The interaction of income distribution, aggregate demand and economic growth in the context of European imbalances

Thomas Obst

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Declaration

"I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of "Doctor of Philosophy (PhD)" being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarised the work of others".

PhD Student	PhD Supervisor
Thomas Obst	Prof. Ozlem Onaran
07.09.2016	07.09.2016

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But the wisdom that comes from heaven is first of all pure; then peace-loving, considerate, submissive, full of mercy and good fruit, impartial and sincere (James 3:17)

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ABSTRACT

Issues of income distribution, economic growth and development are back on the economics research agenda. Different parts of the economic discipline intend to contribute to the understanding of the link between income distribution and growth.

This thesis aims at analysing the interaction of income distribution, aggregate demand and economic growth in the context of European imbalances. It attempts to illuminate the key question whether it is possible to promote higher growth with a more equitable distribution of income in the case of Europe. First, it reviews the theoretical literature on the effect of distribution on growth and empirically estimates a multi-country demand-led growth model. Second, it conducts a critical literature review on the integration of fiscal policy into the Post-Kaleckian distribution and growth model. Third, it estimates the government-augmented model empirically. The time series econometric model applies a single equation approach and uses secondary longitudinal macroeconomic data for fifteen Western European Union countries (EU15) between 1960 and 2012.

The first paper aims to provide new empirical evidence for the EU15. In a second paper, the goal is to integrate government spending and tax policy into the Post-Kaleckian distribution and growth model. Finally, the goal is to empirically estimate the impact of a policy mix that combines wage policies with fiscal policies, based on the new model. The thesis thus brings concerns of equality and targeted public spending to the core of the analysis.

The thesis aimed to make three contributions to the field: First, it provided new empirical estimates for single EU15 countries as well as for a simultaneous decline in the wage share and highlighted whether there is an empirical basis for wage policy coordination. Second, it augmented the Post-Kaleckian model by a government sector and empirically tested it for the EU15 countries, which has previously not been done in the relevant literature. As a related theoretical and policy relevant contribution, the dissertation analysed the impact of a policy mix (wage and fiscal policy) not only on growth but also on investment, budget balance, trade balance and inflation. The empirical research went beyond a country-by-country analysis and integrated cross-country effects of a simultaneous decline in the wage share on demand in the EU15 countries in a unified government augmented model.

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LIST OF ABBREVIATIONS

Number	Abbreviation	Stands for
1	AD	Aggregate Demand
2	EC	European Commission
3	ECM	Error Correction Models
4	EU15	Fifteen Western European Countries
5	GT	General Theory
6	ITR	Implicit Tax Rates
7	MPC	Marginal Propensity to Consume
8	MPS	Marginal Propensity to Save
9	MS	Member States
10	NEG	New Endogenous Growth Theory
11	PK	Post-Keynesian
12	PKA	Post-Kaleckian
13	SEA	Single Equation Approach
14	ULC	Unit Labour Costs
15	VAR	Vector Autoregressive Model
16	VAT	Value Added Tax
17	WS	Wage Share

INTRODUCTION

Issues of income distribution, economic growth and development are back on the economics research agenda. At least since the outbreak of the Great Recession (2007-2009) and the difficulties in world recovery, particularly in the Euro area, there is a renewed interest in the subject. This is not only true for heterodox research output (Onaran and Galanis, 2014; Storm and Naastepad, 2012; Stockhammer et al., 2009) but also in the mainstream it has led to a resurge of interest (Berg et al., 2012; OECD, 2014; Ostry et al., 2014; Ostry, 2016). In the same spirit, major international institutions have conducted extensive research on the issue of income distribution (Foerster and Cingano, 2014; European Commission, 2007). Therefore, different parts of the economic discipline contribute to the understanding of the link between income distribution and growth. A quotation by David Ricardo reminds us that indeed income distribution was considered to be at the core and a relevant starting point of any economic analysis:

> "The produce of the earth – all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated. But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profit and wages, will be essentially different…To determine the laws that regulate this distribution is the principal problem in Political Economy [...]." (Ricardo 1951 [1821], p. 5)

However, Riccardo was not only concerned with the determinants of functional income distribution but also held the view that the development of the distribution of wages and profits directly affects economic development and growth (Hein, 2014). In this thesis, the focus is on the relationship between functional income distribution, aggregate demand (AD) and economic growth, rather than on the determinants of functional income distribution[1].

There has been a substantial decline in the share of wages in national income in both the developed and developing world. In contrast to conventional wisdom (Kuznets, 1955; Bourguignon, 1981; Barro, 2000; EC, 2006), this trend has been accompanied by lower GDP growth rates in many countries (Onaran and Galanis, 2014). While the European Commission (EC) (2006), in the spirit of mainstream policy, argues that wage moderation is the key to preserve employment and competitiveness in an internationally competitive economy, more recently, and in particular after the outbreak of the Great

[1] For a discussion on the determinants of the wage share see Hein (2014) or Stockhammer (2015).

recession a series of authors and institutions have called for a 'wage-led growth strategy' (Lavoie and Stockhammer, 2012).

In fact, the advocacy of a wage-led economic strategy goes back to the 19th century. 'Underconsumptionists' such as Malthus[2] or Hobson already pointed out the issues related to a falling wage share (WS). Keynes endorsed these ideas when he proposed his idea of effective demand, by Marxist authors pointing out problems of the realization of profits[3] and by Kaleckian authors who have brought these two different approaches together. Indeed, several Kaleckian and post-Keynesian (PK) authors have resurrected and developed the benefits of a wage-led growth strategy (Rowthorn, 1981; Taylor 1985; Dutt 1984). As Dray and Thirwall (2011, p. 466) succinctly write:

> "it makes little economic sense to think of growth as supply constraint if, within limits, demand can create its own supply."

The significant trend of increasing personal income inequality is also linked to the fall in the WS (Daudey and Garcia-Penalosa, 2007). The distribution of personal income depends on the distribution of labour and profit income[4]. If the distribution of capital is more unequal a fall in the WS would increase personal income inequality. The relationship between personal income inequality and growth, however, has been a subject of on-going controversy (Barro, 2000). Kuznets (1955) for instance argued that higher inequality would generate higher savings stimulating higher investment and thus enhanced growth performance, particularly in the early stage of development. In the later stage of development trickle-down effects would ensure higher per capita income and lower inequality overall. However, competing theories incorporating political economy arguments suggest other channels showing that inequality can hamper growth. Alesina and Perotti (1996) for instance find that inequality leads to political instability and more uncertainty, which impedes investment. Atkinson (2009) emphasizes the importance of analysing functional income distribution for understanding personal income inequality but also to address issues related to social justice, to take the classical problem of political economy forward to a 21st century treatment.

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[2] Bleaney (1976) categorizes Malthus and Hobson as 'underconsumptionists'. To Bleaney, the crucial feature of this theory relates to its prediction that a capitalist society has an innate tendency towards depression due to insufficient consumer demand. However, authors such as Malthus emphasized the role of savings rather than the crucial role of wages to create sufficient consumer demand.

[3] Bhaduri and Marglin (1990) argue that this essentially represents a reinterpretation of the underconsumptionist argument from a radical point of view.

[4] The distribution of personal income is also depended on other factors, in particular the tax and transfer system of the state (OECD, 2011). However, in this thesis the unit of analysis is the functional income distribution. In Chapter 5 implicit tax rates on capital and labour are introduced as well as social security benefits that can augment the disposable income of households.

The effect of income distribution on economic growth is of central relevance in PK economic theory (Dutt, 2011b). In economic paradigms that allow AD to influence long-run growth, a crucial question is how the distribution between wages and profits affects the components of AD and hence the growth rate (Blecker 2002).

In this context, this thesis analyses whether there is a conflict between growth and a more equitable income distribution[5] in the case of Europe[6].

Of course, there can be many other factors that determine AD and growth (Lavoie and Stockhammer, 2012). Monetary or fiscal policy can affect GDP growth. The burst of stock market bubbles or growth rates of foreign GDP alter economic growth. However, our argument is that if there are long-lasting structural changes in the income distribution, such as observed in most of Europe, they will end up playing a crucial role in determining growth.

This thesis analysis the relationship between income distribution and economic growth in the context of European imbalances. By European imbalances, we mainly refer to macroeconomic imbalances[7], in particular the current account imbalances that have been rising since the establishment of the European Monetary Union in 1999 and created structural problems in Europe that became apparent in the Euro crisis (Arestis and Sawyer, 2012; Dodig and Herr, 2015). The built up of significant current account imbalances can be linked to the divergent development of the level of unit labour costs (ULC) and thus competitiveness of individual EU15 member states (MS). In fact, the afore-mentioned wage moderation (internal devaluation via reducing wage costs) is one strategy initiated by the EC that aims to overcome these imbalances and restore competitiveness in the Euro area (EC, 2013; Dodig and Herr, 2015). However, this thesis outlines an alternative proposal of wage-led growth and argues that this strategy,

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5 In this thesis, income distribution relates to functional income distribution, that is the share of wages and profits in national income. We will also focus on changes in functional income distribution, because it allows us to aggregate the effects of increasing inequality on demand. A more equitable distribution might be defined as reversing the broad changes in the distribution of income in industrialized countries over the past three decades. Certainly, this will be country specific.

6 In this thesis, the term 'Europe' is used as a shorthand for the European Union, which is comprised of 28 Member States. However, due to data limitations the empirical analysis is restricted to the EU15 countries that joined the Economic and Monetary Union including three countries (Denmark, Sweden, and the UK) that did not adopt the Euro in 2002.

7 We do not explicitly consider financial imbalances such as private credit dynamics or the diversion in yields on long-term sovereign bonds (Lane, 2012). Further macroeconomic imbalances include the divergent growth and unemployment rates. Hence, as argued in Arestis and Sawyer (2012) there has been no 'real' convergence but only nominal convergence criteria (e.g. debt levels). Also, the focus is on intra-euro area imbalances between the European countries and not with the rest of the world.

implemented in a coordinated fashion, can foster the reduction of the significant macroeconomic imbalances and help to overcome sluggish growth in the EU15 MS.

The research in this thesis analyses the distributional effects on AD and hence economic growth through the lens of macroeconomic models in a post-Kaleckian/PK tradition[8], as has been formally developed by Dutt (1984), Taylor (1985), and Bhaduri and Marglin (1990). They provide a unifying framework to illuminate whether and under what conditions it is possible to promote higher employment and faster growth with a more equitable income distribution. The Post-Kaleckian (PKA) distribution and growth models include the direct positive effects of higher profits on investment and net exports, but contrast these positive growth effects with the negative effects on consumption. The total effect of the decrease in the WS on AD then depends on the relative size of the reactions of each component. If the total effect is negative, the demand regime is called wage-led and otherwise profit-led (Stockhammer et al. 2009; Onaran and Galanis 2014). In order to focus on the determinants on AD the analysis in this thesis takes the functional income distribution and supply-side conditions (e.g. total factor productivity) as exogenously given[9].

The applied econometric model uses secondary longitudinal macroeconomic data for Western European Union countries (EU15) provided by the annual macro-economic database of the EC. The estimation period is between 1960 and 2012. The research applies a single-estimation approach for the components of AD pioneered by Bowles and Boyer (1995) and later used by Stockhammer et al. (2009), Hein and Vogel (2008) and Onaran and Galanis (2014) among others.

The first paper estimates the effects of a change in the WS on the components of private AD, namely consumption, investment and net exports. First, the effects are estimated for every EU15 country in isolation. Next, the paper estimates a European-wide multiplier in order to gauge the effects under a simultaneous decline in the WS. The question is what happens to AD when there is a simultaneous decline in the WS in EU15 countries. A related one is whether countries that are profit-led in isolation would stop

[8] Post-Keynesian tradition in this context comprises a wide array of works. Harcourt and Kriesler (2013) compile a collection of articles providing a standard reference of current thinking among Post-Keynesians including issues such as income distribution and macroeconomic outcomes, market power or path dependence. King (2015) outlines distinctive features of Post Keynesian economics. Hein (2014) provides an accessible version of Post-Keynesian growth and distribution theories after Keynes and Lavoie (2014) provides an advanced overview of the current state of research in PK economics.

[9] A series of papers have introduced endogenous productivity growth in the basic Kaleckian model (e.g. Storm and Naastepad, 2012 or Dutt, 2013). However, in this thesis, we abstract from changes in productivity growth.

growing, or even contract, when all other countries are experiencing a simultaneous decline in the WS. The novelty of this paper is that it makes an original empirical contribution to knowledge by providing new estimates for single EU15 countries rather than for a hypothetical aggregate of the Eurozone countries as in Stockhammer et al. (2009). Also, it provides new estimates for a simultaneous decline in the WS based on the interaction between these countries.

Therefore, it goes beyond an empirical contribution and can also enrich the policy debate by delivering new empirical evidence, particularly on small open economies such as Belgium or Denmark, and highlighting whether there is an empirical basis for wage policy coordination to avoid 'beggar thy neighbour' policies.

The second paper develops a theoretical model that integrates government spending as well as the distributive impact of tax policy into the Post-Kaleckian demand-led growth model used in the first paper. We highlight the role of expansionary fiscal policy, particularly through increasing public investment, as an additional method of expanding AD and output[10]. In addition to the positive AD effects of government spending, we also consider positive crowding in effects of different spending categories that stimulate private investment by improving the business environment. A progressive tax policy[11] and hence a more equal income distribution of income potentially stimulates demand, capital accumulation, and hence growth. Hence, this literature complements workings through the supply side with those working through the demand side. In this context, the issue of fiscal policy is linked to the relationship between a change in income distribution, AD, and economic growth.

Previous research has continually applied a private sector open economy model leaving government activity aside. To the best of our knowledge, empirical analysis in this field is still lacking and hence presents a research gap we wish to bridge. In this context, we aim to present a unified model that highlights the role of wage and fiscal policy coordination in demand, accumulation and growth.

The third paper empirically analyses the theoretical implications of the second paper and test its presumptions. It estimates a multi-country PKA model augmented by a government sector with public spending and taxes on consumption, labour and capital

[10] Keynes, (1973 [1936]) recognised that there are 'two ways to expand output'.

[11] In this thesis, we define a progressive tax policy as in Blecker (2002). Hence, the term 'progressive' here implies a shift of the tax burden from labour to capital, and not, as commonly defined as a policy where tax rates rise relative to personal income (all types of income). Tax policy is thus viewed as progressive if taxes on capital are increasing while those on labour are decreasing.

for the EU15. We estimate country specific equations to find the effect of a change in functional income distribution and public spending on the components of private AD, namely consumption, investment and net exports. Next, the paper estimates a Europe-wide multiplier based on the responses of each country 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. The novelty of this paper is that it goes beyond a country-by-country analysis and integrated cross-country effects of a simultaneous decline in the WS on demand in Europe in a unified government augmented PKA. The fiscal multiplier effects are estimated and expected to be much stronger when policies are implemented simultaneously.

The main thrust of this dissertation is thus on wage and fiscal policy. Whereas the first paper aims to contribute to the policy debate on wage coordination, the second paper aims to enhance our understanding of government spending and distributional tax policies and hence contribute to the policy debate on fiscal policy coordination[12]. The interaction between distribution, AD and growth will be at the heart of this thesis.

This thesis excludes issues of household debt and wealth such as presented in Hein and van Treeck (2008)[13]. It does not consider the link between personal and functional income distribution in the context of wage-led growth models such as in Carvalho and Rezai (2014) or in Palley (2014a). Furthermore, we do not differentiate between demand and productivity regimes such as in Storm and Naastepad (2012). We also do not integrate issues of financialisation into our models such as in Hein (2012). Also the increasing polarization of the personal income distribution and its effects on growth such as in Alesina and Rodrik (1994) are not the focus of this thesis.

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[12] The second major strategy of the EC is based on a short term approach that focuses on fiscal austerity and thereby complying with the rules of the Stability and Growth Pact (Dodig and Herr, 2015).In contrast, this thesis also presents an alternative proposal of expansionary and coordinated fiscal policy in the EU15 countries. Hence, we present an alternative policy strategy to both the wage restraint and the fiscal austerity argument.

[13] The omission of household debt will affect the empirical results presented in chapter 3 and chapter 5 regarding the difference in marginal propensities to consume between workers and capitalists. An increase in debt counts as dis-savings and augments the disposable income of households. Hence, it can for instance reduce the fall in consumption following a fall in the wage share (Carvalho and Rezai, 2015). In the context of a demand-led growth model Kapeller and Schütz (2015) show the possibility of a consumption-driven profit-led regime. Dutt (2006, 2012) also shows that debt-led consumption has positive effects on output in the short run. It thus might lead to 'perverse distributional effects' of a falling wage share on consumption, which was found in some empirical papers (Stockhammer and Stehrer, 2011; Barbosa-Filho and Taylor, 2006). However, since saving rates cannot be negative forever, such a constellation might be only temporary, pointing to the inherent instability of such a scenario (Kapeller and Schütz. 2015; Hein and van Treeck, 2008). Due to limited data availability this thesis will not integrate household debt but recognizes the importance of household debt with regards to the consumption function.

The dissertation is structured as follows: in chapter 2 we review the literature on the effects of distribution on growth comparing two different schools of economic thought and discuss the main theoretical framework of this thesis. In alignment with the research question of this thesis we discuss the effects of increasing income inequality under the different economic paradigms. We provide arguments why PK distribution and growth theory, and in particular its PKA representation matters in modern economics and is chosen as the main theoretical framework in this thesis. In chapter 3, we present a multi-country demand-led growth model for the EU15 countries presenting our data and stylized facts, discussing the findings of the first paper and comparing our results to the empirical literature. Both chapters also outline how we see the research developing in this thesis.

In chapter 4 we briefly review the debate on crowding in versus crowding out as well as the empirical fiscal multiplier literature. We discuss the integration of tax policy and government spending in the PK literature, and highlight the relevant arguments for extending the PKA workhorse model of this thesis. In chapter 5, we present and estimate multi-country demand-led growth model augmented by fiscal policy for the EU15 countries. We present our data and stylized facts and discuss the empirical findings.

Chapter 2

Chapter 2 - LITERATURE REVIEW ON THE EFFECT OF DISTRIBUTION ON GROWTH

1. Introduction

This chapter presents a review of the theoretical work on the effect of distribution on growth. First, we outline and compare fundamental assumptions and characteristics of primarily two schools of economic thought: Neoclassical and PK economics. The aim is to crystallize how the neoclassical paradigm integrates the effects of increasing income inequality into its theoretical framework in comparison to the PK theory. Second, we discuss the PK/PKA model, which forms the main theoretical framework of this thesis, in the context of PK distribution and growth theories[14]. In alignment with the research question of this thesis we also discuss the effects of a change in functional income distribution on economic growth in alternative growth theories. In other words this chapter presents the paradigmatic differences regarding the nexus between income distribution and economic growth. Last but not least, we shall provide arguments why PK distribution and growth theory, and in particular its PKA representation matters in modern economics and serves as the prevalent model in this thesis.

