.139	0.119	0.385	-0.066	0.066
P	0.668	3.011	0.090	0.000	0.000	0.638	0.913	0.161	0.000	0.568	1.143	0.194	-0.317	0.317
E	0.430	1.754	0.320	-0.277	-0.155	0.614	0.913	0.149	0.034	0.244	0.184	0.144	-0.039	0.074
S	0.407	1.687	0.172	-0.508	-0.147	0.517	0.815	0.273	0.063	0.464	0.319	0.273	-0.137	0.200
UK	0.558	2.264	0.207	-0.518	-0.243	0.612	0.890	0.199	0.070	0.000	0.000	0.198	0.000	0.070

Notes: A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, L = Luxembourg, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

The marginal effect of a 1-% point increase in the profit share on exports (and imports) is -1*the effect of a 1%-point increase in the wage share

Appendix F. Robustness Checks for Investment

Table F1. Private investment: dependent variable $d\ ln(I)$ with total GDP, after-tax profit share and interest rate

	c	$dlog(\pi_t - 1)$	$dlog(\pi_t)$	$log(\pi_t)$	$log(\pi_t - 1)$	$dlog(Y_t)$	$dlog(Y_{t-1})$	$dlog(I_t - 1)$	$dlog(r_t - 1)$	$dlog(r_t)$	$\log(I_t - 1)$	$\log(Y_t - 1)$	$\log(rs_t - 1)(AR1)$	DW	$R2$	Sample
A	-0.025	0.155				1.873								1.944	0.547	1962-2013
	-2.908 ***	1.750 *				7.516 ***										
B	-0.025		0.431			2.059			-0.007				0.340	2.038	0.557	1963-2013
	-1.260		1.897 *			4.419 ***			-1.747 *				1.804 *			
DK	0.066				0.068	2.895			-0.008					1.827	0.742	1963-2012
	0.695				1.120	10.013 ***			-2.137 **							
FIN	-0.045	-0.078				2.143		0.227	-0.004					1.855	0.802	1963-2012
	-5.689 ***	-1.098				10.163 ***		2.743 ***	-1.863 *							
F	-0.010	0.171				2.066	-1.062	0.387						1.733	0.791	1962-2013
	-1.716 *	2.541 **				10.926 ***	-3.456 ***	3.181 ***								
D	-0.449		0.033			2.050		0.151			-0.203	0.210		1.711	0.780	1962-2012
	-4.709 ***		0.319			10.422 ***		1.802 *			-3.196 *	3.875 ***				
GR	0.033			0.034		1.948	-0.840	0.338						1.904	0.724	1962-2012
	0.699			0.969		10.312 ***	-2.533 **	2.455 **								
IRL	-0.046	0.363				1.770			-0.009	-0.008				1.993	0.593	1973-2013
	-2.551 ***	2.321 **				5.248 ***			-2.851 ***	-2.488 **						
I	-0.012	0.195				1.824	-0.831	0.341						2.082	0.649	1962-2013
	-1.549	1.974 **				8.111 ***	-2.346 **	2.509 **								
L	-0.029					1.728								2.410	0.273	1963-2013
	-1.420	0.160				4.172 ***										
NL	-0.316	0.109				2.671					-0.266	0.257	0.101	2.173	0.725	1962-2013
	-1.969 **	1.288				9.362 ***					-4.561 ***	4.350 ***	2.647 ***			
P	-0.041	0.025				2.116								2.025	0.485	1962-2013
	-2.819 ***	0.460				6.640 ***										
E	0.222				0.194	2.342							0.336	1.865	0.763	1961-2013
	1.237				1.438	14.625 ***							2.269 **			
S	0.098				0.105	2.281		0.274	-0.006					1.777	0.737	1963-2013
	1.149				1.621 *	9.214 ***		3.490 ***	-1.961 *							
UK	-0.470				0.057	2.262					-0.207	0.227		1.930	0.676	1961-2013
	-1.776 *				1.509	8.635 ***					-3.205 *	2.845 ***				