In reviewing distribution and growth theories, a first question is whether the respective schools of thought postulate any connection between income distribution, output and growth. The second question is about the specific nature of this relationship, which invites several sub-questions: How is income inequality integrated in each paradigm? What kind of income inequality (e.g. functional or personal income distribution) is discussed? How does causality run? Is there a certain impact running from growth to income distribution or is the latter determined by other factors, and rather impacts on economic growth in an economy? Are they mutually dependent on each other? What are the determinants of growth in each paradigm? What is the macroeconomic framework (assumptions) applied in the different schools of thought? How do both theories treat the role of wages in an economy?

In covering the development of distribution and growth theories we focus on the main strands and contributing authors and derive the main theoretical cornerstones under each school of thought.

[14] The model is a hybrid model that combines features of PK and Kaleckian theory in regards to distribution and growth. It is PK because it emphasizes the role of income distribution for aggregate demand and adheres to the principle of effective demand (Hein, 2014). The model is PKA because it adds a Kaleckian mark-up pricing theory as well as an independent investment function and considers open economy issues such as in Dutt (1984), Taylor (1985), and Bhaduri and Marglin (1990). It integrates the Kaleckian paradox of cost (Lavoie, 2014) in addition to the paradox of thrift well-known in the PK literature (Kaldor, 1957; Robinson, 1962). We will outline more details on this in section 3.

The neoclassical approach, discussed in section 2, explains both income distribution and growth in a unified and integrated framework, which starts from 'first principles' that constitute the foundations of this economic paradigm. These include exogenous production technologies, utility functions, initial endowments of economic agents and the crucial assumption of utility and profit maximising behaviour of households and firms that operate in perfectly competitive markets. In neoclassical theory, the technology of production determines the relevant incomes shares of the factors of production and initial endowments lead to a certain personal or household distribution of income.

In contrast to mainstream approaches, PK growth and distribution theories develop an independent theory of distribution in order to determine equilibrium relative prices which require the integration of specific institutional, historical and societal settings. Income distribution, capital accumulation and growth are interrelated. However, they can be related to each other in different ways. All PK growth theories are united by the adherence to Keynes and Kalecki's principle of effective demand. Under this economic theory, investment is independent of previous savings and is the driving force in the growth process. Firm's investment determines the utilization of existing capacities as well as creates additional productive capacities. Therefore, the analysis of the determinants of investment plays a key role in these models.

In Section 2, we start by outlining old and new neoclassical growth theory, followed by an overview on recent research incorporating political economy in the mainstream literature. In Section 3, we introduce PK distribution and growth models with a focus on its PKA variant, which represents the 'work-horse' model in this thesis. We also show several extensions to the basic model and briefly review the empirical research that has been triggered by this literature. Section 4 concludes by problematizing the neoclassical assumptions and contrasting them to the theoretical framework of PK distribution and growth models.

2. Neoclassical Growth Theory

The neoclassical paradigm started in the 1870s, attempting to further the classical price, distribution and growth theory[15]. This led to a complete shift from the focus of

[15] Works by Stanley Jevons, Carl Menger and Leon Walras constituted this path-breaking change in distribution and price theory.

classical political economy[16] that was concerned with the functional distribution of income, capital accumulation and growth dynamics to the emphasis of static optimal allocation equilibrium (Hein, 2014). One of the most distinct differences to the classical theory was the explanation of prices through a consideration of subjective demand behaviour of 'pre-societal' individuals. This is in stark contrast to the classical school that assumed that prices are determined by more objective factors, namely via the process of production (Heine and Herr, 2013)[17].

The neoclassical approach provides a theory of distribution that is inherent to the general equilibrium price theory, based on 'first principles' (Hein 2014). These are based on an exogenous production technology and given utility functions, given initial endowments and the assumption of strictly maximising behaviour of individuals in perfectly competitive markets[18]. Furthermore, neoclassical economists distinguish between the real sphere on the one hand and the monetary sphere on the other hand. All relevant variables are determined in the real sphere, except the general price level (Heine and Herr, 2013)[19].

Classical as well as neoclassical economic theory place great faith in 'natural market mechanisms[20]' that automatically maintain (or quickly restore) full employment (Snowdon and Vane, 2005). In these economic models markets always clear and Say's law[21] of markets prevails. Similarly, standard classical-Marxian growth theories also do not allow AD to affect the long-run growth rate of the economy (Dutt, 2011a)[22].

There are two generations of neoclassical growth models, which are outlined in section 2.1. and 2.2. We discuss basic versions of these models and focus on the role of income distribution as well as the explanation of economic growth in these models. In

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16 Works of Adam Smith and David Ricardo represented this school of thought in particular.

17 Eventually, prices were measured through the amount of working hours that enter into the production process of a certain commodity. In other words, value originates in labour time, rather than in demand behaviour of individuals.

18 Households maximise their utility and firms maximise their profits.

19 The Keynesian school of thought rejects this dichotomy and argues for a monetary production economy.

20 In this context, 'natural markets' would be seen as an unfettered market (Mankiw, 1989). Natural market mechanisms thus include market forces that bring back the economy to equilibrium without the need for government intervention. For instance, the adjustment of relative prices to equate aggregate demand and supply (e.g. full utilisation of factors of production) or the optimization of rational economic agents. In this view, market failure would be absent. The term 'natural' also refers to the classical dichotomy that tries to separate real forces from monetary forces, e.g. as reflected in the use of the concept 'neutrality of money' in the well-known AS-AD textbook model (Sawyer, 2011).

21 Say's law refers to the statement that supply creates its own demand. It was set forward in the context of a barter economy (Snowdon and Vane, 2005).

22 Models of growth in the classical-Marxian tradition tend to be close to neoclassical growth theory as they take growth to be supply-side determined and hence adhere to Say's law. Issues of aggregate demand are either ignored altogether or related only to the short run. Even though Marx recognised the possibility of a realisation crisis he did not develop a theory of growth the emphasized the role of aggregate demand.

section 2.3 we summarize both generations of neoclassical growth models. In section 2.4 we give an overview of more recent approaches incorporating political economy concepts to the analysis of income inequality and growth in mainstream economics.

2.1. Old Neoclassical Growth Theory: Full Employment Growth with Exogenous Technology

In the 1950s, Robert Solow and Trevor Swan introduced what is now known as 'old neoclassical growth models' (Solow, 1956; Swan 1956). This section outlines (I) the properties and assumptions of the Solow model, (II) what it tried to explain, and (III) what led to a rise of new endogenous growth theory (NEG). Our main aim is to illustrate the main features of the model and subsequently compare it to the PK models of distribution and growth applied in this thesis[23].

The Solow model can be characterized as a full employment growth model with exogenous technological progress[24]. First, it is assumed that the labour force grows at a constant rate. The second assumption is that savings (identically) equal investment. All savings are reinvested and hence no independent behavioural investment function exists. The third assumption is that output (represented by one homogenous good) is a function of capital and labour, with the production function exhibiting constant returns to scale, but diminishing returns to individual production factors (Jones, 2005). All factors of production (capital and labour) are fully utilized and the neoclassical principles (e.g. given resources and preferences of households) are assumed[25]. Furthermore, there is no international trade in the model and only one commodity is produced (Jones, 2005).

The Solow model tried to gain insight into the underlying factors of world economic growth as well as to explain cross-country differences (Jones, 2005). In essence, the Solow model is based on two equations, a production function and a capital accumulation function (Jones, 2005, pp. 22-36).

We start with the neoclassical production function and include technological progress right away. As is widely used in text books, a Cobb/Douglas production function[26] is

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[23] Hence, we will not derive the full model in every detail, but rather focus on the main aspects and conclusions of the model.

[24] That is, technology is unaffected by the actions of the firms, including research and development.

[25] In a historical context, Solow intended to examine and interpret Harrods's (1939) instability theorem and hence provide an alternative to the Harrod and Domar line of thought. Due to reasons of space, Harrods's analysis cannot be outlined here.

[26] In this production function, the multitudes of factors that are present in the Walrasian model are reduced to only two: labour and capital. Constant returns to scale imply that if all inputs are doubled output will exactly double too (Jones, 2005). Note also, that under profit-maximising conditions firms will only hire labour until the marginal product of labour is equal to the wage cost and will rent capital until the marginal

illustrated. Real output (Y) is dependent on two factors: labour (L), with the partial elasticity of production (1-α), and capital (K), with the partial elasticity of production (α), augmented by the level of technology (T).

$$Y = F(TK, L) = (TK)^{a}(L)^{1-a} \tag{2.1.}$$

Following this equation, it can be seen that real output is derived as the sum of two inputs labour and capital, each weighted by their respective elasticities of production where α is a value between 0 and 1[27]. Technological change is modelled as an exogenous, 'Hicks-neutral' term[28]. The elasticities determine the WS and profit share respectively. For the actual growth rate of real output ($\dot{Y}$) we obtain:

$$\dot{Y} = a\,\dot{K} + (1-a)\dot{L} + \dot{T} \tag{2.2.}$$

The growth rate is now given by the sum of the growth rate of the capital stock ($\dot{K}$) and growth rate of the labour force ($\dot{L}$) (each weighted by their respective elasticities of production), and the growth rate of total factor productivity ($\dot{T}$)[29]. A crucial assumption is that the labour force growth rate is assumed to be constant (equal to the population growth rate). Output per worker is derived by $y = Y/L$ and $k = TKL/L$ which yields:

$$y = T\,(k) \tag{2.3.}$$

where output per worker depends positively on the level of technology (T) and capital per worker (k)[30]. The second equation is the capital accumulation function, which is given by:

$$K = sY - dK \tag{2.4.}$$

Consumers save a constant fraction (s), of their combined wage and rental income (Jones, 2005). The capital stock (K) depreciates every period by a constant fraction (d). A change in the capital stock is thus equal to the amount of gross investment (sY), less the amount of depreciation that occurs during the production process(dk). The crucial assumption here is that saving equals investment (in a closed economy) ($I = sY$). The evolution of capital per person is given by:

$$k = sy - (n+d)k \tag{2.5.}$$

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product is equal to the rental price (Solow, 1956; Jones, 2005). Also the factor shares of labour and capital are assumed to be constant over time.

[27] The assumption of constant returns to scale is thus represented by $\alpha + (1-\alpha) = 1$.

[28] In this model, technology falls like 'manna from heaven'. As a result, it could be characterized as a public good that allows each firm to have equal access to it, without restricting any other firm. It is not linked to a specific factor of production and hence cannot be accumulated (e.g. through R&D). This assumption will be relaxed in new endogenous growth theory.

[29] Technical change is calculated as a residual in growth accounting (Solow, 1957).

[30] It should be noted that one of the inventions of the Solow model in the 1950s was the possibility to integrate the time dimension. In a dynamic context we would denote $\dot{y} = \frac{dy}{dt}$ (Jones, 2005).

According to this equation, the change in capital per worker is positively related to gross investment, and negatively related to population growth (n) and the depreciation of the capital stock (dk). If we disregard depreciation and population growth the accumulation growth rate is:

$$\dot{K} = \frac{dK}{K} = \frac{sY}{K} = \frac{s}{v} = g_w \tag{2.6.}$$

where the warranted growth rate (g_w) of the capital stock is given by the change in the capital stock over a certain period (dK/K) and can be further decomposed into gross investment over the capital stock (sY/K) and as a ratio of the propensity to save ($s = S/Y$) and the capital-potential output ratio ($v = K/Y$), assuming the normal rate of utilization to be equal to one. Hence, in the neoclassical model, households' savings decisions determine the accumulation and growth process.

A growth equilibrium (steady state) is reached when the growth rate of real output ($\dot{Y}$) stays constant. This requires that the equilibrium growth rate of the capital stock ($\dot{K}$) stays constant (together with the outlined assumptions of the production function). Hence, the equilibrium conditions yields:

$$\dot{Y} = \dot{K} \tag{2.7.}$$

Plugging this equilibrium condition into equation (2.2.) gives:

$$\dot{Y} = \dot{L} + \dot{T} \tag{2.8.}$$

where the exogenously given growth rate of labour ($\dot{L}$) and the exogenous growth rate of total factor productivity determine the equilibrium growth rate (steady state) of real output. Next, we discuss main predictions that follow from this model.

First, in the steady state, the level of output per worker (y) is positively related to gross savings and investment (sY)[31] but negatively related to population (or labour force) growth (n). However, there are diminishing returns to capital so that each additional unit of capital per worker increases output by less. Technology (e.g. increased labour productivity) can offset the diminishing returns to capital (Jones, 2005). Second, the steady state (equilibrium) growth of output is independent from (sY) but is determined by the exogenously given rate of growth of the labour force[32] and technology. Third, poor countries should grow faster than rich countries (inverse relationship between

[31] If consumers decide to increase savings and hence the investment rate this will lead to so-called capital deepening. Investment per worker exceeds the amount required to keep capital per worker constant.

[32] Output grows if the capital stock per worker (k) is below its steady state (equilibrium growth rate) and slows down as the economy approaches this steady state value. A higher savings-investment ratio would be offset by a higher capital-output ratio (due to diminishing returns to capital).

capital-labour ratio and the productivity of capital), leading to convergence of per capita incomes in the world (Thirlwall, 2003).

One crucial aspect of the model is the so-called 'balanced growth path', which outlines the conditions of a steady state in this model (Jones, 2005):

$$g_y = g_k = g \tag{2.9.}$$

That is, output per worker (g_y) and capital per worker (g_k) both grow at the rate of exogenous technological change (g). Therefore, the model shows that technological progress is the main source of sustained per capita growth[33].

To sum up, according to the Solow model, countries that have high savings/investment rates will, ceteris paribus, tend to be richer while countries with high population growth rates will tend to be poorer. The long-run equilibrium growth rate is exogenously determined and does not depend on economic choices. In contrast, the long-run equilibrium level of output is affected by the savings and investment decisions, which are identical in this model. As a result economic policy is helpless to affect the long-run productivity growth but can be employed to alter the country's propensity to save and hence to invest in the capital stock.

Several weaknesses about the assumptions and simplifications of the Solow model have been pointed out in the literature. For instance, the absence of an independent investment function or the assumption of flexible factor prices has been criticised. However, we will outline this criticism in more detail in the conclusion of this chapter below.

2.2. New Endogenous Growth Theory

The unsatisfactory treatment of technological progress as an exogenous variable gave rise to a second generation of growth models[34], which were developed in the 1980s. These models attempt to explain productivity growth within the model, the major difference being the relaxation of the assumption of diminishing returns to capital (Thirlwall, 2003). In this context, the authors apply the neoclassical 'lenses of scarcity' and relate technological progress to preferences and technology (Hein, 2014).

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[33] In a model without technological progress the exogenous rate of the labour force determines the equilibrium growth rate of real output.

[34] In fact, Solow (1957) analysing growth performances, was the first to conclude that only roughly 12 per cent of the growth of output per worker could be explained by the growth capital per worker, leaving around 88 per cent of growth to be explained by forms of technical progress. Moreover, the model had difficulties in explaining some of the stylized empirical facts of the real world. Studies showed that, contrary to the prediction of neoclassical growth theory that there was no convergence of per capita incomes, at least not in the world economy as a whole (Baumol, 1986).

NEG theory attempted to explain differences in output growth and living standards (non-convergence) across the globe (Thirlwall, 2003). In a nutshell, the explanation includes forces that prevented the marginal product of capital from falling. Paul Romer (1986) suggested externalities to research and development expenditure (R&D). Robert Lucas (1988) focused on externalities related to human capital formation (education). Other authors concentrated on technology spillovers from trade, the role of foreign direct investment (FDI), or other types of infrastructure investment (e.g. Grossman and Helpman, 1990). NEG theory thus focuses on the contribution of knowledge and innovation to economic growth[35]. Investment takes place in an environment with increasing returns to scale. In each of these variants, it is endogenous saving choices of the community that determine different growth experiences (Hein, 2014).

In what follows, we briefly outline the NEG theory in its simplest form of the so-called AK model. It represents a very early version of NEG theory and hence has been subject to debate whether it is well supported by empirical evidence (Jones, 1995; McGrattan, 1998). However, it will be sufficient to illustrate main features of this theory and indicate how the role of income distribution might play a role in this model[36].

The AK model illustrates the idea that technological progress and productivity growth are an unintended outcome of production and investment at the firm level. Romer (1986) argued that so-called knowledge spillovers occur when single firms accumulate capital and produce output. These knowledge spillovers represent positive externalities because they increase the general level of knowledge available to all firms. The crucial point is that this allows for a treatment of the above introduced production function with constant returns to scale and diminishing returns to capital (Hein, 2014). In NEG theory, production functions for the economy as a whole exhibit rising returns (due to these positive externalities) and thus compensate for the falling returns to capital at the firm level.

Long run growth is driven by knowledge spillovers and defined as:

$$Y = AK_B \tag{2.10.}$$

where (Y) is real output, (A) is a constant, which implies a constant proportional relation between output and broad capital (K_B), including physical and human capital. In other words, there are constant returns to capital. Assuming investment in physical and

[35] Kaldor (1957) already emphasized the role of investment in long-run growth.

[36] Regarding the effects of income distribution on growth it should be emphasized that this mainly is a more heterodox interpretation following for instance Hein (2014). As we show in section 2.4 personal income inequality has been introduced only more recently by empirical research that applies NEG theory.

human capital to be equal to savings ($I_B = sY$) and since (A) is a constant we can rewrite:

$$g_n = \frac{dY}{Y} = \frac{I_B}{K_B} = \frac{sY}{K_B} = sA \tag{2.11}$$

where the natural rate of growth g_n is decomposed into gross investment over broad capital (I_B/K_B), which is equal to s_Y/K_B and reflects the savings for a given productivity of broad capital (sA).

It can be seen that, assuming a constant productivity of broad capital, savings and investment have a permanent effect on the natural rate of growth[37]. Therefore, non-convergence of long-run growth rates among countries comes about through different propensities to save and invest (in capital stock and human capital). The crucial component of any endogenous growth model is the constant return to capital that can be accumulated.

Whereas the old neoclassical growth model postulates an exogenous long-run equilibrium natural rate of growth and an endogenously determined equilibrium real profit rate (Hein, 2014) this causality is now reversed[38]. From equation (2.10.) we can derive the marginal product of broad capital (A), which determines the rate of profit (r), if we assume remuneration based on marginal productivity:

$$\frac{\partial Y}{\partial K} = A = r \tag{2.12.}$$

Inserting this into equation (2.11) we receive:

$$g_n = sA = sr \tag{2.13.}$$

Hence, the natural rate of growth is determined by the production technology (A) and the propensity to save out of profits (s). From this follows, a higher average propensity to save would lead to a higher long-run rate of growth. Hein (2014) states that (in this model) redistribution in favour of capital incomes (or high income households) should be conducive to higher long-run equilibrium growth rates. The reason being that high-income household's propensity to save exceeds the propensity to save of low-income households. Kuznets (1955) in a well-known paper argued that the relationship between

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[37] In fact, it was Harrod who first formally introduced the concept of a natural rate of growth into economic theory, which he also framed the ‚social optimum rate of growth' (Thrilwall, 2002, p. 79).

[38] In the old neoclassical growth theory income distribution is static (technology determined by the partial elasticities of production of capital and labour; technology itself being exogenous). However, in the AK model, due to positive externalities, the production function for the economy as a whole can exhibit rising returns to scale, e.g. through knowledge spillovers (Hein, 2014). For instance, human capital accumulation or R&D expenditures enhance the growth performance (e.g. economic policy can alter these outcomes). Hence income shares might change through an increase in output but it is not specified how this might take place. Income distribution (e.g. inequality) is introduced as in Alesina & Perotti (1996) or Aghion et al. (1999) exclusively through supply side channels, which we will review in section 2.4. below.

personal income distribution and economic development is hump shaped. During the course of economic development inequality will increase in the beginning and tend to fall at a later stage of development[39]. Hence, income and wealth distribution will affect economic growth.

2.3. Brief Summary

Neoclassical macroeconomics that underpins both growth models implies that demand plays no independent role and household's savings determine available investment. One key difference between old and NEG theory is the impact of savings on output as well as the growth rate. As has been shown, in the Solow model a fall in the propensity to save will lower the level of output only temporarily but will not affect the long-run (steady-state) growth rate, which is determined exogenously. Changes in the investment rate (and the population growth rate) thus do not affect the long-run growth rate of output per worker and policies in the Solow model only temporarily increase the level of output, but have no long-run effects.

In contrast, in NEG theory a decrease in the propensity to save does affect the growth rate of the economy. Higher inequality should be growth enhancing because high-income households have a higher propensity to save. NEG puts the contribution of knowledge and innovation to economic growth into the centre of their analysis. The assumption of diminishing returns to capital of the old growth model is relaxed in NEG theory. Here, constant returns to capital, such as in the AK model, prevail. In fact, the economy as a whole can exhibit increasing returns to capital and long-run growth in per capita incomes (and innovation) can be sustained. Technological progress is endogenous and depends on associated spillover effects, e.g. through investment in human capital. Therefore, it is able to explain incomplete convergence across the globe and economic policy now becomes effective in influencing the determinants of growth.

Both growth models assume full capacity utilization as well as full employment. Income distribution is technology determined and no special connection between growth and the determination of factor prices is established. In the Solow Model, the Cobb Douglas Production function implies constancy of factor shares over time (income distribution is static). Under Say's law, there could be no impediment to full employment caused by a deficiency in AD (Snowdon and Vane, 2005). Therefore, there is no role of

[39] Kuznets crystallised a range of social and political mechanisms generating such a result, for instance taxation on wealth or 'catching up' of lower income households at a later stage of development will lead to a decline in personal income inequality (Hein, 2014).

effective demand, neither in old neoclassical growth theory nor in NEG theory. Economic growth is essentially dependent on supply-side factors.

In retrospective, it should be noted that the main finding of NEG theory regarding the positive effect of capital accumulation on long-run productivity growth was not particularly new. In the PK distribution and growth theory 'camp' Kaldor (1957) had already developed models with endogenous productivity growth in them.

In the neoclassical paradigm an increase in profits would lead to an enhanced growth performance. As shown in the Solow model, more capital per worker would lead to higher GDP growth. Under the condition of profit maximisation, firms would be inclined to invest and produce more if they can achieve a higher profit rate. It will also increase net exports due to gains in international competitiveness. However, the aggregate savings propensity does not result from different behaviour of social classes[40] and hence cannot be connected to a change in functional income distribution (e.g. an increase in the profit share) based on institutional factors[41].

Furthermore, savings equal investment and are viewed as a necessary condition for growth. Since high income households have a higher propensity to save, redistribution towards wealthy households or profit income would increase the level of investment and hence be positive for growth. Therefore, inequality might be conducive to economic growth. However, there is no special connection in the old neoclassical model between growth and income distribution. Rather, causality runs from growth to income distribution.

In PK/PKA models demand-led growth models distribution enters the picture right from the start and is part of economic analysis. Under-utilisation of the capital stock and involuntary unemployment are persistent features of the capitalist economy. Changes in functional income distribution will impact AD and hence economic growth in these models.[42]

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[40] Hahn (1972) finds fault with neoclassical distribution theory based models of perfect competition in permanent equilibrium and its failure not to acknowledge social class as an explanatory variable. In the same vein, he commends Kalecki's theory to be important in its own right by introducing social class as the basis of analysis.

[41] Following general equilibrium price theory, factor income shares are determined by the initial endowments of the households and given factors of production (Hein, 2014).

[42] Another fundamental criticism of neoclassical growth theory is conceptual and relates to the treatment of the concepts of output and capital. The so-called 'Cambridge-Cambridge Debates' or 'Capital controversy' put forward in the 1950s and 1960s questioned the logical consistency of the neoclassical approach outside a one good barter economy (Hein, 2014).

2.4. Incorporating Political Economy in Neoclassical Growth and Distribution Theory

More recently, the issue of increasing income inequality triggered increased research interest in the mainstream economic literature. The unit of analysis is the personal income distribution among households[43] and various transmission channels between rising income inequality and economic growth are crystallized (Voitchovsky, 2011). Usually, causality runs mainly from growth to distribution (Kuznets, 1955). Barro (2000)[44], however, reverses this causality. In this literature, three groups of transmission channels between inequality and growth can be distinguished (Hein, 2014; Onaran and Galanis, 2014; Ostry, 2016).

The first group looks at political economy arguments[45]. Alesina & Rodrik (1994) explore a channel, in which a higher inequality of wealth and income distribution leads to higher rates of taxation on capital, which hinder economic growth. In a model of endogenous growth, they analyse the nexus between politics and economic growth including distributional conflict[46]. In democratic societies, a high degree of inequality might give rise to a government that will increase the tax burden on the rich in order to reduce inequality. Redistribution through the tax system will create disincentives to investment.

In the same spirit, the second group looks at the effects of 'political instability'[47] on investment and hence long-run growth. One channel, proposed by Alesina & Perotti (1996) is that of rising income inequality that increases socio-political instability, thereby increasing uncertainty in the political and economic environment and hence reducing the level of investment. Therefore, they find an inverse channel between rising income inequality on the one hand, and economic growth on the other hand.

A third group, in the light of NEG theory, analyses the distribution of income and wealth and its detrimental effects on human capital development (education) as well as investment in R&D. Aghion et al. (1999) show that less wealthy groups might be restricted in their access to the means of financing highly profitable investment projects

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[43] However, PK scholars also take personal income distribution into account, for instance see Van Treeck and Behringer (2013).
[44] He argues that higher inequality retards growth in poor but enhances growth in rich countries (Barro, 2000).
[45] Snowdon and Vane (2005, pp. 29-32) call this literature 'new political macroeconomics'. This research focuses on the political constraints of growth.
[46] In their analysis, they explore a negative relationship between inequality in land distribution and subsequent economic growth over two and a half decades.
[47] High degree of inequality is supposed to lead to illegal activities, corruption, and rent seeking, among others.

in human capital (e.g. poor people may not have the resources to finance their education) or in R&D. Therefore, the income and wealth distribution negatively affects the rate of technological progress and hence the per-capita growth rate of output. Galor and Zeira (1993) also argue that the initial distribution of wealth (e.g. given endowments) affects economic growth and investment in both the short and long run and thus help to explain persistent differences (e.g. per capita income) across countries. They focus on the relationship between distribution and growth through investment in human capital, given imperfect capital markets, and find that richer economies tend to have smaller wage dispersion and thus a more equal distribution of income.

What this literature shows is that despite the prediction of basic neoclassical growth theory of a positive relationship between inequality on the one hand and long-run growth on the other hand, empirical studies that incorporate political economy and income distribution may lead just to the opposite conclusion. In contrast to old neoclassical growth theory where growth is set by the natural rate and functional income distribution depends solely on the properties of the production function (e.g. constant shares in the Cobb-Douglas functions); growth now also depends on the role of income distribution that enters the picture exclusively through supply side channels and institutional settings[48].

More recently, Berg et al. (2012) found that the level of income distribution serves as one of the most robust and important factors associated with the duration of growth. "The main result is that there is a large and statistically significant association between income inequality and duration of growth. A one-% point higher Gini is associated with an expected duration of the growth spell[49] that is lower by between 11 and 15%", cited in Berg et al. (2012, p. 156). Hence, a more unequal income distribution leads to lower growth[50].

Kumhof et al. (2013) link increasing income inequality with the outbreak of the financial crisis of 2007. Comparing the Great Recession of 1929 with the Great recession of 2007, they argue that rising income inequality might have played a role in the origin

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[48] In the model developed by Galor and Zeira (1993) for instance, the different levels of investment in human capital determine the distribution of income, which gradually changes the distribution of wealth through time. The initial wealth distribution (e.g. in a given country) will determine economic dynamics and thus might explain cross-country differences.

[49] Growth spells are defined as periods of time (A duration of 5 years minimum spell and a duration of 8 years minimum spell). Periods are separated by a statistical upbreak or downbreak, e.g. a difference in percentage growth.

[50] Persson and Tabellini (1994) also find a negative and significant relationship between inequality and growth.

of both crises for the case of the United States. They further highlight a sharp increase in household debt- to income ratio as an underlying trend leading to the crisis. The authors model two household groups – investors (top 5 per cent of the income distribution) and workers (95 per cent of the income distribution) – with an increasing debt leverage among workers that is financed by increased savings from investors. The paper is an attempt to integrate the two stylized facts prior to the crisis. In a mainstream growth model, poor and middle-income households borrowed an increasing portion of debt to sustain consumption levels and maintain their relative income position. The increased debt leverage as well as a concentration of wealth among rich households (top 5 per cent) generated a higher demand for financial intermediation. This led to increased fragility and risk in the financial sector, which eventually erupted in 2007.

Foerster and Cingano (2014), in a report for the OECD, emphasise the relevance of addressing the trend of rising income inequality and review a large body of theoretical as well as empirical literature on the implications of inequality on growth, asking whether inequality is conducive or corrosive to growth and what the effects redistributive policies on growth in the short and long run are. In their view, the empirical literature has been largely inconclusive. In their own analysis, they find a negative and statistically significant relationship between income inequality and growth. They focus on personal income distribution arguing that increased dispersion at the bottom in particular matters, and find no conclusive evidence that redistribution might hamper growth. Based on NEG theory, the OECD study further investigates the human capital accumulation channel, which they view as one of the possible explanations for the statistically significant negative effects of inequality on growth.

In the European context, neoclassical growth theory as described above has determined the policy-making field. The focus of the EC (2013) is on structural reforms in labour markets, which aim at the stimulation of private investment and exports. Polices designed to make labour markets more flexible, in connection with a wage moderation strategy are at the centre of the structural labour market reforms. In the light of international competitiveness, the EC (2006) emphasises the role of real wage growth below productivity growth to be one of the key factors to preserve growth and employment. The belief that high levels of unemployment and sluggish growth are due to labour market rigidities is thus significantly anchored in policy making on the European level, and stands in striking contrast to the policy recommendations highlighted by the PK analysis. The focus is primarily on supply side channels to improve

the long-run growth potential in the European countries. This thesis analysis and presents an alternative growth strategy of wage-led growth that takes into account neglected issues such as a change in functional income distribution and a lack of effective demand.

3. Post-Keynesian Theory on the Effect of Income Distribution on Growth

Since the marginal counter-revolution in classical economics there has been an overwhelming focus on supply-side macroeconomic processes in the 1970s and 1980s (Setterfield, 2002). However, it is in this time period that we can witness key contributions in the area of what we call 'demand-led growth'. Several heterodox economists rejected the idea that demand would passively adjust to accommodate supply and conversely argued for the relevance of Keynes principle of 'effective demand'. For Cornwall for instance, 'Reverse Says Law' was one of the central principles on which to base growth theory (cited in Setterfield, 2002, p. 2)[51].

In the previous section, we have outlined that neither the old neoclassical growth nor the NEG models allows for effective demand failures. While autonomous changes in AD might impact on the utilization of resources in the short run (e.g. through wage rigidities), it cannot interrupt the otherwise neutral adjustment of prices and nominal wages in the long run. Essentially, AD does not play any role in this school of thought. Neoclassical authors do recognize that investment in human capital or research and development may end up modifying the potential growth rate, but they usually set aside the idea that actual growth rates could have an influence on potential growth rates (Lavoie and Stockhammer, 2012).

Keynes (1973 [1936]) himself never explicitly dealt with the topic of income distribution but there are some starting points expressed in his General Theory (GT). He assumed that there is a higher propensity to save out of profits than out of wages, which leads to a negative effect on consumption (Heine and Herr, 2013). Hence, a more equal income distribution allows for a higher propensity to consume, which would lead to higher consumption demand. The effect of the profit share on investment would be minor

[51] The key idea is that the expansion of supply (potential output) responds to an expansion in aggregate demand (actual output). Instead of assuming a supply-determined equilibrium, which functions as a centre of gravity towards which the level of economic activity is inevitably drawn, the utilization as well as the development of existing productive resources is fundamentally demand-determined (Setterfield 2002). For instance, capital accumulation is influenced by actual output (and hence demand) through accelerator effects.

because the level of investment is rather determined by the overall level of AD and so-called 'animal spirits' in the economy.

Keynes rejected the Say's law, which made macroeconomic demand management policies redundant (Snowdon and Vane, 2005). He criticised in particular that an increase in savings automatically increases investment, by the adjustment of the interest rate. In Keynes model, output and employment are determined by effective demand. The interest rate is determined in the money market (e.g. liquidity preference), rather than by the interaction of savings and investment decisions. In his view, savings adjust to investment through changes in income and any inequality between planned savings and planned investment would lead to quantity adjustments. Therefore, he effectively reversed Say's law stating that demand creates supply. Moreover, in defence of the argument that demand plays a key role in economic growth, he elaborated what is now known as the paradox of savings (also called paradox of thrift), which has been further developed particularly by Robinson (1962) and Kaldor (1957)[52]. In this context, increases in the level of savings would lead to lower growth and hence contrasts neoclassical postulates. Therefore, this 'first generation' of PK models developed a theory based on the nexus between distribution and growth.

PK distribution and growth theory retains the principle of effective demand[53], both in the short and long run (Hein, 2014). In these approaches, income distribution, capital accumulation and economic growth are all interrelated. One of the main purposes is to extend the analysis of effective demand from the short to the long run. In the short period, the capital stock is a constant; hence the role of AD is to determine output and employment. In the long period, however, capital stock becomes a variable; hence the role of AD is extended to determining the growth of productive capacities and their utilization in the long run (Hein, 2014; Setterfield 2002). Lavoie (2009, p. 110) succinctly speaks of the intention of earlier PK models to provide "a dynamic analogue of Keynes's static analysis".

What all PK models have in common is that they emphasize the principle of effective demand, developed by Kalecki and Keynes. Moreover, investment is independent of prior savings and is the driving force in the growth process. On the one hand, it

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[52] Due to reasons of space we will not specifically outline the growth models developed by Kaldor and Robinson. However, they illustrate the 'first generation' of PK models and it is important to mention that both approaches still assumed full capacity utilisation and flexible prices and Kaldor also assumed full employment, in alignment with neoclassical growth theory. This distinguished them from the Kaleckian models, which we focus on.

[53] The argument is that the level of employment and output are governed by aggregate demand.

determines the utilization of existing capacities, and also creates additional productive capacities on the other hand. As a result, the identification of the determinants of investment plays a key role in these models.

Before we go further it is important to outline crucial theoretical and methodological differences between neoclassical and PK distribution and growth theory. In PK distribution and growth theory the analysis starts off with one degree of freedom when it comes to the determination of relative prices and functional income distribution, which, in fact can be determined by different theories (Hein, 2014). More importantly, these factors cannot be determined by technology but are open and require the integration of specific historical, institutional and societal considerations[54]. Furthermore, and in stark contrast to neoclassical growth theory, the long run is understood to be a continuous process, rather than a predefined position towards which the economy inevitably tends to be drawn to. In other words, the sequence of short-run outcomes, which are associated with the mentioned demand-determined utilization of productive resources, leads to the economy's long run growth trend[55]. This also implies another methodological difference of demand-determined growth theory to neoclassical growth theory, that is, macroeconomic analysis should start with the short run. Finally, technological change is also demand-determined and hence endogenous to the growth process. Investment always induces AD, the available stock of capital and also average productivity. As a result, the natural rate of growth (potential output) is ultimately endogenous to the demand-determined actual rate of growth (Setterfield 2002, p.5)[56].

While there have been different developments in terms of demand-led growth theory, e.g. Balance of Payments Constraints (Thirlwall, 2003)[57], we focus on the Kalecki-inspired growth theory, which has been further developed by Rowthorn (1981), Dutt, (1984), Taylor (1985), Blecker (1989), and Bhaduri and Marglin (1990), because of their explicit focus on the relationship between distribution and growth[58] and because they have much to offer to understand the issue of slow growth and unemployment (Sawyer,

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[54] On methodological considerations in PK theory see Dow (2001).
[55] In the literature it is also known as 'path dependence'.
[56] In fact, it should be rather viewed as a 'ceiling' to the level of economic activity, which is sensitive to the demand-determined actual rate of growth (Setterfield, 2002). Dray and Thirlwall (2011) show, using statistical techniques that the (Harrod) natural rate of growth is elastic to the actual rate of growth (e.g. through induced productivity). In other words, demand matters for economic growth.
[57] Thirlwall (2003) argues that for most countries demand constraints would bite long before supply constraints start to operate and hence this understanding is key to analyse growth rate differences between countries over the long run.
[58] However, as pointed out by Lavoie (2015, p. 359) the same results of the model were also derived in Amadeo (1986).

1985). In fact, the work of Michal Kalecki has been a major source for the theory of the dynamics of economic growth and income distribution in particular, taking into account important behavioural and institutional features of real economies (Dutt, 2011b)[59]. At the heart of this literature is the question whether redistribution away from wages and towards profits has the potential to boost economic growth, given the negative effects on consumption spending compared to the positive effects on investment and net exports[60]. The Kaleckian approach can also be viewed as an 'under-investment' approach where the adjustment of the level of economic activity equates savings and investments (Sawyer, 2012)[61]. We start with a brief introduction to the basic Kaleckian model. Second, we discuss the PKA model, a la Bhaduri and Marglin (1990), which represents the 'working horse model' of this thesis. Third, we give an overview of possible extensions to the model.

3.1. Kaleckian Distribution and Growth Models

In the basic Kaleckian distribution and growth models by Rowthorn (1981), Dutt (1984), and Taylor (1985), economies will always turn out to be wage-led with a lower profit share leading to higher capacity utilisation, higher profit bill and higher capital accumulation, due to the so-called 'paradox of costs'[62]. Hein (2014) calls these models 'Neo-Kaleckian models'. The unambiguous effects of a change in the profit share on equilibrium output are obtained because redistribution in favour of wages has only positive consumption effects but no direct negative effects on investment and capital accumulation. These models exclude technical progress, government and foreign trade. Bhaduri and Marglin (1990) develop a slight variation of these models, changing primarily the investment function. They allow for both wage-led and profit-led demand

[59] Unlike Keynes, Michal Kalecki was strongly influenced by the works of Marx and rejected many of the neoclassical assumptions (e.g. perfect competition) from the onset. For a comprehensive writing on his ideas and works see Sawyer (1985) or López G. and Assous (2010).