Note: A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table F2. Private investment: dependent variable d ln(I) with G in moving sum 3 years

	c	$dlog(\pi_t - 1)$	$dlog(\pi_t)$	$log(\pi_t)$	$log(\pi_t - 1)$	$dlog(Yp_t)$	$dlog(Yp_{t-1}$	$dlog(I_{t-1})$	$dlog(Gsum_t)$	$dlog(DY_t)$	$dlog(DY_{t-1})$	$log(I_{t-1})$	$log(Y_{t-1})$	$log(G_{t-1}))$	$log(\pi_{t-1}))$	$log(DY_{t-1}))$	$(AR1)$	DW	$R2$	Sample
A	-0.019	0.128				1.532			0.051									2.035	0.531	1963-2012
	-1.577	1.361				6.619 ***			0.114											
B	0.008	0.166				1.818			-1.130		-0.451							1.564	0.707	1971-2012
	0.713	1.070				7.645 ***			-2.552 **		-3.809 ***									
DK	-0.017			0.007		2.463			0.019									2.284	0.744	1963-2011
	-0.157			0.100		10.170 ***			0.055											
FIN	-0.510		-0.027			1.344				-0.140	-0.231	-0.483	0.265	0.336		-0.105		1.884	0.839	1972-2012
	-3.811 ***		-0.394			6.958 ***				-2.436 ***	-4.213 ***	-5.203 ***	3.081 ***	3.925 ***		-4.063 ***				
F	0.016	0.187				1.378			-0.512	-0.316								2.038	0.898	1978-2012
	2.078 **	2.871 ***				8.782 ***			-1.993 **	-4.698 ***										
D	-0.021		-0.043			1.565			0.112								0.313	1.968	0.739	1964-2012
	-2.130 **		-0.402			10.351 ***			0.374								2.155 **			
GR	0.114				0.181	1.906	0.789	-0.271	0.128									1.862	0.631	1963-2012
	1.130				1.825 *	5.932 ***	2.127 **	-2.021 **	0.274											
IRL	0.004	0.346				0.616			0.105	-0.331								2.002	0.530	1971-2012
	0.139	2.252 **				1.398			0.347	-2.752 ***										
I	-0.015	0.135				1.397			-0.222								0.324	1.765	0.634	1964-2012
	-1.423	1.749 *				7.925 ***			-0.590								2.245 **			
NL	-0.139	0.051				1.857			1.242			-0.348	0.316		0.169			2.184	0.711	1963-2012
	-0.871	0.553				8.565 ***			2.602 ***			-4.601 ***	4.307 ***		3.696 ***					
P	-1.765					2.709			0.437			-0.636	1.049		0.067	-0.259		2.055	0.704	1974-2012
	-3.090 ***					6.354 ***			0.761			-3.521 *	3.573 ***		2.015 **	-3.090 ***				
E	0.303				0.252	2.475			0.115								0.287	1.887	0.829	1964-2012
	2.411 **				2.705 ***	11.725 ***			0.466								2.093 **			
S	0.141				0.145	1.911		0.208	1.364		-0.153							2.076	0.813	1972-2012
	1.578				2.066 **	10.163 ***		2.025 **	1.732 *		-1.797 *									
UK	-0.439				-0.002	1.407				-0.211		-0.513	1.407	-0.239				2.094	0.817	1971-2012
	-1.850 *				-0.053	8.202 ***				-2.970 ***		-3.918 **	8.202 ***	-1.808 *						

Note: A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table F3. Private investment: dependent variable $d\ ln(I)$ and three separate government spending variables ($G_c; G_i; I_g$)