[60] How these effects exactly might play out depends on the structural characteristics of an economy and will be explained in chapter 3 in more detail.

[61] Since the economy is characterised by having excess capacity this implies that there is a reserve of capital equipment. Sawyer (2010; 2012) argues that in a Kaleckian framework fiscal policy should be included in the analysis because (a) the budget deficit corresponds to the difference between savings and investment and (b) it raises growth and future productive capacity and thus helps to overcome a low level of capacity utilisation. In this thesis, we will introduce fiscal policy into the model in chapter 5.

[62] The paradox of costs postulates that an increase in the profit share lowers the profit rate. In reverse, a higher wage share will lead to higher capacity utilisation, accumulation and profits in the new equilibrium. For an illustration of this principle see Hein (2014, pp. 256-257). Lavoie (2014, p. 359) summarizes this literature by highlighting that the 'most intriguing result' of all these models is that higher costing margins and hence lower real wages lead to lower rates of utilisation, lower growth rates and thus lower realised profit rates.

regimes and Hein (2014) refers to these as PKA models. In both versions of Kaleckian distribution and growth models, AD and sales expectations matter, as well as firm's internal means of finance does.

The research conducted in this field can also be understood as being part of the 'underconsumptionist' view that has a long tradition going back to the 19th century (Lavoie and Stockhammer, 2012). Underconsumptionist theories can be related to the principle of effective demand, endorsed by Keynes, or to the problems of realization of profit, emphasized by Marxist authors. The Kaleckian authors have tried to synthesize both ideas, e.g. by Steindl (1952). Consumption thus plays a central role in these models (Rowthorn, 1981). We will outline the basics of the model and then only focus on the PKA distribution and growth model following Bhaduri and Marglin (1990).

3.1.1. Macroeconomic Framework of Neo-Kaleckian and Post-Kaleckian Models

In the 'second-generation' PK models[63], based on Michal Kalecki and Josef Steindl's works, the Keynesian assumption of independence of capital accumulation of firms from prior saving is maintained. In addition, this critical assumption is complemented with a determination of income distribution that is determined by relative economic powers, mainly through firms' mark-up pricing on ULC in incompletely competitive goods markets. This determines functional income distribution in the economy[64]. Kalecki turns his approach to price determination purposefully against the neoclassical model of perfect competition, to be closer to the nature of capitalist systems (Hein, 2014).

Kalecki assumes 'active cost determined' pricing because in his thinking, the economy (industrial sector)[65] is characterised by an oligopolistic or monopolistic competition framework. Therefore, firms have price-setting power (and are not price takers such as in the neoclassical theory)[66]. Moreover, unemployment is a persistent feature of a capitalist economy and therefore is also fundamentally different from the

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[63] 'Second generation' of PK models is a categorisation done by Hein (2014), which this thesis follows here. He differentiates between 'first generation' models outlined above (e.g. Kaldor, 1957) and the 'second generation' models that follow Kalecki and Steindl more closely, for instance by assuming excess capacity and involuntary unemployment (beyond the short run) as persistent features of the capitalist economies.

[64] Therefore, it can be interpreted as a behavioural theory of income distribution (Laramie and Mair, 2000).

[65] Kalecki drew a distinction between cost-determined (manufacturing sector) and demand-determined prices (primary sector of the economy, e.g. agriculture or mining) (Hein, 2014).

[66] Kalecki regarded perfect competition as an unrealistic assumption and equilibrium positions as purely hypothetical positions that would not be reached (Laramie and Mair, 2000, pp. 10-13). In the growth context, he did not believe in a steady state or balanced equilibrium rate of growth.

assumption of neoclassical economics. Firms operate with excess capacity. Therefore, AD determines aggregate supply, with capacity utilisation being the adjusting variable.

In contrast to Keynes, Kalecki integrated the principle of effective demand into the dynamic context of the business cycle and considered issues of income distribution right from the start. According to Blecker (2002), Kalecki was the first economist to construct formal models in which workers had a higher marginal propensity to consume (MPC) than capitalists. Kalecki analysed investment functions in which the rate of investment depends positively on retained earnings due to the financial constraints[67] as outlined in his article on the principle of increasing risk (Kalecki, 1937)[68]. Therefore, his analysis incorporated the two-sided effects of income distribution on consumption and investment demand (Blecker, 2002).

Keynes stressed the role of savings not being a precondition for investment but does not explicitly discuss the growth rate of output in detail. Even though the PK authors (e.g. Kaldor) adopted the paradox of savings, they still assumed an inverse relationship between investment and real wages. Kaleckian economists challenged this assumption by introducing the paradox of costs. They questioned the viability of a normal rate of capacity utilisation and argued that this variable is endogenous to AD. A higher real wage rate possibly increases capacity utilisation, which then increases investment and profits, due to accelerator effects[69]. Economic growth and profitability thus become wage-led which represents a cornerstone of our analysis in this thesis. In this thinking, wages serve a dual role – they represent a cost item but also a source of demand (Onaran and Galanis, 2014)[70].

[67] The 'principle of increasing risk' thus provides an argument of credit rationing. The availability of finance for investment hence might be limited.

[68] In his view (Kalecki, 1971[1937], pp. 110-123) investment was a positive function of gross profits and gross savings, and a decreasing function of the capital stock. He particularly emphasised the time dimension of fixed capital investment decisions. Actual investment would follow with a time lag because of delayed entrepreneurial reactions or periods of construction.

[69] According to Lavoie (2014, p. 293) there are two conditions for the paradox of cost to hold: Firms operate below full capacity and the real wage is higher than labour productivity. However, the second condition is more relevant for effective labour demand. In general, the crucial constraint for firms to produce more is given by sales, hence an effective demand constraint.

[70] In Kaleckian theory, both macro and microfoundations are present (Laramie et al., 1996-97). Seguino (2012) adds another macroeconomic effect of wages: productivity growth. In this thesis, however, we abstract from issues of productivity growth.

3.1.2. The Basics of the Model[71]

In the canonical model a closed economy without a government sector is presented. An open economy context will be introduced in section 3.3.2. The economy is composed of two classes – capitalists and workers. Workers offer labour to capitalists and receive wages in return that they fully employ to purchase consumption goods. Hence, there is no savings out of wages, an assumption, which will also be relaxed below. Capitalists own the means of production and receive profit income, which they partly consume and save, for instance through buying assets in the corporate sector or depositing profits in the financial sector. The financial sector is not explicitly modelled here[72]. Capitalists thus decide about the expansion of the capital stock. They draw on their own means of finance or take credit granted by the financial sector. We assume a homogenous output (Y) that is produced through combination of direct labour and non-depreciating capital and can be used for consumption or investment purposes. We exclude technical progress by holding the capital-potential output ratio ($v = \frac{K}{Y^P}$) and the labour-output ratio ($a = \frac{L}{Y}$) constant. Also, this can be integrated into the model, which will be shown in section 3.3.

The basic model follows Kalecki (1971) and Steindl (1952). The rate of capacity utilisation is the accommodating variable that adjusts aggregate supply to AD and hence saving to investment, both in the short and long run. The first equation decomposes the profit rate (r), the profit share (π), and the rate of capacity utilisation (u), and further presents its link the real wage rate (w/p), assuming production coefficients (a, v) to be constant:

$$r = \frac{R}{K} = \frac{R}{Y}\frac{Y}{Y^P}\frac{Y^P}{K} = \frac{Y-wL}{Y}\frac{Y}{Y^P}\frac{Y^P}{K} = \left(1 - \frac{w}{p}a\right)\frac{u}{v} = \pi\frac{u}{v} \qquad (2.14.)$$

where the sum of profits is denoted by (R), the real capital stock by (K), output by (Y) and potential output by (Y^P). The general price level is represented by (p) and the

[71] The presentation of the model is based on Hein (2014, pp. 245-247). For an introduction to the neo-Kaleckian model see also Lavoie (1995).

[72] Hence the basic model does not take into account the recent developments discussed in the 'financialisation' literature (Hein and van Treeck, 2008; Hein, 2012; Sawyer, 2013). There are significant effects of the growth as well deregulation of the financial sector on economic growth (Sawyer, 2014). For instance, the model does not take into account issues such as the financial fragility of the system or debt-led consumption. Hein and van Treeck (2008) provide a systematic review on how the recent developments can be introduced into PK models of distribution and growth. For instance, developments in the financial sector might affect objectives (e.g. long run accumulation versus short run profitability) and financial constraints of firms (e.g. share buybacks or dividend payments). Also, distribution of income between shareholders, managers and workers will be affected (Onaran et al. 2011). This thesis abstracts from such financial complications since it is not the immediate purpose of this analysis and also due to data limitations (e.g. on dividend payments for the EU15 MS).

nominal wage rate by (w). The rate of capacity utilisation is given by $(u = Y/Y^P)$ and the profit share defined as $(\pi = R/Y)$.

Functional income distribution is determined by mark-up pricing of firms in incompletely competitive goods markets. Denoting mark-up by (m) and denoting the wage bill by $(W = w * L)$ we can derive the following pricing equation in this one-good economy:

$$p = (1 + m)\frac{W}{Y} = (1 + m)wa, \quad m > 0 \tag{2.15.}$$

If we assume the technical conditions of production constant, the real wage rate is inversely determined by the mark-up:

$$\frac{w}{p} = \frac{1}{(1+m)a} \tag{2.16.}$$

An increasing (decreasing) mark-up leads to a lower (higher) real wage rate. Kalecki assumed the mark-up to be determined by the intensity of price competition in the goods market (degree of monopoly) and by the bargaining power of trade unions in the labour market. It determines the profit share as follows:

$$\pi = \frac{R}{Y} = \frac{Y-W}{Y} = 1 - \frac{1}{1+m} = \frac{m}{1+m} \tag{2.17.}$$

There is no savings (S) out of worker's income but only out of profits as stated above. Assuming a constant propensity to save out of total profits (s_R) and taking into consideration equation 2.14. we arrive at the following saving rate (σ), which relates total saving to the capital stock.

$$\sigma = \frac{S}{K} = \frac{s_R R}{K} = s_R r = s_R \pi \frac{u}{v}, 0 \leq s_R \leq 1 \tag{2.18.}$$

According to (2.18), the savings rate depends positively on the saving ratio out of profits, as well as on the profit share and capacity utilization, but negatively on the capital-potential output ratio. Therefore, we have outlined the foundations for the different variants of Kaleckian models[73]; we have defined the profit rate (r), the determination of the profit share (π) and the saving rate (σ). To complete the model we need an accumulation function (g) and the goods market equilibrium $(g = \sigma)$. However, since particularly the form of the investment function (e.g. whether to introduce a profit rate or profit share) is debated among PK economists, which led to the rise of alternative specifications, this will be introduced in more detail in the section below. Kalecki and Steindl both viewed investment decisions to be dependent more

[73] The model, in almost all its variants, consists of three equations that include income distribution, saving and investment (Lavoie, 2014).

generally speaking on: (I) Internal means of finance[74], (II) on capacity utilisation[75], (III) and on semi-exogenous development factors, such as technological progress and innovations.

3.2. Post-Kaleckian Model of Distribution and Growth

In an influential paper, Bhaduri and Marglin (1990) established what is now called PKA models of distribution and growth. They developed two demand-led growth regimes, which they called 'Exhilarationist' and 'Stagnationist', the latter referring to the Neo-Kaleckian models of distribution and growth. The authors conduct a short-run analysis from a broad Keynesian perspective that recognises the central importance of effective demand. This theoretical paper triggered a rich empirical literature, which will be explained in more detail in section 4.

The key distinction between Neo-Kaleckian and PKA distribution and growth models is the specification of the investment function, which can be written as follows:

$$g = \frac{I}{K} = c_0 + c_1 u + c_2 \pi, \qquad (2.19.)$$

Equation (2.19.) illustrates that investment is a positive function of animal spirits (c_0), capacity utilisation (u), and the profit share (π). The intercept term (c_0) integrates Keynesian 'animal spirits' of entrepreneurs[76]. The coefficient c_1 represents the accelerator effect[77]. An increase in AD and higher capacity utilisation will induce firms to engage in more investment expenditures (Blecker, 2002; Onaran and Galanis, 2014)[78]. The coefficient (c_2) reflects the profit-driven nature of investment. It reflects the expected rate of return as well serves as a proxy for the availability of internal finance[79]. In the model of this thesis, the investment function is further enhanced by a cost variable, which we will show below in chapter 3.

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[74] Firms are generally assumed to be externally finance-constrained in incomplete financial markets, following Kalecki's 'principle of increasing risk' (1937).

[75] This includes the development of sales and sales expectations.

[76] Hein (2014, pp. 248-249) outlines several factors that affect investment: The general business climate, pressure of competition, or long-run expectations.

[77] Steindl (1952) first introduced the idea that investment depends on capacity utilisation. As is well known, he tried to explain economic stagnation in the US interwar period. In his view, the growth of oligopolies in capitalist economies is directly linked with reduced utilisation rates and thus lower investment.

[78] By the same token, low utilisation (undesired excess capacity) will induce firms to reduce planned investment (Blecker, 1989). Bhaduri and Marglin (1990) argue that the current average degree of capacity utilisation can be used for prediction of future state of demand.

[79] More specifically, the authors argue that investment behaviour may be based on static expectations, given that investors make predictions related to marginal profitability on new investment projects con the basis of current average profitability.

The crucial difference between the Neo-Kaleckian model and the PKA model is that investment is a function of the profit share rather than the profit rate. The latter is decomposed as capacity utilisation and profit share. Bhaduri and Marglin (1990) showed that in Neo-Kaleckian models, the rate of capacity utilisation was counted twice and therefore overrepresented the effect on capital accumulation. Moreover, following this equation the influences of profit share and capacity utilisation are separated out rather than combined as is the case when using only the profit rate. Hence, one is able to focus on the different influences on profit share and on capacity utilisation (Sawyer, 2012).

This new investment specification allows for a variety of growth regimes (Blecker, 2002). The goods market equilibrium is given by:

$$g = \sigma \tag{2.20.}$$

which states that the savings rate (σ) is equal to the accumulation rate (g) and hence output of firms is equal to AD in the goods market. In order to obtain the equilibrium rate of capacity utilisation equations (2.18.) and (2.19.) are inserted into equation (2.20.):

$$u^* = \frac{c_0 + c_2\pi}{s_R\frac{\pi}{v} - c_1} \tag{2.21.}$$

Plugging this equilibrium into equation (2.18.) or (2.19.) yields the equilibrium accumulation and savings rates.

$$g^* = \sigma^* = c_o + c_1\frac{c_0 + c_2\pi}{s_R\frac{\pi}{v} - c_1} + c_2\pi = \frac{(c_0 + c_2\pi)s_R\frac{\pi}{v}}{s_R\frac{\pi}{v} - c_1} \tag{2.22.}$$

In this model, an accumulation equilibrium (g^*) with below full capacity utilisation $(u_n = Y/Y_P = 1)$ is expected (Hein, 2014). Savings are expected to adjust towards investment by means of changes in output and hence in capacity utilisation, which is the adjusting variable in the model. Stable equilibrium in this model is given by:

$$\frac{\partial\sigma}{\partial u} - \frac{\partial g}{\partial u} > 0 \;\rightarrow\; s_R\frac{\pi}{v} - c_1 > 0 \tag{2.23.}$$

where $(\partial\sigma/\partial u)$ represent savings decisions and $(\partial g/\partial u)$ reflect investment decisions respectively. In order to obtain a stable equilibrium savings decisions have to react stronger to a change in the endogenous variable capacity utilisation than investments. Differentiation with respect to π implies that:

$$\frac{\partial u^*}{\partial\pi} = \frac{c_2 - s_R\frac{u}{v}}{s_R\frac{\pi}{v} - c_1} \tag{2.24.}$$

and

$$\frac{\partial g^*}{\partial\pi} = \frac{s_R\frac{1}{v}(c_2\pi - c_1 u)}{s_R\frac{\pi}{v} - c_1} \tag{2.25.}$$

Equation (2.24.) shows that an increase in the profit share (π) has a positive effect on the equilibrium capacity utilisation (u^*), if the expansionary effect on investment outweighs the negative effect on consumption. If the effects of profit share on investment are rather weak and the propensity to save from profits is relatively high, the total effect of the profit share on equilibrium capacity utilisation is negative. In this case, the demand regime is wage-led. However, if there is a high sensitivity of investment to the profit share and a low propensity to save from profits prevails, the total effect of the profits share on equilibrium capacity utilisation is positive, thus the demand regime is profit-led[80].

Equation (2.25.) presents the effects of the profit share on equilibrium capital accumulation (g^*). A strong partial effect of the profit share and a rather weak effect of capacity utilisation on investment will lead to a positive effect of redistribution towards profits and hence the accumulation regime is profit-led. Conversely, in the reverse constellation, a higher profit share might dampen equilibrium capital accumulation due to weak effects of the profit share and strong effects of capacity utilisation on investment, thus the accumulation regime becomes wage-led. As a result, the overall effects of a change in functional income distribution on the equilibrium rates of capacity utilisation (demand regime) and capital accumulation (growth regime) depend on the parameters in the behavioural equations for the savings and investment functions of the model.

The focus in this thesis is on analysing the demand regime and thus on the effect of the profits share on equilibrium capacity utilisation, which is represented by real output (Y). However, we will also empirically analyse the effects on the accumulation regime (called 'investment regime' in the following) in chapter 3 and chapter 5 of this thesis.

3.2.1. Assessment of the Post-Kaleckian Distribution and Growth Model

Bhaduri and Marglin (1990)[81] have presented a flexible model that takes into account distributional conflict between capital and labour as a determinant of growth and integrates open economy issues. It is able to generate different regimes of demand and accumulation/growth (wage-led or profit-led), depending on the parameter values in the saving and investment functions of the model (Hein, 2014). Hence, it allows to empirically testing for different regimes of demand and growth across countries.

[80] Bhaduri and Marglin (1990) call a wage-led demand regime 'stagnationist' regime and a profit-led demand regime 'exhilaratioinist' regime.
[81] It should be mentioned that also Blecker (1989) significantly contributed to the development of this model by extending the stagnationist model to an open economy context.

Therefore, in order to compare and explain differences of the regimes of demand and growth across countries (and over time), one is able to apply the same model framework in a consistent manner.

Moreover, it maintains the validity of the principle of effective demand as well as excess capacity of firms. In this short-run model, firms' make autonomous decisions to invest and are not restrained by households' decisions to save. Savings are not a precondition of investment. There is also no labour-supply constraint due to the assumption of excess labour supply to be a persistent feature in the economy[82]. Prices are set via cost-plus pricing reflecting an oligopolistic / monopolistic framework.

In this model, these assumptions represent the most important features of modern capitalist economies. It emphasises the contradictory role of wages as the main element of production cost as well as a major source of AD and hence highlights the complex and ambiguous relationship between a change in wages and the level of output and employment. The analysis recognises the central relevance of effective demand. However, in contrast to the closed economy models proposed by Keynes and Kalecki, Bhaduri and Marglin (1990) consider an exogenous change in the real wage rate[83].

The paradox of savings is maintained but the paradox of costs might disappear, depending on the different effects of the parameters in the behavioural savings and investment function. This model is thus able to generate different demand and accumulation regimes. It has therefore been applied widely in empirical research that we will outline below. It has also generated substantive interaction and debate among different economic schools of thought since it was independently developed by PK, Sraffian and Marxist authors (Lavoie, 2014). As a caveat it must be said that the generated demand and accumulation regimes have to be embedded into a social and historical framework, which may affect the estimated parameters and model outcomes[84].

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[82] However, this assumption might be violated in the long run where real wage growth could 'endanger' the required growth in productive capacity (Rowthorn, 1981). However, as the authors note themselves crisis of underaccumulation in the stagnationist regime as well as overaccumulation crisis of the exhilirationist regime are not considered due to the short run nature of the model.

[83] In the GT the real wage rate is an endogenous variable, which is determined by autonomous investment and the subsequent change in effective demand. A change in effective demand determines output and the level of employment through the multiplier mechanism. In this context, the real wage rate is determined when the marginal product of labour at a given level of output equals the real wage rate needed to satisfy profit maximising firms. In our analysis, we consider an exogenous change in the wage share. According to Bhaduri and Marglin (1990) this assumption might be easier to justify in an open economy context where international competitions and exchange rate variation play a role in price setting of firms. Particularly small open economies might be subject to 'international price discipline' (Bhaduri and Marglin, 1990, p. 385).

[84] Hein (2014, p. 266) argues that Bhaduri and Marglin (1990) might have indented to use their approach to interpret the regime shifts from the golden age of capitalism to its crises starting in the 1980s.

There is also an on-going debate about the assumption of the rate of capacity utilisation to be endogenous to AD. Other heterodox economists (e.g. Harrodian and Marxian authors) for instance have questioned the likelihood of this assumption and argue in favour of a long-run equilibrium independent rate of capacity utilisation[85]. However, this criticism does not directly relate to the Bhaduri-Marglin model since it only applies to the short run period.

Moreover, as Blecker (2015) argues that whereas the Bhaduri and Marglin (1990) specification of investment has convenient mathematical properties it is not well suited for an empirical estimation. Combining an array of different theories of investment[86] he proposes a so-called hybrid accelerator model which combines the different factors outlined above and replaces the profit share with taking cash flow, which is equal to gross retained profits. We will argue in chapter 3 why we take the specification of investment presented by Bhaduri and Marglin (1990).

Finally, there are issues related to the supply-side constraints of this approach. Sawyer (2010) for instance argues that one cannot presume that the productive capacity of an economy is adequate to underpin the full employment of labour. He points out that there would be limits on the growth rate of output, which is sustainable. Again, since the Bhaduri-Marglin model presents a short-run framework (implying a level effect on output rather than the growth rate) this criticism might be limited but needs to be taken into account when considering issues of long-run growth and productive capacity of an economy.

3.3. Extensions to the Post-Kaleckian Models

So far, we have assumed a closed economy and no savings out of wage income. Both assumptions will now be relaxed. First, we introduce savings out of wages into the closed economy model and second extend this model to the open economy context by including international trade following Bhaduri and Marglin (1990) and Blecker (1989), which illustrates the 'work-horse' model in this thesis.

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[85] Hein (2014) and Lavoie (2009) outline the debate in detail and justify the assumption of an endogenous rate of capacity utilisation. The crucial point is that the Kaleckian models retain the paradox of costs and paradox of savings even when introducing an exogenous rate of capacity utilisation. See also Nikoforos (2016) for a more recent contribution to this debate.

[86] Chirinko et al. (2011) provide a comprehensive overview of the literature on investment specifications.

3.3.1. Savings in the Post-Kaleckian Models

In the following, we distinguish between the propensities to save from wages (s_w) and from profits (s_R). We assume the propensity to save out of profits to exceed the propensity to save out of wages. Hein (2014) states two reasons for this to hold true: First, firms retain part of their profits, which represent savings by definition. Second, although workers save and accumulate financial assets, the major part of profits goes to capitalists and so-called rentiers. Keynes (1936) argued that the marginal propensity to save (MPS) increases with the level of income, which supports the argument of the former sentence. Introducing savings out of wages alters equation (2.18.) in the following:

$$\sigma = \frac{S_R+S_W}{K} = \frac{s_R R+s_W(Y-R)}{K} = [s_w + (s_R - s_w)\pi]\frac{u}{v}, 0 \leq s_w \leq s_R \leq 1 \qquad (2.26.)$$

Equation (2.26.) now includes saving out of wages (S_W) which gives us also the propensity to save out of wages (s_w). According to this equation, an increase in either propensity to save (out of wages or out of profits) will lead to a reduction in consumption demand which will lower the rate of capacity utilisation as well as feedback negatively on capital accumulation. Therefore, the paradox of savings remains valid in the PKA model. A wage-led demand and accumulation regime requires a high differential between the propensities to save from profits and from wages. In contrast, a low differential would be conducive to a profit-led demand and accumulation regime. In other words, the smaller the difference between the propensity to save out of wages and profits is, the less likely are wage-led demand and accumulation regimes.

3.3.2. International Trade in the Post-Kaleckian Models

Introducing international trade brings the model into an open economy context, which is essential for applying the theory to post-war growth (Blecker, 1989). We can thus call it private sector open economy model. The focus is on the relationship between domestic redistribution and international competitiveness such as in Blecker (1989). In the open economy context, the profit share (π), consisting of domestic wages (W) and domestic profits (R), with (z) representing the relationship between (imported) unit material costs and ULC, is now determined by:

$$\pi = \frac{R}{R+W} = \frac{(1+z)\,m}{1+(1+z)\,m} = \frac{1}{\frac{1}{(1+z)\,m}+1} \qquad (2.27.)$$

In an open economy context, the profit share is thus still determined by the mark-up[87] as well as the relationship between unit costs for imported material (and semi-finished products) and ULC.

In goods market equilibrium, planned savings (S) have to be equal to planned investment (I) plus net exports (NX), the difference between exports (X) and imports (M) of goods and services.

$$S = I + X - M = I + NX \tag{2.28.}$$

Dividing both sides by the capital stock (K) we obtain the goods market equilibrium between the savings rate (σ), the accumulation rate (g) and the net export rate (e).

$$\sigma = g + e \tag{2.29.}$$

The net export rate is positively affected by increased international competiveness. Provided that the Marshall-Lerner-Condition holds, the real exchange rate (depreciation of domestic currency) will have a positive effect on net exports. Furthermore, net exports also depend on demand variables such as domestic and foreign demand. If domestic demand increases, ceteris paribus, net exports will decline and if foreign demand increases net exports will rise.

As in the closed economy, an overall wage-led regime requires three conditions to hold true: a high differential between the propensities to save from profits and from wages (equivalently a higher difference in the MPC out of wages and out of profits), a low effect of the profit share, but a strong effect of capacity utilisation on investment. Furthermore, in an open economy context, a wage-led regime becomes less likely if the domestic redistribution weakens international competitiveness through a real appreciation for a given normal exchange rate. More importantly, the positive effects of a decline in the WS on net exports (ULC are lowered) might turn the regime from wage-led to profit-led.

3.3.3. Government in the Post-Kaleckian Models

The outlined models of growth represent private sector open economy models without explicit consideration of the government. To the best of our knowledge, this issue is still relatively under-researched in a PK/PKA model and has only been discussed at a

[87] Blecker (1989, pp. 407-408) argues that if the domestic economy were disaggregated into individual sectors and firms that compete for consumption expenditures the assumption of a fixed mark-up would not make sense even in a closed economy. Hence, it should be noted that the assumption of a rigid mark-up might be too simplistic and a flexible mark-up might be more realistic in certain contexts, particularly in an open economy context. However, in our model we focus on short-run effects of a change in the wage share on output, hence the assumption of constant mark-ups may be justified.

theoretical level but without much empirical research being done. Hence, it represents a research gap this thesis intends to work on.

You and Dutt (1996) for instance present a Kaleckian model of distribution and growth that integrates public deficits. In this context, government debt appears to have a positive impact on output and an expansionary fiscal policy leads to large multiplier effects. Blecker (2002) also includes tax policy and progressiveness of the taxation structure as a determinant of distribution and hence demand. In the same spirit, Mott and Slattery (1994) analyse tax incidence in a Kaleckian framework and Palley (2013) examines the application of Kaleckian models to fiscal policy.

Detached from demand-led growth literature, there is rich empirical research on the role of fiscal multipliers (e.g. Blanchard and Leigh, 2013 or Gechert, 2015). Qazizada and Stockhammer (2014) for instance have extended the analysis of government spending multipliers over different periods of the business cycle, namely expansion and contraction. These studies are primarily concerned with the magnitude of multipliers and, based on the theoretical framework and estimation methodology applied, show diverse outcomes. However, they do not present a unified model of the role of wage and fiscal policies on demand, accumulation and growth. Hence, we intend to expand on this research gap in chapter 5 below.

3.4. Wage-led versus Profit-led Regimes

Next, we summarize the effects of an increase in the profit share (fall in the WS) on the components of AD and the accumulation rate. We give an overview of the empirical literature that tried to cluster a variety of countries into one of these regimes by using econometric methods[88].

The PK literature includes the direct positive effects of higher profits on investment and net exports, but contrasts these positive effects with the negative effect on consumption. The total effect of the decrease in the WS on AD then depends on the relative size of the reactions of each component and hence allows for different regimes of demand. If the total effect is negative, the demand regime is called wage-led and if the total effect is positive the demand regime is called profit-led (Onaran and Galanis, 2014)[89]. The definition of profit-led and wage-led regimes can be seen in table 1 below.

[88] Here, the intention is to introduce the empirical literature. A more detailed comparison and discussion of the literature and how it relates to our findings will be done in chapter 3.

[89] In our analysis, we do not attempt to distinguish between demand and productivity effects, but only discuss the economic regime.

Table 1 Wage-led and Profit-led Regimes

		Overall effect on the economy	
		Expansionary	**Contractionary**
A change in the functional income distribution	An increase in the profit share	Profit-led regime	Wage-led regime
	An increase in the WS	Wage-led regime	Profit-led regime

Source: Lavoie and Stockhammer (2012, p. 5).

Our empirical analysis in this this thesis is based on a version of the canonical Bhaduri and Marglin (1990) model, as presented in Stockhammer et al. (2009), incorporating the modelling of the foreign sector such as in Onaran and Galanis (2014). The general (modified) model can be written in the following way:

$$Y = AD = C(W, R, z_c) + I(Y, \pi, z_i) + NX\left(Y, \frac{P}{P_m}, \frac{P_x}{P_m}, \pi, z_{NX}\right) + G \qquad (2.30.)$$

where (Y) is output (and income), (AD) is aggregate demand, (π) is the profit share, (P) are domestic prices, (P_m) are import prices, (P_x) are export prices, (W) is wage bill, (R) indicates gross operating surplus and (z_c, z_i, z_{NX}) represent exogenous control variables[90].

According to this specification a change in AD is dependent on the effects of a change in functional income distribution on Consumption (C), investment expenditure (I), net exports (NX) and public expenditure (G). We exclude the government sector in chapter 3 but extend the model by introducing it in chapter 5. Whether an economy is in profit led or wage led depends on the economic structure of an economy and the behavioural parameters in each component of AD.

A change in the functional distribution affects the three different components of private AD in the following way: First, we assume that an increase of the profit share would have a negative effect on consumption due to the different MPC out of wage income (W) and profit income (R)[91]. An increase in the profit share would increase savings and hence reduce consumption ($C_\pi < 0$). The magnitude of the positive effect

[90] In the case of investment for instance we introduced the long-term real interest rate as a cost factor.
[91] In the model of this thesis, the savings specification is replaced with a consumption function to include the effect of a different MPC out of wage and out of profit income.

of an increased profit share on investment depends on the sensitivity of investment to profits on the one hand, and on the accelerator effect on the other hand. Second, an increase in the profit share as well as an increase in output has positive effects on investment ($I_\pi > 0, I_Y > 0$). Third, the effects of pro-capital redistribution on net exports depend on the sensitivity of net exports to ULC. Typically, export and import functions include a price term where prices are dependent (among other things) on ULC (Stockhammer et al., 2009). ULC in turn are closely linked to the WS. An increase in the profit share would thus reduce ULC and hence lead to higher net exports($NX_\pi > 0$). In other words, it would improve international competitiveness. Hence, net exports depend negatively on ULC. In macroeconometric models ULC usually affect prices and prices enter the export and import functions. Therefore, relative prices ($P/P_m, P_x/P_m$) are determining imports and exports respectively. For instance, an increase in the relative price of (P_x/P_m) would have a negative effect on exports. Moreover, net exports are a negative function of domestic demand and a positive function of foreign demand.

The total effects are the sum of these three effects on the components of AD:

$$\frac{\partial Y}{\partial \pi} = + \frac{\partial C}{\partial \pi} + \frac{\partial I}{\partial \pi} + \frac{\partial NX}{\partial \pi} \tag{2.31.}$$

It is not possible to determine a priori whether the expected negative effects on consumption will overpower the expected positive effects on investment and net exports. Essentially, it becomes an empirical question, whether a regime is wage-led or profit-led.

3.4.1. Empirical Literature on Wage-led and Profit-led Regimes

In the following, we give an overview of some empirical findings regarding the different demand regimes. Since the early 1980s dramatic changes in income distribution have occurred[92]. There has been a substantial decline in the WS across the world (OECD, 2012). While there has been a substantial literature on the effects of changes in personal income distribution and growth, as outlined above, the change in functional income

[92] Changes in income distribution have occurred on different dimensions. In the Anglo-Saxon world a sharp polarization of personal income distribution (distribution of household income) has taken place (Stockhammer, 2015). In the majority of OECD countries household income of the top 10% grew faster than those of the poorest 10%, and hence widening income inequality occurred (Foerster and Cigano, 2014). Today, average income of the richest 10% of the population is about 9.5 times than that of the poorest 10% compared to a ratio 7:1 in the 1980s. In addition, there has been a moderate decline in the wage share. In European countries, shifts in the functional income distribution rather than in the personal income distribution have been dramatic (Stockhammer, 2015; OECD, 2011). In the advanced economies the wage share, on average, has fallen from 73.4 per cent in 1980 to 64.0 per cent in 2007 (Stockhammer, 2015)

distribution (that is also interlinked with changes in personal income distribution) remains comparatively under researched.

Based on the PKA model, a growing body of empirical literature tried to identify demand regimes by applying econometric methods. These studies differ in several aspects: Countries analysed, time period considered, source of data, and econometric method employed. Therefore, a comparison is difficult and the robustness of the studies is still challenged[93].

The majority of the conducted econometric studies find that domestic demand regimes, e.g. the sum of consumption and investment, tend to be wage led $[(\partial C/Y)/\partial\pi] + [\partial I/Y/\partial\pi] < 0$, whereas international trade can turn demand regimes in some economies into a profit-led regime $[dY/Y/d\pi > 0]$. However, with a simultaneous [94]decline in the WS, the net export channel is scaled down and AD might turn out to be wage-led again (Onaran and Galanis, 2014). This reveals a 'fallacy of composition', even though countries that decrease their WS might grow in isolation, GDP in these countries may also contract when all economies apply the same strategy of wage moderation.

This thesis builds on this literature, estimating the impact of a change in the income distribution on AD and hence growth in EU15 countries. In particular, the latter part of analysing a simultaneous decline in the WS, e.g. 'race to the bottom', in Europe is one of the aims of this thesis.

4. Conclusion

In neoclassical growth models (old and new) income distribution does not play a central role in determining investment and growth. Since investment is assumed to equal savings there is no independent behavioural investment function. Following Say's law the real rate of interest ensures equality between demand for and supply of loanable funds. It will change, so as to reconcile the desires of households to save and of firms to invest.

The natural rate of growth is determined exogenously by the labour force growth and total factor productivity, which are both determined by supply-side factors. In the NEG theory the latter becomes endogenous but the model remains within the pre-confined

[93] Blecker (2014) reviews the robustness challenges regarding the short-run and long run validity of these results. We will outline this debate in more detail and present our empirical findings in chapter 3.
[94] 'Simultaneous' implies that the change takes place in all trading partner's economy, such as the fall in the WS we have observed in most of the European countries since the 1980s. In our model this refers to the EU15 countries.

framework of neoclassical theory. It is still household's savings decisions that determine the general level of investment. Firms do not play an independent role when it comes to the crucial decision over capital accumulation and growth. As a result, the economy is assumed to be at full employment level and there is no excess capacity or deficiency of demand in the economy. Any issues of effective demand and its role for long-run growth are thus assumed away in the neoclassical models of growth.

Moreover, functional income distribution is solely technology determined and hence a higher real wage cannot be enforced by exogenous institutional factors such as collective wage bargaining for example. Distribution accommodates to labour productivity growth, and real wage adjustment will lead to equilibrium and determine the level of (full) employment. As a result, distribution reflects technical conditions but blurs the picture classical economists were (and PK authors are) interested in. There is inherent fairness in this model and no consideration of distributional conflicts. In NEG theory, income distribution is still based on a marginal productivity approach which implies that the same view of static income distribution is taken.

However, personal income distribution matters for determining available savings that are to fund investment. Recent research, which incorporated political economy aspects in the neoclassical framework, has predominantly analysed the nexus between personal income distribution (income inequality) and growth. In these models applied to empirical research, causality runs from income distribution to growth and economic policy issues and institutional settings are brought back into the picture. The channels proposed rather illustrate empirical channels. Strikingly, in contrast to theoretical predictions, they point at a negative relationship between inequality and growth. In these studies, the underlying framework remains within the neoclassical methodology. These models also do not explicitly model the effects of distribution on demand other than its effects on the business environment and thereby on investment.

In contrast, PK distribution and growth models integrate the role of income distribution into the analysis of economic growth where income distribution comes into play through the principle of effective demand. Keynes rejected Say's law and replaced it with the paradox of thrift that predicts a decline in spending, output and employment when the level of saving increases. Different marginal propensities to consume for wages and profits are assumed. Whereas investment is driven by prices (e.g. interest rate) in the neoclassical model, in PK economics it is essentially determined by quantities (e.g. demand), finance (e.g. profits), and animal spirits (e.g. business confidence).

Kaleckian inspired distribution and growth models retain the principle of effective demand of Keynes. These models take into account important behavioural and institutional features of real economies, which are mostly left out in old and new neoclassical growth theory. They reject the idea of a negative relationship between real wages and investment, such as was assumed in neoclassical growth theory and the first generation of PK distribution and growth models. Wages are treated as a cost item but also as a source of demand. Similar to Keynes, they also view unemployment as a consequence of a deficiency of AD in the goods market. These models make use of historical time and replace the marginal productivity theory of income distribution with a degree of monopoly theory in which firms have price-setting power.