	c	$dlog(\pi_t - 1)$	$dlog(\pi_t)$	$log(\pi_t)$	$log(\pi_t - 1)$	$dlog(Yp_t)$	$dlog(Yp_t - 1)$	$dlog(I_{t-1})$	$dlog(Igc_t)$	$dlogIgc_{t-1}$	$dlog(Gc_t)$	$dlog(Gc_{t-1})$	$dlog(Gi_t)$	$dlog(Gi_{t-1})$	$dlog(DY_t)$	$dlog(DY_{t-1})$	$log(I_{t-1})$	$log(Yp_{t-1})$	$log(\pi_{t-1}))$	$log(Igc_{t-1}))$	$log(Gc_{t-1}))$	$log(Gi_{t-1}))$	$log(DY_{t-1}))$	*DW*	*R2*	Sample
A	-0.030	0.245				1.367			0.166				0.649											1.880	0.619	1971-2012
	-3.273 ***	2.451 **				5.382 ***			2.187 **				2.348 **													
B	0.735					1.528			-0.178							-0.610	-0.315		0.181	-0.189		0.529		1.983	0.866	1971-2012
	3.329 ***					8.176 ***			-2.634 ***							-4.562 ***	-6.328 ***		2.706 ***	-3.076 ***		6.565 ***				
DK	0.041				0.042	2.303	0.503			0.168	0.482			-0.761										1.955	0.828	1972-2012
	0.409				0.670	10.203 ***	2.024 **			1.840 *	1.992 **			-2.315 **												
FIN	-0.231		0.008			1.370				0.170					-0.122	-0.256	-0.473	0.265				0.287	-0.094	2.033	0.927	1972-2012
	-2.182 **		0.123			7.548 ***				2.642 ***					-2.269 **	-4.842 ***	-5.587 ***	3.247 ***				4.262 ***	-4.235 ***			
F	-1.233	0.103				1.421	0.389						1.128		-0.384		-0.207			-0.229		0.720	-0.150	2.120	0.941	1979-2012
	-3.777 ***	1.689 *				8.281 ***	2.848 ***						3.375 ***		-5.091 ***		-3.393 *			-3.649 ***		3.986 ***	-3.134 ***			
D	-0.017	0.017				1.651						-0.351												1.518	0.658	1972-2007
	-2.414 **	0.141				7.343 ***						-2.114														
GR	-1.519			0.030		1.648	1.142				0.338						-0.841	1.156		0.176		-0.290	-0.188	1.881	0.862	1971-2012
	-2.411 **			0.204		5.463 ***	3.879 ***				2.066 **						-5.532 ***	3.829 ***		2.439 **		-2.327 **	-3.677 ***			
IRL	-0.015	0.420				0.681							0.550		-0.296									1.893	0.570	1971-2012
	-0.564	2.789 ***				1.660 *							1.929 *		-2.671 ***											
I	-0.011	0.043				1.590					-0.535		0.443			-0.222								1.891	0.747	1971-2012
	-2.017 **	0.572				9.131 ***					-1.944 *		1.846 *			-1.810 *										
NL	-0.226	0.009				1.716	1.036		0.276		0.735						-0.412			0.197	0.373			2.146	0.794	1971-2012
	-2.633 ***	0.092				8.466 ***	3.181 ***		2.374 **		2.970 ***						-4.681 ***			3.232 ***	5.427 ***					
P	-0.022	0.018				1.790		-0.286						0.677	-0.229	-0.264								2.038	0.697	1975-2012
	-1.203	0.383				3.882 ***		-2.130 **						2.500 **	-1.678 *	-2.282 **										
E	0.694				0.104	1.934	-0.594			0.114					-0.250	-0.382	-0.253			-0.087	0.298		-0.039	1.654	0.964	1972-2012
	6.293 ***				1.766 *	7.822 ***	-2.311 **			4.120 ***					-3.642 ***	-5.190 ***	-6.005 ***			-4.503 ***	6.064 ***		-2.012 **			
S	0.093				0.103	1.761		0.414	0.458			0.451												2.056	0.861	1972-2012
	1.299				1.882 *	12.270 ***		6.018 ***	3.978 ***			2.725 ***														
UK	-0.238				-0.017	1.287		0.168		0.062					-0.314		-0.728	0.800			-0.256		-0.066	2.142	0.860	1971-2012
	-0.875				-0.408	7.891 ***		1.635 *		2.026 **					-4.384 ***		-5.192 ***	5.131 ***			-2.900 ***		-2.505 ***			