In the neoclassical paradigm, an increase in the profit share would always lead to enhanced growth, and inequality should be seen to be conducive to higher economic growth. Political economy factors are added into the models to explain the empirical trends regarding the rise in inequality and fall in growth. In contrast, in the PK literature, a more equal income distribution can have positive effects on AD and hence economic growth. In the PKA models of distribution and growth, an increase in the profit share can have contractionary or expansionary effects on the economy. Based on the size of the effects of individual behavioural components in AD a demand-led regime can be either wage-led or profit-led.

The PKA model puts functional income distribution at the heart of the analysis of AD and economic growth and includes features of the capitalist economic system that appear more realistic than many assumptions in the neoclassical models. Many important issues such as market imperfections, excess capacity, involuntary unemployment, or lack of effective demand are simply assumed away in the neoclassical growth models but in our opinion, need to be brought back into the picture because they are more consistent with the data and stylized facts of the real world economy. As Kaldor succinctly pointed out:

> "Any theory must necessarily be based on abstractions; but the type of abstraction chosen cannot be decided in a vacuum: it must be appropriate to the characteristic features of the economic process as recorded by experience. Hence the theorist, in choosing a particular theoretical approach, […] should be free to start off with a stylized view of the facts, […], i.e. construct a hypothesis that could account for these stylized facts […]." (Kaldor, 1961, pp.177-178)

The outbreak of the Great Recession in 2007 has led to a resurge of interest in Keynesian economics in the academic field as well as in demand management policies in the policy making field. The crisis points to the importance of Keynes' and Kaleckis' principle of effective demand in determining output and employment. Moreover, we

believe that taking into account issues of functional income distribution will enhance the explanatory power of our analysis, e.g. in explaining the poor growth performance in Europe. Concerning our research question of whether there is a conflict between a more equitable distribution of income and economic growth the PKA model is therefore regarded suitable to conduct a fruitful analysis on the issue of the nexus between income distribution, AD, and economic growth.

We have presented the basic PKA model and several possible extensions, including savings out of wages and international trade. In the background of a race to the bottom in the WS, a further issue is the international interactions and responses of countries to changes in distribution in their trade partners. This thesis employs the PKA model to analyse the effects of distribution on growth. The significant fall in the WS accompanied a weaker growth performance in the majority of countries in Europe begs the question: What are the effects of a fall in the WS on AD and economic growth? The theoretical and empirical analysis of this dissertation has important implications for wage policy coordination as part of macroeconomic policy coordination. In fact, the thrust is on policy coordination – wage policy coordination and fiscal policy coordination. Therefore, we will extend the model by integrating government spending as well as the effects of taxes on distribution. To the best of our knowledge, attempts to integrate the government sector in the PKA models are still rudimentary and this area presents a research gap.

Empirical research has established a good body of literature on fiscal multipliers, but does not consider fiscal policy in combination with wage policy in the context of distribution driven demand led models. Therefore, we are interested in the effects of fiscal coordination on investment and growth on the one hand, and the distributional impact of tax policy on labour and capital incomes on the other hand. A related issue is the economic significance of the effects of a higher WS on growth; empirical findings indicate that the effect of a higher WS on growth is rather low, albeit positive at least in large economies. From a policy perspective, coordinated wage policies make an egalitarian growth path possible, however, the economic significance of these effects is rather weak. Hence, this invites research into fiscal policy coordination to stimulate growth, along with wage policy coordination in an integrated Europe.

Chapter 3

CHAPTER 3 - ESTIMATING THE MULTI-COUNTRY DEMAND-LED GROWTH MODEL FOR THE EU15[95]

[95] This chapter has been published as a Journal Article: ONARAN, O. & OBST, T. 2016. Wage-led growth in the EU15 member-states: the effects of income distribution on growth, investment, trade balance and inflation. *Cambridge Journal of Economics,* Advance Access**,** 1-35.

1. Introduction

This chapter presents a multi-country demand-led growth model for the EU15. We analyse the effect of a pro-capital redistribution of income on growth in a highly integrated region such as the EU15 MS. The model estimated in this chapter extends the post-Keynesian/PKA demand-led growth model developed by Bhaduri and Marglin (1990), presented in chapter 2, to a multi-country framework, and aims at analysing the effects of a change in the WS on growth.

A priori one would expect a falling WS to have positive direct effects on investment and net exports, but negative direct effects on consumption, since the MPC out of wage income is expected to be higher than that out of profit income. However, the question whether the negative effect of an increasing profit share on consumption overpowers the positive effects on investment and net exports essentially is an empirical one. If the total effect is negative, the demand regime is called wage-led; otherwise it is profit-led.

The novelty of the empirical analysis in this chapter is that it integrates cross-country effects on demand following to a simultaneous decline in the WS in Europe. Therefore, it goes beyond the analysis of a single country, which has been the main focus of most previous research that has analysed only a subset of countries (e.g. Bowles and Boyer, 1995; Hein and Vogel, 2008) or taken the Eurozone as a hypothetical aggregate (Stockhammer et al. 2009).

To the best of our knowledge, Onaran and Galanis (2014) were the first to develop a theoretical and empirical multi-country model for the G20 countries, which inspired the empirical research on the EU15 countries in this thesis. The second contribution is that it provides new empirical estimates for individual EU15 countries (e.g. Ireland, Greece, or Portugal) rather than for a hypothetical aggregate of the Eurozone as is in Stockhammer et al. (2009). It can thus highlight whether there is an empirical basis for wage policy coordination to avoid 'beggar thy neighbour' policies, which is in turn beneficial to all individual countries, or alternatively, whether there are conflicts of interests across countries. Moreover, it develops a consistent estimation strategy providing new estimates for all EU15 MS individually, including those countries that have not been previously covered in the empirical literature. We further extend the research by estimating the impact of a simultaneous fall in the WS on growth in the EU15 as well as on investment, net exports, and prices based on interactions across countries, which is another contribution of this research to the policy debate. Finally, we present a

wage-led recovery scenario, and discuss whether coordinated wage policies can promote growth with a more equitable income distribution in the EU15.

The chapter is structures as follows: Section 2 specifies data and stylized facts. Section 3 presents the theoretical model. Section 4 critically reviews the estimation methodology. Section 5 presents and discusses the estimation results. Section 6 compares our findings to the literature. Section 7 outlines a wage-led recovery scenario. Finally, section 8 concludes.

2. Data and Stylized Facts

The data used in this section is supplied by the EC for the period between 1960 and 2012. The variables and details of data sources are explained in appendix A.

Our main macroeconomic variables are the following: *C*, *I*, *X*, *M*, *Y*, *W*, and *R* are consumption expenditures, private investment expenditures, exports, imports, GDP at market prices, adjusted wages and adjusted profits respectively, all variables are in real terms. The descriptive statistics and number of observations can be found in appendix B table B1.

Profit share,π, is adjusted gross operating surplus as a ratio to GDP at factor cost[96],Y_f, WS, ws, is $1-\pi$. Returns from self-employment traditionally accrue to capital income leading to lower WSs. The unadjusted WS thus significantly underestimates the labour share, particularly in countries where self-employment income plays a big role. Therefore, the adjusted WS allocates a labour compensation for each self-employed equivalent to the average compensation equivalent to the average compensation of the dependent employees (Onaran and Galanis, 2013)[97].

All variables will be used in logarithmic form[98] due to the fact that they exhibit exponential growth. The sample is restricted to EU15 countries[99], due to the lack of long time series data for the new EU MS. Previous studies have only analysed a subset of 9

[96] GDP at factor cost is GDP at market prices minus taxes on production and imports plus subsidies. It is equal to the summation of labour compensation and operating surplus in the national accounts.

[97] This methodology is used by the EC to calculate the adjusted labour share. See Gollin (2002) for details on the estimation methodology. The calculations of the adjusted wage share have been computed by AMECO (2016). Compensation of employees includes wages and salaries as well as employer's social contributions. Compensation per employee is then taken as a ratio to GDP at current factor cost (GDP at market prices minus taxes on production and imports, plus subsidies) per employee (Domestic Concept). They assign a certain proportion of self-employment income to the average compensation of dependent employees. We have downloaded data from the online database (AMECO, 2016).

[98] The exception is the real interest rate.

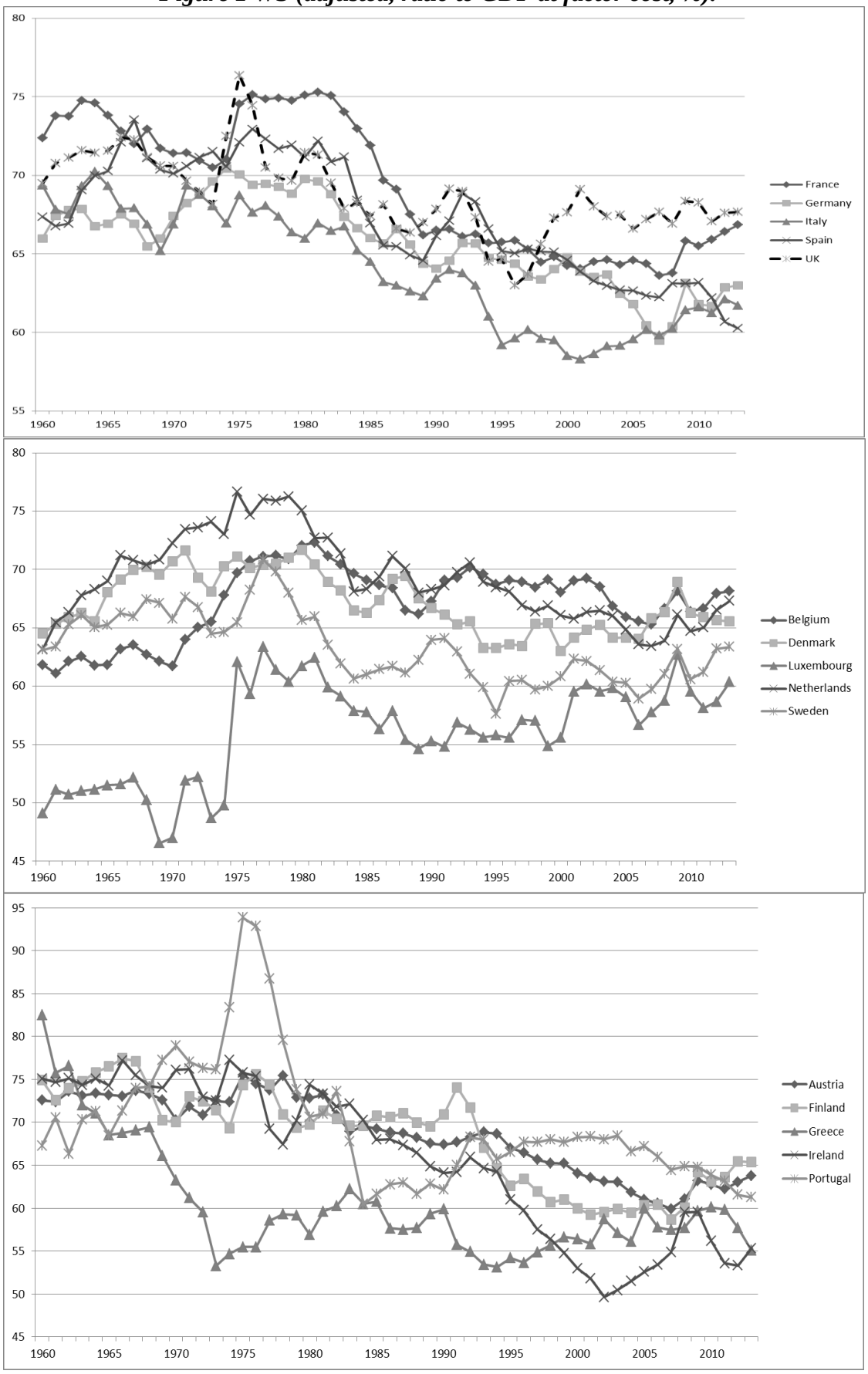
[99] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

European countries (Austria, Belgium, Denmark, Germany, France, Italy, Netherlands, Spain and the UK) (Onaran and Galanis, 2014; Storm and Naastepad, 2012; Hein and Vogel 2008; Bowles and Boyer, 1995, Stockhammer and Stehrer, 2011) or taken the Euro area (twelve West European MS) as a hypothetical aggregate economy without considering cross-country interactions (Stockhammer et al., 2009).

Figure 1 shows the levels of the adjusted WS. There is an overall decline in the WS in the majority of the countries, particularly pronounced between the early 1980s and mid-2000s. The fall is slightly more moderate in Belgium, Denmark and the UK. In the UK, this may be due to the significant increase in managerial wages (OECD, 2012). Greece experienced a pronounced fall in the 1960s coming to a stop with the ending of the military dictatorship in the mid-1970s. Portugal exhibits a significant downswing after a peak in the mid-1970s, after the military coup in 1974. Luxembourg, as an outlier, exhibits a significant increase starting in the early 1970s followed by a moderate decline after the early 1980s. Overall, the share of wages in national income has declined by roughly 10% points in the EU15 countries between their latest peak levels (mid-1970s or early 1980s) and 2013.

Table 1 presents average growth rates of GDP for sub periods and show that the secular decline in the WS was linked with a weaker growth performance. For instance, average growth of GDP in France declined from 5.7% in the 1960s to roughly 2% in the 1990s. In Italy, average growth dropped significantly from almost 6% in the 1960s to roughly 1.5% in the 1990s. This trend holds true for the majority of countries. However, growth rates increased in the case of Ireland and Luxembourg until the Great Recession in 2008. In the UK, average growth of GDP remained relatively stable, with values between 2% and 3% between the 1960s and 2000s.

Figure 1 WS (adjusted, ratio to GDP at factor cost, %).



Source: AMECO online (2014).

Note: Greece and Portugal exhibit high levels of WS due to the share of substantial agricultural self-employment in GDP in these economies.

Table 2: Average growth rates (per cent) of GDP in EU15 countries

	A	B	D	FIN	F	D	GR	IR	I	L	NL	P	E	S	UK
1961-69	4.45	4.76	5.23	4.54	5.64	4.39	8.50	4.39	5.77	3.77	5.01	5.51	7.71	4.44	2.90
1970-79	4.17	3.57	2.47	4.17	4.15	3.27	5.53	4.69	4.02	2.74	3.42	5.37	3.86	2.46	2.42
1980-89	2.00	2.15	1.89	3.56	2.29	1.96	0.78	3.13	2.55	4.57	2.15	3.36	2.70	2.31	2.48
1990-99	2.76	2.18	2.41	1.65	1.87	2.17	1.91	7.20	1.45	4.76	3.20	3.48	2.69	1.75	2.18
2000-07	2.43	2.15	1.85	3.53	2.06	1.63	4.22	5.69	1.56	4.73	2.23	1.49	3.61	3.19	3.17
2008-12	0.62	0.43	-0.83	-0.60	0.11	0.79	-4.36	-1.46	-1.40	-0.29	-0.13	-1.09	-0.95	0.96	-0.61

Source: See Appendix A.

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.

3. Empirical Model

We model the effects of a change in the profit share on the level of GDP by analysing the country level effects on the components of private AD: consumption, investment, exports and imports. We then estimate European interactions resulting from the effects of a change in the profit share of other EU15 countries. The model is based on the PKA framework outlined in chapter 2; however, the behavioural functions also encompass standard Keynesian models (e.g. Blanchard, 2006). Hence, our econometric results, from a theoretical point of view, have a short-run perspective.

Consumption is commonly estimated as a function of income [100] and closely resembles Keynesian consumption functions (Stockhammer et al., 2009) [101]. The Kaleckian assumption holds that the MPS out of profit income is higher than that out of wage income. Consumption decreases with a higher MPS. By definition MPS out of wages is equal to 1 minus the MPC out of wages, and the same holds for that out of profits. Therefore, by estimating consumption we can estimate the consumption differential instead of taking the savings differential such as in Stockhammer et al. (2009). In order to include the distributional effects, we distinguish between profit and wage income and estimate Consumption (C) as a function of adjusted profits (R) and adjusted wages (W):

$$logC = c_0 + c_R logR + c_W logW \tag{3.3.}$$

In order to eventually sum up the individual effects across different components of demand and find $\partial Y/Y$ as a response to a 1% point increase in R/Y, we are interested in the marginal effects, rather than elasticities. Following Stockhammer et al. (2009) we thus convert elasticities to marginal effects. In the case of consumption, the elasticities are c_R and c_W in equation (3.3.) respectively. Note that in Equation (3.3.) c_R is estimated for a given W. The same is true for c_W where the elasticity is estimated for a given R. Hence:

$$c_R = \frac{\partial lnC}{\partial lnR}\Big|_W \cong \frac{\partial C}{C} \Big/ \frac{\partial R}{R}\Big|_W = \frac{\partial C}{\partial R}\frac{R}{C}\Big|_W \tag{3.4.}$$

and

$$c_W = \frac{\partial lnC}{\partial lnW}\Big|_R \cong \frac{\partial C}{C} \Big/ \frac{\partial W}{W}\Big|_R = \frac{\partial C}{\partial W}\frac{W}{C}\Big|_R \tag{3.5.}$$

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[100] Income here relates to total gross income (before taxes and transfers). We will introduce post-tax income when considering taxes on capital and labour in chapter 5 of this thesis.

[101] Our specification is a version of the PKA model that includes the effects of income distribution on AD.

Dividing and multiplying equation (3.4) and (3.5) gives

$$c_R = \frac{\partial C/Y}{\partial R/Y}\frac{R}{C}\Big|_W \tag{3.6.}$$

and

$$c_W = \frac{\partial C/Y}{\partial W/Y}\frac{W}{C}\Big|_R \tag{3.7.}$$

We calculate the marginal effects through multiplying by mean vales of our sample C/R and C/W, respectively:

$$\frac{\partial C/Y}{\partial R/Y}\Big|_W = c_R \frac{C}{R}\Big|_W \tag{3.8.}$$

and

$$\frac{\partial C/Y}{\partial W/Y}\Big|_R = c_W \frac{C}{W}\Big|_R \tag{3.9.}$$

Since we know that $W/Y = 1 - R/Y$, we can say that, for a given Y (prior to any multiplier effects), whenever there is an increase in R/Y there is an equivalent fall in W/Y. The aggregate effect combines these effects for an initially constant Y:

$$\frac{\partial C/Y}{\partial R/Y} = c_R \frac{C}{R} - c_W \frac{C}{W} \tag{3.10.}$$

This marginal effect is equivalent to the difference in the MPC out of profits and wages, and is expected to be negative.