Note: A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Table F4. Private investment: dependent variable $d\ ln(I)$ with G in contemporaneous and lagged form, Reduced Sample 1960-2007

	c	$dlog(\pi_t - 1)$	$dlog(\pi_t)$	$log(\pi_t - 1)$	$dlog(Yp_t)$	$dlog(Yp_{t-1})$	$dlog(I_{t-1})$	$dlog(G_t)$	$dlogG_{t-1}$	$dlog(DY_t)$	$dlog(DY_{t-1})$	$log(I_{t-1})$	$log(Yp_{t-1}))$	$log(G_{t-1}))$	$log(DY_{t-1}))$	$(AR1)$	DW	$R2$	Sample
A	-0.021	0.141			1.279			0.793		-0.172							1.953	0.476	1971-2007
	-1.365	1.329			2.864 ***			1.733 *		-1.482									
B	-0.007	0.364			1.931			-0.418			-0.491						1.532	0.725	1972-2007
	-0.541	1.533			7.141 ***			-0.753			-3.811 ***								
DK	-0.026			0.016	3.270			0.492			-0.088					-0.383	1.809	0.807	1973-2007
	-0.330			0.326	13.105 ***			1.263			-2.459 **					-1.818 *			
FIN	-0.429		-0.011		1.555					-0.123	-0.270	-0.444	0.162	0.402	-0.103		2.098	0.920	1972-2007
	-2.978 ***		-0.150		6.563 ***					-2.118 **	-4.640 ***	-4.716 ***	1.624 *	4.498 ***	-3.994 ***				
F	0.017	0.222			1.319				-0.532	-0.327							1.776	0.894	1978-2007
	2.246 **	3.421 ***			7.330 ***				-2.983 ***	-5.335 ***									
D	-0.020		-0.052		1.536			0.037								0.297	1.938	0.668	1961-2007
	-1.646 *		-0.482		7.760			0.208								1.941 *			
GR	0.020			0.067	1.387			0.770									2.110	0.461	1961-2007
	0.261			0.876	4.452			2.098 **											
IRL	0.327	0.182				0.412				-0.698		-0.401	0.076	0.313	-0.130		1.892	0.526	1971-2007
	1.511	0.931				0.738				-3.344 ***		-2.753	0.777 *	1.966 *	-2.754 ***				
I	-0.016	0.109			1.242		0.238	-0.141									1.611	0.520	1962-2007
	-1.683 *	1.116			5.937 ***		2.043 **	-0.510											
NL	-0.036	0.231			1.550			0.617									1.716	0.483	1962-2007
	-2.445 **	2.222 **			6.114 ***			1.797 *											
P	-2.176	-0.030			2.218			0.758				-0.667	1.046		-0.148		2.146	0.720	1974-2007
	-4.056 ***	-0.672			4.612 ***			1.847 *				-3.723 **	3.686 ***		-2.002 **				
E	-1.476			0.077	1.765				0.460	-0.186	-0.254	-0.426	0.580			0.489	1.720	0.917	1973-2007
	-2.019 **			0.534	3.098 ***				2.316 **	-1.320	-3.169 ***	-3.257 *	3.116 ***			1.784 *			
S	0.154			0.152	1.821			1.461		-0.179							1.625	0.759	1971-2007
	1.626 *			2.053 **	6.015 ***			2.758 ***		-2.061 **									
UK	-0.668			0.008	1.200					-0.180		-0.531	0.650				1.929	0.746	1971-2007
	-1.775 *			0.194	6.352 ***					-2.236 **		-3.582 **	3.185 ***						

Note: A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

Appendix G

Table G1. The total effect of an isolated 1% point fall in profit share, a 1% point increase in government expenditure, a 1% point increase in capital taxation or a 1% point fall in labour taxation on investment and net exports