Private Investment (I) is modelled as a positive function of output and the profit share (π) as an indicator for expected profitability as well as for the availability of internal finance, and the real long term interest rate (r) representing a cost factor in alignment with standard investment functions[102] (Chirinko, 1993) :

$$logI = i_A + i_Y logY + i_\pi log\pi + i_r r \tag{3.11.}$$

where i_A is autonomous investment and captures the effects of 'animal spirits', the effects of (Y) and (π) are expected to be positive and the effect of (r) negative. In chapter 2, we have asserted that investment is a function of capacity utilisation (u). In the empirical specification (3.11.) we thus take real output (Y) as a proxy for capacity utilisation which represents the accelerator effect. In alignment with the Bhaduri and

[102] In case of Belgium, France and Germany we included long-term real interest rate as a control variable. As mentioned above, Blecker argues in favour of replacing the variable profit share by taking cash flow, which is equal to gross retained profits (net profits minus corporate income tax, net interest payments, and dividend pay-outs, plus depreciation allowances). However, data availability is severely restricted, for instance in dividend payments. Hence, we prefer equation (3.11), which closely resembles the investment specification presented by Bhaduri and Marglin (1990) but augmented with a cost factor.

Marglin model (1990) we take the profit share instead of the profit rate[103] such as in Neo-Kaleckian distribution and growth models.

In the case of Investment, i_π in equation (3.11.) is the elasticity of (I) with respect toπ (R/Y), hence:

$$i_\pi = \frac{\partial lnI}{\partial \ln(R/Y)} \cong \frac{\partial I}{I} \Big/ \frac{\partial (R/Y)}{(R/Y)} = \frac{\partial I}{\partial (R/Y)} \frac{R/Y}{I} \tag{3.12.}$$

Multiplying and dividing by Y, we obtain

$$i_\pi = \frac{\partial I}{\partial (R/Y)} \frac{Y}{Y} \frac{R/Y}{I} = \frac{\partial I/Y}{\partial (R/Y)} \frac{R}{I} \tag{3.13}$$

Hence, the marginal effect of R/Y on I/Y is

$$\frac{\partial I/Y}{\partial (R/Y)} = i_\pi \frac{I}{R} \tag{3.14.}$$

In converting the elasticity to the marginal effect on (I/Y), we use the mean value for the whole sample for (I/R).

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). This approach allows taking into account the increasing importance of internal trade, e.g. rising exports and import shares. Prices are estimated as a function of labour and non-labour input costs. Furthermore, exports and imports are estimated as a function of relative prices and other control variables.

In order to crystallize the effects of a change in the functional income distribution on net exports we have to integrate price effects into our model. First, domestic prices (P) and export prices (P_x) are functions of nominal ULC (ulc) and import prices (P_m), based on a mark-up pricing model in an imperfectly competitive economy[104].

$$logP = p_0 + p_{ulc} \log(ulc) + p_m \log(Pm) \tag{3.15}$$

$$logP_x = px_0 + p_{ulc} \log(ulc) + p_m \log(Pm) \tag{3.16}$$

Import prices (P_m) are a proxy for the cost of imported input costs. Exports (X) is a function of export prices/import prices (P_x/P_M) and the GDP of the rest of the world(Y_{rw}).

$$logX = x_0 + x_{pxm} \log(Px/Pm) + x_{Yrw} \log(Yrw) + x_e \log(E) \tag{3.17}$$

Imports (M) are a function of domestic prices/import prices (P/P_m) and GDP.

$$logM = m_0 + m_{ppm} \log(P/Pm) + m_Y \log(Y) + m_e \log(E) \tag{3.18}$$

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[103] The use of the profit share instead of the profit rate assumes that the capital-output ratio is constant over time. Hence, we abstract from technological progress.

[104] However, mark-up behaviour may differ in domestic versus international markets due to market differentiation by firms.

The exchange rate (E) is included into export and import estimations as a control variable when significant[105]. Relative prices (Px/Pm) and P/P_m reflect international competiveness of the economy.

The price equations (3.15 and 3.16) allow for the calculation of the effects of an increase in real ULC[106] on net exports. We calculate the marginal effect of a change in the profit share on Exports/GDP as follows:

$$\frac{\partial(\frac{X}{Y})}{\partial(\pi)} = (-)\left(\frac{\partial X}{\partial P_x}\frac{\partial P_x}{\partial(ulc)}\frac{\partial(ulc)}{\partial(rulc)}\frac{\partial(rulc)}{\partial(ws)}\right)\frac{\frac{X}{Y}}{rulc} = (-)\left(e_{XP}\ e_{Px}\frac{1}{1-e_P}\frac{Yf}{Y}\right)\frac{X/Y}{rulc} \qquad (3.19)$$

where (e_{Px}) illustrates the effect of nominal ULC on (P_x) and (e_{XP}) is the effect of (P_x) on exports, e_p is real ULC (adjusted wage bill as a ratio to GDP at market prices). The WS is real ULC ($rulc$) multiplied by GDP at market prices / GDP at factor costs (Y/Yf) [107]. Thus, the total effect of a change in the WS on exports includes the effects of a change in WS on rulc, the effect of rulc on ulc, the effect of ulc on export prices, and the effect of P_x on exports. Hence, this allows taking into account the total effect of a change in functional income distribution on exports. The average values of $\frac{X/Y}{rulc}$ for the sample mean are used to convert the elasticity of exports to the WS to the marginal effect.

A similar procedure is followed for imports:

$$\frac{\partial(M/Y)}{\partial(ws)} = \left(\frac{\partial M}{\partial P}\frac{\partial P}{\partial(ulc)}\frac{\partial(ulc)}{\partial(rulc)}\frac{\partial(rulc)}{\partial(ws)}\right)\frac{M/Y}{rulc} = \left(e_{MP}\ e_P\ \frac{1}{1-e_P}\frac{Y_f}{Y}\right)\frac{M/Y}{rulc} \qquad (3.20)$$

where (e_{MP}) is of domestic prices on imports and e_P reflects the effects of ULC on domestic prices. The average values of $\frac{M/Y}{rulc}$ for the sample mean are used to convert the elasticity of exports to the WS to the marginal effect.

The sum of partial effects of a change in π on consumption, investment, and net exports ($NX = X - M$) on demand is the effect on private excess demand. This, in turn, will further affect consumption, investment, and imports through the multiplier mechanism. If we assume that the change in the profit share is isolated to a single country only, then in order to find the total effects of a change in π_i on equilibrium AD in country i, private excess demand (E_{ii}) has to be multiplied by the standard multiplier:

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[105] The nominal exchange rate here denotes an exogenous control variable. We exclude it if insignificant.

[106] Real ULC are equal to $\frac{W}{Y}\frac{ET}{EE}$ where ET and EE denote dependent employment and total employment. In the conversion differences between consumer prices and GDP prices are ignored. See Materbauer and Walterskirchen (2003) for more detail on the relationship between wage share and ULC.

[107] The wage share is closely related to real unit labour cost. Nominal unit labour cost, ulc, is simply rulc times the domestic price deflator, P.

$$\frac{dY_i/Y_i}{d\pi_i} = \frac{\left(\frac{\partial(C_i/Y)}{\partial\pi_i} + \frac{\partial(I_i/Y_i)}{\partial\pi_i} + \frac{(\partial NX_i/Y_i)}{\partial\pi_i}\right)}{1-\left(\frac{\partial C_i}{\partial Y_i} + \frac{\partial I_i}{\partial Y_i} - \frac{\partial M_i}{\partial Y_i}\right)} = \frac{E_{ii}}{1-H_{ii}} \quad (3.21)$$

The numerator is private excess demand, that is, the change in private demand caused by a change in income distribution, for a given level of income (isolated). The term $1/\left(1-\frac{\partial C_i}{\partial Y_i}+\frac{\partial I_i}{\partial Y_i}-\frac{\partial M_i}{\partial Y_i}\right)$, in the equation represents the standard multiplier and is expected to be positive for stability.

3.1. Effects of a simultaneous decline in the wage share in Europe

Until now, the unit of analysis has been the nation state. Keynes (1973 [1936]) reminded us on the issue of a 'fallacy of composition'. What seems to make sense, as a policy approach for a single nation state, might not be plausible on an international level. While higher openness of an economy increases the relevance of the positive effects of a fall in the WS due to a higher share of net exports in GDP, European economies are integrated and, as recommended by the EC, all countries are trying to compete on the basis of wage costs. This decreases the effects of a fall in the WS on net exports when it is implemented simultaneously in a variety of countries[108]. Given the high economic integration of the European economy a full understanding of the simultaneous fall in the WS hence requires an integrated European wide analysis[109].

Therefore, we incorporate the European-wide effects of a simultaneous change in π in all the economies, following the methodology developed in Onaran and Galanis (2014) for a global multi-country model[110]. To the best of our knowledge, this research is the first to extend the multi-country model to the EU15 countries based on individual country estimations.

This European multiplier mechanism incorporates the effects of a change in the profit share on the AD of each economy through the effects of changes in import prices and the GDP of trade partners on each country's net exports. The vector of the percentage change in the GDP of each country can be written as a summation of the effect of a change in the own profit share on own private excess demand (C+I+NX) in each country, the national multiplier effects of a change in own private excess demand, the effect of a

[108] Relative prices of exports and imports do not change significantly when all countries reduce their nominal ULC.

[109] In 2013, the greater proportion of a MS's total trade in goods was with partners within the EU-28 with an average of 62% of total exports (Eurostat, 2015).

[110] Rezai (2011) and von Arnim et al. (2012) offer a theoretical model in a similar spirit to this paper. In our analysis we apply matrix algebra to estimate a system of equations that takes into account a simultaneous change of the profit share in all EU15 MS.

change in the profit share of the trade partners on net exports of each country, and the effect of changes in the income of the trade partners on income of each country via the effects on exports:

For the case of 15 countries, the % change in the GDP of each country is given by:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = E_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} + H_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + P_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{n15} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (3.22)$$

The matrices E and H represent the effects of a change in each country's own π on demand in that particular country. Hence, here we consider a change in the profit share in each country in isolation. E is a diagonal 15x15 matrix, where the diagonal elements are the effect of a change in the profit share in country i on private excess demand ($C + I + NX$) in country i, calculated as in equations (3.3.), (3.11.) and (3.17., 3.18.).

$$E_{15x15} = \begin{bmatrix} \frac{\frac{\Delta C}{Y_1} + \frac{\Delta I}{Y_1} + \frac{\Delta NX}{Y_1}}{\Delta\pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \vdots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\frac{\Delta C}{Y_{15}} + \frac{\Delta I}{Y_{15}} + \frac{\Delta NX}{Y_{15}}}{\Delta\pi_{15}} \end{bmatrix} \quad (3.23)$$

However, this will lead to further multiplier effects[111]. H is a 15x15 diagonal matrix, which shows the effect of an autonomous change in private excess demand on AD in each country and reflects the national multiplier:

$$H_{15x15} = \begin{bmatrix} \frac{\Delta C_1}{\Delta Y_1} + \frac{\Delta I_1}{\Delta Y_1} - \frac{\Delta M_1}{\Delta Y_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \cdots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta C_{15}}{\Delta Y_{15}} + \frac{\Delta I_{15}}{\Delta Y_{15}} - \frac{\Delta M_{15}}{\Delta Y_{15}} \end{bmatrix} \quad (3.24)$$

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 coefficient estimates in tables 3, 4 and 8 give the elasticities with C, I, and M with respect to Y (e_{CY}, e_{IY}, e_{MY} respectively). Again the elasticities have to be converted into partial effects, e.g.:

111 In our analysis we first estimate private excess demand (C+I+NX/Y) in each country. In order to take into account multiplier effects we multiply private excess demand with the estimated multipliers in each country, which gives us the percentage change in AD (see table 10 column F, G, and H). Hence, matrix E for instance includes the change in income (table 10 column F) in its diagonal.

$$e_{CYi} = \frac{\partial log C_i}{\partial log Y_i} \cong \frac{\frac{\partial C_i}{C_i}}{\frac{\partial Y_i}{Y_i}} = \frac{\partial C_i}{\partial Y_i}\frac{Y_i}{C_i} \tag{3.25}$$

Hence,

$$\frac{\partial C_i}{\partial Y_i} = e_{CYi}\frac{C_i}{Y_i} \tag{3.26}$$

Finally,

$$H_{ii} = \frac{\partial C_i}{\partial Y_i} + \frac{\partial I_i}{\partial Y_i} - \frac{\partial M_i}{\partial Y_i} = e_{CY,i}\frac{C_i}{Y_i} + e_{IY,i}\frac{I_i}{Y_i} - e_{MY,i}\frac{M_i}{Y_i} \tag{3.27}$$

Matrix *P* is an 15x15 matrix and illustrates the effect of a change in trade partners` π_j on import prices and hence on net exports in each country i:

$$P_{15x15} = \begin{bmatrix} 0 & \frac{\partial\left(\frac{NX}{Y}\right)_1}{\partial\pi_2}\frac{M_{21}}{M_1} & \cdots & \frac{\partial\left(\frac{NX}{Y}\right)_1}{\partial\pi_n}\frac{M_{151}}{M_1} \\ \frac{\partial\left(\frac{NX}{Y}\right)_2}{\partial\pi_1}\frac{M_{12}}{M_2} & 0 & \dots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ \frac{\partial\left(\frac{NX}{Y}\right)_{15}}{\partial\pi_1}\frac{M_{115}}{M_{15}} & \frac{\partial\left(\frac{NX}{Y}\right)_{15}}{\partial\pi_2}\frac{M_{215}}{M_{15}} & \cdots & 0 \end{bmatrix} \tag{3.28}$$

The diagonal elements of P are zero, the off-diagonal elements are calculated as:

$$P_{ij} = \frac{\partial\left(\frac{NX}{Y}\right)i}{\Delta\pi_j}\frac{M_{ji}}{M_i} = \left(e_{Pxj}\frac{1}{1-e_{pj}}\frac{Yf_j}{Y_j}\frac{1}{rulc_j}\right)\frac{M_{ji}}{M_i}\left(e_{XPi}\frac{X_i}{Y_i} - e_{MPi}\frac{M_i}{Y_i}\right) \tag{3.29}$$

The terms in the first parenthesis shows the effect of a change in the profit share in country j on its export prices (based on elasticities). This change is weighted by the share of imports from country j to country i in country i's total imports to reflect the effect on country i's overall import prices. The last term calculates the effects of this change in import prices on country i's exports – imports (using the elasticities of X and M to P_x/P_m and P/P_m respectively), each weighted by the share of exports and imports in GDP.

Finally, W is a 15x15 matrix, which incorporates the change in trade partners' GPD on exports of each country, is:

$$W_{15x15} = \begin{bmatrix} 0 & e_{XYrw,1}\frac{X_1}{Y_1}\frac{Y_2}{Y_w} & \cdots & e_{XYrw,1}\frac{X_1}{Y_1}\frac{Y_{15}}{Y_w} \\ e_{XYrw,2}\frac{X_2}{Y_2}\frac{Y_1}{Y_w} & 0 & \dots & e_{XYrw,2}\frac{X_2}{Y_2}\frac{Y_{15}}{Y_w} \\ \vdots & \ddots & \ddots & \vdots \\ e_{XYrw,15}\frac{X_n}{Y_n}\frac{Y_1}{Y_w} & e_{XYrw,15}\frac{X_{15}}{Y_{15}}\frac{Y_2}{Y_w} & \cdots & 0 \end{bmatrix} \tag{3.30}$$

The diagonal elements of this matrix are zero, and the off diagonal element reflects the effect of a change in country j's income on country i's exports (as a ratio to GDP), and is calculated as the elasticity of exports of country i with respect to the GDP of the rest

of the world ($e_{XYrw,i}$) multiplied by the share of exports in GDP in country i and weighted by the share of country j in world GDP (Y_w).

Solving equation (3.22.) for $\left[\frac{dY}{Y}\right]$ we obtain:

$$\begin{bmatrix} \frac{dY_1}{Y_1} \\ \vdots \\ \frac{dY_n}{Y_n} \end{bmatrix} = (I_{nxn} - H_{nxn} - W_{nxn})^{-1}(E_{nxn} + P_{nxn}) \begin{bmatrix} \delta\pi_1 \\ \vdots \\ \delta\pi_n \end{bmatrix} \tag{3.31}$$

where $(I - H - W)^{-1}$ is the equivalent of the European level multiplier.

3.2. Total effects on investment, net exports and inflation

Next we model the total effects on investment, net exports and inflation integrating both national and cross-country multiplier effects, which is a novelty of this dissertation. We employ the same methodology (based on matrix algebra) applied in section 3.1. However, we adjust the respective calculations accordingly as we outline below.

The total effect on investment determines ultimately the character of the accumulation regime (Blecker, 2015). A strong partial effect of π and a weak partial effect of Y on I favour a positive impact of pro-capital redistribution on investment, resulting in a profit-led investment regime $\left(\frac{\Delta I/Y}{\Delta\pi} > 0\right)$. In the reverse constellation a pro-capital redistribution would have a negative effect on investment resulting in a wage-led investment regime $\left(\frac{\Delta I/Y}{\Delta\pi} < 0\right)$. Hence, even if demand is wage-led, investment can be either wage-led or profit-led.

The total effects will depend on whether the profitability or the accelerator effects dominate as well as the sign and size of the overall effect of π on Y. We calculate the total effects on investment as follows:

$$\frac{\Delta I/Y}{\Delta\pi} = \left[\left(\frac{\Delta Y/Y}{\Delta\pi} e_{IY} \frac{I}{Y}\right) + i_\pi \frac{I}{R}\right] \tag{3.32}$$

where $\frac{\Delta Y/Y}{\Delta\pi}$ illustrates the change in aggregate demand and (e_{IY}) reflects the elasticity of investment to GDP. In order to convert elasticities into marginal effects we multiply with the sample mean of $(\frac{I}{Y})$. The first term denotes the ex-post multiplier indirect effect, whereas the second term is the direct partial profitability effect as calculated in equation (3.11)[112].

[112] The ex-post multiplier indirect effect takes into account both national (isolated change in profit share) and cross-country multiplier effects (simultaneous change in profit share). The direct partial profitability effect integrates only national multiplier effects.

Regarding the trade balance, the total effect of a 1%-point increase in π on net exports in wage-led countries will be positive and larger after the multiplier due to a fall in imports following lower growth; however the effect in profit-led countries is theoretically ambiguous. There will be a positive effect on imports due to the rise in GDP in profit-led countries, which partially offsets the positive price competition effects and deteriorates the trade balance position. Furthermore, when there is a simultaneous change in all countries, and if the EU15 as a whole is wage-led, this leads to a decrease in trade partners' GDP, and a negative effect on exports. This may offset the positive effects via prices; hence the total effect on trade balance is ambiguous in both the wage-led and profit-led economies. We calculate the post-multiplier net export effects as[113]:

$$\begin{bmatrix} \frac{\Delta NX/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta NX/Y_{15}}{\Delta \pi_{15}} \end{bmatrix} = (NX_{15x15} + P_{15x15}) \begin{bmatrix} \Delta \pi_1 \\ \vdots \\ \Delta \pi_{15} \end{bmatrix} + (W_{15x15} - M_{15x15}) \begin{bmatrix} \frac{\Delta Y/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta Y/Y_{15}}{\Delta \pi_{15}} \end{bmatrix} \tag{3.33}$$

where

$$NX_{15x15} = \begin{bmatrix} \frac{\frac{\Delta NX}{Y_1}}{\Delta \pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \vdots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\frac{\Delta NX}{Y_{15}}}{\Delta \pi_{15}} \end{bmatrix} \tag{3.34}$$

$$M_{15x15} = \begin{bmatrix} \frac{\Delta M_1}{\Delta Y_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \ldots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta M_{15}}{\Delta Y_{15}} \end{bmatrix} \tag{3.35}$$

where NX_{ii}= $\frac{\frac{\Delta X}{Y_1}}{\Delta \pi_1} - \frac{\frac{\Delta M}{Y_1}}{\Delta \pi_1}$ and M_{ii}=$e_{MYi} \frac{M_i}{Y_i}$.