	Total effect of π on I / Y	*Total effect of π on NX / Y*	*Total effect of G on I/Y*	*Total Effect of G on NX /Y*	*Total effect of tr on I/Y*	*Total Effect of tw on I /Y*
Austria	0.054	-0.444	1.125	-0.482	-0.036	0.210
Belgium	-0.380	0.035	0.437	-0.639	-0.121	0.347
Denmark	0.078	-0.233	0.319	-0.218	-0.021	0.130
Finland	0.154	-0.138	2.045	-0.494	-0.043	0.645
France	-0.071	-0.119	0.265	-0.071	-0.106	0.545
Germany	0.243	-0.155	0.740	-0.414	-0.035	0.226
Greece	0.485	-0.210	1.828	-0.327	-0.134	0.345
Ireland	0.036	-0.213	0.810	-0.824	-0.012	0.526
Italy	-0.073	-0.084	0.315	-0.091	-0.062	0.088
Luxembourg	0.013	-0.104	0.084	-0.680	-0.004	0.017
Netherlands	-0.107	-0.128	0.987	-0.631	-0.125	0.252
Portugal	0.057	-0.345	1.563	-0.809	-0.035	0.835
Spain	0.622	-0.214	1.940	-0.297	-0.050	0.725
Sweden	-0.022	-0.270	1.461	-0.822	-0.054	0.282
United Kingdom	0.138	-0.140	0.345	-0.406	-0.022	0.241

Table G2. The total effect of a simultaneous 1% point fall in profit share, a 1% point increase in government expenditure, a 1% point increase in capital taxation or a 1% point fall in labour taxation on investment and net exports

	Total effect of π on I / Y	*Total effect of π on NX / Y*	*Total effect of G on I/Y*	*Total Effect of G on NX /Y*	*Total effect of tr on I/Y*	*Total Effect of tw on I /Y*
Austria	0.310	-0.020	1.455	0.065	-0.067	0.365
Belgium	-0.261	0.393	0.746	0.099	-0.150	0.488
Denmark	0.175	0.005	0.500	0.225	-0.038	0.215
Finland	0.369	0.186	2.967	0.058	-0.107	0.960
France	0.009	0.046	0.495	0.248	-0.124	0.635
Germany	0.312	-0.005	0.907	-0.047	-0.051	0.302
Greece	0.692	-0.055	2.268	0.002	-0.176	0.555
Ireland	0.122	-0.084	0.929	-0.488	-0.023	0.580
Italy	-0.013	0.156	0.487	0.406	-0.078	0.171
Luxembourg	0.138	0.372	0.416	0.577	-0.035	0.173
Netherlands	0.124	0.126	1.553	-0.010	-0.178	0.519
Portugal	0.164	-0.161	1.852	-0.485	-0.060	0.960
Spain	0.755	-0.076	2.288	-0.001	-0.084	0.884
Sweden	0.190	0.044	1.956	-0.308	-0.098	0.496
United Kingdom	0.175	-0.029	0.429	-0.190	-0.030	0.277
Average*	**0.20**	**0.036**	**0.92**	**0.045**	**-0.08**	**0.42**

* Change in each country is multiplier by its share in EU15 GDP

Table G3. Total effects of a policy mix on budget balance following an isolated change in each country

	1%-point fall in profit share	*1%-point increase in public spending*	*1%-point increase in taxation on capital income*	*1%-point fall in taxation on wage income*	*Combined effect on budget balance*
	A	***B***	***C***	***D***	***E***
Austria	0.044	-0.493	0.245	0.772	0.569
Belgium	-0.028	-0.927	0.271	0.637	-0.047
Denmark	0.085	-0.649	0.262	0.725	0.423
Finland	0.071	-0.445	0.258	0.728	0.613
France	0.081	-0.719	0.206	0.826	0.394
Germany	0.267	-0.545	0.275	0.848	0.844
Greece	0.005	-0.986	0.359	0.552	-0.070
Ireland	0.004	-0.984	0.304	0.597	-0.079
Italy	0.009	-0.789	0.300	0.646	0.166
Luxembourg	0.005	-0.970	0.409	0.527	-0.030
Netherlands	0.045	-0.543	0.220	0.812	0.535
Portugal	0.040	-0.610	0.245	0.824	0.499
Spain	0.508	0.074	0.255	1.080	1.917
Sweden	0.036	-0.744	0.288	0.571	0.151
United Kingdom	0.094	-0.858	0.261	0.717	0.214

Table G4. The effect of a 1% point increase in the wage share on annual inflation and nominal unit labour costs

	1% point increase in the wage share in isolation		1% point simultaneous increase in the wage share
	ULC $\Delta logULC/\Delta ws$	*Annual inflation* $\Delta logP/\Delta ws$	*Annual inflation* $\Delta logP/\Delta ws$
Austria	3.062	1.603	1.777
Belgium	1.893	0.405	0.700
Denmark	2.785	1.296	1.603
Finland	3.037	1.574	1.845
France	3.059	1.617	1.833
Germany	2.399	0.878	1.166
Greece	2.877	1.217	1.452
Ireland	2.288	0.764	0.875
Italy	2.807	1.249	1.442
Luxembourg	2.325	0.541	0.773
Netherlands	2.680	1.235	1.386
Portugal	4.307	2.877	3.102
Spain	2.605	1.120	1.362
Sweden	2.661	1.083	1.335
United Kingdom	3.289	1.836	2.066
Average	*2.805*	*1.286*	*1.515*

Table G5. Three Policy Scenarios with disaggregated government expenditure

	Scenario 1				Scenario 2				Scenario 3			
	All countries increase public investment (Ig) by 1% point				All countries increase government spending in social infrastructure (Gi) by 1% point				All countries increase other government spending (Gc) by 1% point			
	Excess Demand / Y	Multiplier	% change in aggregate demand (A*B)	The effects of a simultaneous 1%-point increase in Ig on % change in aggregate demand	Excess Demand / Y	Multiplier	% change in aggregate demand (E*F)	The effects of a simultaneous 1%-point increase in Gi on % change in aggregate demand	Excess Demand / Y	Multiplier	% change in aggregate demand (I*J)	The effects of a simultaneous 1%-point increase in Gc on % change in aggregate demand
	A	B	C	D	E	F	G	H	I	J	K	L
A	1.010	2.048	2.067	3.679	1.011	2.048	2.070	3.718	1.000	2.048	2.048	4.294
B	0.844	1.185	1.000	2.576	0.923	1.185	1.094	2.704	0.918	1.185	1.088	3.279
DK	0.997	2.191	2.185	3.391	0.994	2.191	2.177	3.410	1.008	2.191	2.209	3.890
FIN	0.729	4.682	3.412	7.698	0.729	4.682	3.412	7.794	0.720	4.682	3.372	9.344
F	0.796	3.395	2.703	3.868	0.885	3.395	3.005	4.182	1.841	3.395	6.249	7.721
D	1.000	2.256	2.256	3.208	1.000	2.256	2.256	3.233	0.993	2.256	2.241	3.625
GR	1.009	5.055	5.103	7.233	0.993	5.055	5.020	7.200	1.005	5.055	5.083	8.061
IRL	0.875	1.176	1.029	1.691	0.912	1.176	1.072	1.749	1.222	1.176	1.437	2.356
I	1.000	1.718	1.718	2.632	0.993	1.718	1.705	2.641	2.583	1.718	4.437	5.627
L	1.000	0.560	0.560	2.698	1.000	0.560	0.560	2.746	1.000	0.560	0.560	3.529
NL	1.020	2.760	2.816	5.999	1.001	2.760	2.763	6.022	1.017	2.760	2.806	7.273
P	0.875	3.460	3.026	4.601	0.876	3.460	3.032	4.643	0.875	3.460	3.026	5.219
E	0.923	4.680	4.321	6.109	0.950	4.680	4.446	6.272	0.988	4.680	4.624	7.161
S	0.936	3.239	3.033	5.767	0.916	3.239	2.966	5.764	0.562	3.239	1.820	5.669
UK	0.937	2.330	2.182	2.748	0.938	2.330	2.186	2.765	0.933	2.330	2.174	2.985
*EU15 GDP**				*3.71*				*3.80*				*5.15*

Note: Regressions for Luxembourg are based on estimation in Onaran and Obst (2016). Y_p hence refers to total GDP in this case. A = Austria, B = Belgium, DK = Denmark, FIN = Finland, F = France, D = Germany, GR = Greece, IRL = Ireland, I = Italy, NL = Netherlands, P = Portugal, E = Spain, S = Sweden, UK = United Kingdom

* Change in each country is multiplied by its share in EU15 GDP. See Appendix C for details.