Next, we calculate the effect of an isolated change in π in one country on inflation ($\Delta logP$) as:

$$\frac{\Delta logP}{\Delta \pi} = - \left[\frac{\partial logP}{\partial logulc} \frac{\partial logulc}{\partial logrulc} \frac{\partial logrulc}{\partial logws} \right] \frac{1}{rulc} = - \left(e_{PULC} \frac{1}{1 - e_{PULC}} \frac{Y_f}{Y} \right) \frac{1}{rulc} \tag{3.36}$$

The effects of a simultaneous change in π on prices in each country is then given by:

[113] We follow the same matrix operation as in section 3.1. The main difference being that matrix "NX" (in contrast to matrix "E") now only includes the effects on net exports coming from a change in the profit share and matrix "M" is deducted from matrix "W" also to only include net export effects coming from the feedback effects between the EU15 MS.

$$\begin{bmatrix} \frac{\Delta logP}{\Delta\pi_1} \\ \vdots \\ \frac{\Delta logP}{\Delta\pi_{15}} \end{bmatrix} = \left(DP_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} + PM_{15x15} \begin{bmatrix} 0 & \Delta\pi_2 & \cdots & \Delta\pi_{15} \\ \Delta\pi_1 & \ddots & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ \Delta\pi_1 & \Delta\pi_2 & \cdots & 0 \end{bmatrix} \begin{bmatrix} p_{m1} \\ \vdots \\ p_{m15} \end{bmatrix} \right) \quad (3.37)$$

where

$$DP_{15x15} = \begin{bmatrix} \frac{\Delta logP}{\Delta\pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta logP}{\Delta\pi_{15}} \end{bmatrix} \quad (3.38)$$

$$PM_{15x15} = \begin{bmatrix} 0 & \frac{\Delta log(P_x)_2}{\Delta\pi_2}\frac{M_{21}}{M_1} & \cdots & \frac{\Delta log(P_x)_{15}}{\Delta\pi_{15}}\frac{M_{151}}{M_1} \\ \frac{\Delta log(P_x)_1}{\Delta\pi_1}\frac{M_{12}}{M_2} & 0 & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ \frac{\Delta log(P_x)_1}{\Delta\pi_1}\frac{M_{115}}{M_{15}} & \frac{\Delta log(P_x)_2}{\Delta\pi_2}\frac{M_{215}}{M_{15}} & \cdots & 0 \end{bmatrix} \quad (3.39)$$

where $DP_{ii} = \frac{logP}{\Delta\pi}$ and

$$PM_{ij} = \frac{\Delta log(P_x)_j}{\Delta\pi_j}\frac{M_{ji}}{M_i} = -(e_{Pxj}\frac{1}{1-e_{pj}}\frac{Yf_j}{Y_j}\frac{1}{rulc_j})\frac{M_{ji}}{M_i} \quad (3.40)$$

DP_{ii} represents the effects of a change in π in country i on domestic prices in country i; PM_{ij} includes the effects of a change in π in country j on inflation in country i via changes in the import prices of country i[114].

4. Estimation Methodology

We apply a single-equation approach to analyse the effects of a change in the WS on growth the EU15 countries. We estimate the distributional effects of individual components of private which are consumption, investment, exports, imports and do this for each country as is widely applied in the literature (Stockhammer et al., 2009; Onaran and Galanis, 2014; Hein and Vogel, 2008).

The econometric specifications are following the standard practice in modern econometric modelling. Regressions with non-stationary time series may produce spurious regressions. Therefore, we carry out Augmented Dickey Fuller tests to test for unit roots in our variables. The tests suggest that most of our variables are integrated of order one (see appendix C table C1). Only the profit share is stationary in Greece, the Netherlands, Spain, Sweden and the UK, hence this variable enters the investment

[114] PM matrix represents an adjusted version of matrix P we employed in section 3.1. to incorporate the effects of a change of the profit share on net exports working through a change in import prices. Here we are only interested in the effects on import prices.

specification in its level form. All the other non-stationary variables are used in first differences. In order to detect long run relationships, Error-correction models (ECM) are applied wherever statistically significant[115].

In all estimations we start with general specifications with both the contemporaneous values and first lags of the variables as well as include a lagged dependent variable. Wherever there is autocorrelation[116], either the lagged dependent variable is kept or an AR(1) term is added. In order to derive the long-term coefficients (elasticities) we follow two different methods depending on whether there is a short-run (differenced form) or long run relationship (ECM). In the ECM we divide the negation of the statistically significant coefficient of the log-level of the lagged explanatory variable by the speed of adjustment coefficient (coefficient of the log-level of the lagged dependent variable). If there is no statistically significant cointegration relationship then we use difference specifications. In this context, we derive long-term elasticities by summing up the coefficients of the contemporaneous and lagged variables (if statistically significant) and dividing by 1 – the coefficient of the lagged dependent variable (if statistically significant).

Generally speaking, the relevant empirical literature has developed two different estimation strategies to determine whether an economic regime is wage-led or profit-led. We can call these different strategies 'structural approach' and 'aggregative approach' (Blecker, 2015). The structural approach represents the single equation approach (SEA), which is applied in this thesis and the aggregative approach stands for the application of a structural Vector-Autoregression-Models (VAR). Both approaches have merits and weaknesses on their own[117].

The first, larger, group of papers analyses the goods market in isolation and have been applied by Bowles and Boyer (1995), Hein and Vogel (2008), Storm and Naastepad (2012), Stockhammer et al. (2009), Onaran et al. (2011), Onaran and Galanis (2014), among others. This literature uses annual data and usually interprets the effects as a partial goods market equilibrium with a focus on the medium run (Stockhammer, 2015). Usually, the authors estimate separate econometric equations for the behavioural

[115] We apply t-ratios reported in Banerjee et al. (1998) for the coefficient of the speed of adjustment term to test for the significance of cointegration in the ECM model.

[116] The Durbin Watson tests exhibit severe restrictions; therefore we applied Breusch-Godfrey tests to detect autocorrelation.

[117] One shortcoming both estimation approaches have is that the exclude debt variables (Blecker, 2015). However, there is one recent and notable study by Stockhammer and Wildauer (2015) who control for debt effects in their panel data estimation. They find a panel of 18 OECD countries to be wage-led. We introduce public debt, as a ratio to nominal GDP in our model in chapter 5.

functions for consumption, investment, and net exports, and then add the effects together to determine the total effect of a change in income distribution on AD. In this approach, the total effect is calculated by summing up the various effects for consumption, investment, and net exports with respect to a change in the WS (or equivalently a change in the profit share).

The SEA has several advantages. It allows for flexible modelling of the individual behavioural functions for single countries and to detect the precise economic relationships between demand and changes in income distribution (Onaran and Galanis, 2014)[118]. Moreover, it is possible to distinguish between domestic and total effects that include international trade. Although it does not explicitly account for the fact that C, I and NX add up to private demand, we do integrate the interactions between the three components of demand indirectly as both investment and imports are functions of domestic GDP, which includes all demand components, and thereby the national multiplier effects are integrated. Moreover, by estimating the Europe wide multiplier effects we incorporate further effects on C, I and M.

The main alternative, the aggregative approach[119] tries to estimate the full model (goods market equilibrium relation and a distribution function) and has been applied by has been applied by Onaran and Stockhammer (2005) and Stockhammer and Onaran (2004), and Barbosa-Filho and Taylor (2006) among others. Typically, output is regressed directly on the wage (or profit) share, usually with some lags, and possibly using various control variables as well (Blecker, 2015). Stockhammer and Onaran (2004) for instance estimate a VAR model consisting of five variables: Capital accumulation, capacity utilisation, profits share, unemployment rate and labour productivity growth. In this context, the individual effects on capital accumulation and capacity utilization are analysed using impulse response functions[120].

The advantage of this approach is that the interaction between the variables can be incorporated and it allows for tracing effects through an entire system rather than analysing one equation at a time. Also, it is more suitable to deal with simultaneity bias. However, using this approach would require a substantial simplification of the model

[118] The structural method can identify the sign and magnitude of the distributional effects on each component of AD

[119] The VAR accounts for the system-dimension through analysing the dynamic impact of random disturbances on the system of variables, by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system.

[120] Issues of multicollinearity are inevitable and hence inference in VAR models does not focus on the statistical significance of t-values (Onaran and Stockhammer, 2005).

since the VAR model cannot handle more than five endogenous variables (Onaran and Galanis, 2014)[121]. In the context of our analysis that encompasses seventeen variables, this would lead to a significant misspecification of the behavioural functions and does not give a precise account of the effects of the WS on C, I and NX.

The problem is that the VAR structure implies that the lagged values of all variables enter each behavioural function, and it becomes hard to specify each function appropriately or issues of overdetermination or misspecification arise; e.g. profit income, wage income, profit share, and nominal ULC would all be allowed to affect import prices. Alternatively, in order to simplify the model a single variable to reflect the wage share would have to be used in all equations; however then the specifications would be misspecified.

What we currently do is to introduce the appropriate related variable in each behavioural equation, e.g. profit share in investment, profit and wage incomes in consumption, relative prices in imports, and nominal ULC in price estimations, which we believe are the appropriate behavioural specifications, and this would not be possible in a VAR framework. The estimation regarding the effects on net exports alone requires the stepwise estimation of four separate equations. Simplified direct estimations of net exports as functions of the wage share applied in the former literature (e.g. Bowles and Boyer, 1995; Hein and Vogel, 2008) fail to detect the significant effects of labour costs on foreign demand; hence it is not our preferred approach. In the past decades international trade has increased substantially. As a consequence the estimation of the net export effect is a very sensitive part of the model.

Specification of proper behavioural functions is thus a choice we made over the systems estimations. Furthermore, in a VAR model it is not possible to detect and decompose the precise economic relationships that lead to changes in demand in response to distribution using impulse responses or decomposition analysis, which trace the cumulative effects of changes in all the variables in the system following an initial shock in distribution. The SEA thus has the big advantage that the interpretation of the results is much clearer, which is crucial to understand the mechanisms of how a change in the wage share affects total as well as decomposed parts of aggregate demand.

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[121] In our model we have 52 observations. In a VAR with short time series introducing more variables comes at a cost. Adding one more variable introduces autoregressive parameters and hence this procedure can become prohibitive. VAR models use lags of all variables in the system as explanatory variables; too many variables thus lead to problems with degrees of freedom very quickly (Onaran and Stockhammer, 2005).

The second major qualification relates to changes in the functional income distribution. It is important to recognize that income distribution is endogenous (i.e. a higher unemployment rate lowers the wage share, which usually takes place with a time lag[122]). However, endogenising income distribution, e.g. by using an instrumental variable method, work only if the instrumental variables are valid instruments, and for income distribution the common approach is to use the lags of distribution as instruments, which raises concerns about the validity of the instruments as well as poses challenges regarding the degrees of freedom with short time series data. Using a VAR methodology, in addition to the problems of specification discussed above, also requires identifying some variables as simultaneously exogenous, and the interactions are modelled via the lagged effects only; hence this method also does not offer much more than assuming distribution to be exogenous in the short run and endogenous in the long run.

Given these caveats of instrumental variable approaches as well as systems estimations discussed above, in order to focus on the determinants of demand we take the wage share as exogenous in the short run[123], hence we are implying that the time lag of the effect of output on distribution is longer than one year.

As a result, the convenience of having a clearer interpretation using a SEA may come at the price of possible bias due to ignoring the system dimension and endogeneity. The main alternative of using a VAR model approach, however, comes with its own problems.

Another methodological issue is the modelling of international trade. In the age of globalisation (e.g. exports and impost have usually grown faster than GDP) the modelling and estimation of the foreign sector is a very sensitive part of the estimation (Stockhammer et al., 2009). In the literature, two estimation strategies were applied.

One group (Hein and Vogel, 2008; Bowles and Boyer, 1995; Naastepad and Storm, 2006) estimates net exports specifications directly as a function of real ULC and other control variables. Net exports (as a share to GDP) are directly regressed on domestic GDP, foreign GDP of the most important trading partners, nominal exchange rates and real ULC. However, this puts a strong emphasis on the influence of the WS on net exports. It implicitly assumes that a change in real ULC has a constant effect on net

[122] Marterbauer and Walterskirchen (2003) for instance find three statistically significant variables that explain a change in the wage share: economic activity (Kaldor effect), development of prices and the labour market situation. According to their estimations, an increase in GDP growth by 1% point (on average over three decades) leads to a decline of the wage share of roughly 0.4 to 0.7 percentage points.

[123] This assumption might be plausible since labour contracts are fixed for a certain period of time and wages adjust only with a time lag to a change in output.

exports over time. This is a rather strong assumption given that export and import shares have been rising and hence the importance of international trade has been increasing (Stockhammer et al., 2009). In contrast, most macroeconometric models use prices rather than ULC and include them in the import and export functions. Therefore, this 'direct estimation strategy' imposes a rather restrictive component to the model. Simplified direct estimations of net exports fail to detect the significant effects of a change in labour costs on foreign demand[124] and therefore are not our preferred method.

Another strand of research estimates separate price equations and then import and export equations (Stockhammer et al., 2009; Onaran et al., 2011; Onaran and Galanis, 2014). This estimation strategy offers a richer treatment of the effects of globalization and is more in alignment with standard modelling practice of prices and international trade. The estimations employ ULC, rather than the wage share, as the explanatory variable, due to the fact that this is the relevant one for international competiveness. Moreover, the effects of change in real ULC can be easily converted (and hence linked to) into effects of changes in the wage share (or profit share).

Usually the research applying this latter estimation strategy is able to find statistically significant effects and hence finds small open economies to be profit-led due to the stronger effects of the WS on net exports. This thesis will apply the second estimation strategy to take fully into account the effects of globalization.

5. Estimation Results

The estimation results for consumption are shown in table 3. The hypothesis that the MPC out of profit income is larger than out of wage income is confirmed in all countries. This finding is equivalent to the difference in savings rates out of profit and wage income.

The results for investment are given in table 4. In all countries, GDP has strong and significant accelerator effects on private investment. The effects of the profit share are less robust across countries; the profit share has no statistically significant effect on private investment in Austria, Greece, Germany, Finland, Luxembourg, Portugal and the UK. In these countries the effect of π is treated as zero when we calculate the total effects private excess demand.

Comparing these results to previous findings in the empirical literature (Onaran and Galanis, 2014; Hein and Vogel, 2008; Stockhammer et al., 2009) we find a general

[124] Hein and Vogel (2008) for instance fail to find significant effects of income distribution on net export in four out of six countries (Austria, France, Germany, the Netherlands, the UK and USA).

breakdown of the profit-investment nexus since the start of the Great Recession in 2007. Onaran et al. (2011) find that in the case of the US when interest and dividend payments are deducted from the profit share, there is a positive effect on investment illustrating the impact of financialisation on the sensitivity of investment to π. Such a correction, however, is beyond the scope of this thesis due to limited time series data on dividend payments in most EU15 countries.

The estimation results for domestic prices, export prices, exports, imports and prices can be found in the tables 5-8 respectively. We did not find statistically significant effects of domestic prices relative to import prices on imports for Denmark, Finland, Germany, Greece, and Luxembourg. By the same token, we did not find statistically significant effects of export prices relative to import prices on exports for Belgium, Ireland, Luxembourg, Netherlands and Portugal.

Table 9 summarises the effects of a change in π on X/Y and M/Y. The total effect does depend not only on the elasticity of exports and imports to relative prices and the pass through from labour costs to prices, but also on the share of the respective component in GDP[125]. As a result, in small open economies the effects are likely to be much larger compared to large relatively closed economies.

[125] As a robustness check we converted elasticities into marginal effects using the sample mean as well as the latest value in 2013 to take into account possible effects coming from higher trade openness. Our results regarding the nature of the regimes remain robust and EU15 GDP remains wage-led.

Table 3 Consumption: dependent variable $d\ ln\ (C)$

	c	$dlog(R_t)$	$dlog(W_t)$	$dlog(C_t - 1)$	$(AR1)$	DW	$R2$	Sample
A	0.005 (1.567)	0.160 (4.394)***	0.616 (6.024)***			2.369	0.527	1961-2013
B	0.007 (2.963)***	0.148 (3.832)***	0.483 (7.506)***			2.241	0.590	1961-2013
DK	0.001 (0.323)	0.236 (4.758)***	0.655 (6.262)***			1.869	0.564	1961-2013
FIN	0.007 (2.735)***	0.184 (7.984)***	0.635 (11.061)***			1.694	0.774	1961-2013
F	0.006 (2.751)***	0.143 (4.865)***	0.657 (10.635)***			2.074	0.771	1961-2013
D	0.004 1.313	0.101 (2.151)**	0.476 (4.352)***	0.292 (2.500)**		2.090	0.707	1962-2013
GR	0.013 (3.889)***	0.114 (3.859)***	0.633 (10.282)***			1.771	0.748	1961-2013
IRL	0.004 (0.798)	0.183 (4.746)***	0.520 (5.153)***			2.233	0.483	1961-2013
I	0.004 (1.793)*	0.204 (4.713)***	0.744 (9.447)***			1.531	0.773	1961-2013
L	0.016 (4.087)***	0.103 (3.451)***	0.350 (4.920)***			1.741	0.350	1961-2013
NL	-0.004 (-1.574)	0.149 (4.807)***	0.582 (5.749)***	0.376 (3.766)***		1.876	0.813	1962-2013
P	0.012 (3.025)***	0.099 (6.177)***	0.612 (8.195)***			2.121	0.615	1961-2013
E	0.001 (0.278)	0.182 (4.750)***	0.767 (16.751)***			2.096	0.878	1961-2013
S	0.006 (2.279)**	0.088 (2.788)***	0.554 (7.891)***			1.736	0.578	1961-2013
UK	0.005 (1.627)	0.209 (6.744)***	0.702 (7.567)***		0.273 (1.884)*	1.944	0.718	1962-2013

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 4 Private investment: dependent variable $d\ln(I)$

	c	$dlog(\pi_t - 1)$	$log(\pi_t - 1)$	$dlog(Y_t)$	$dlog(I_{t-1})$	$dlog(r_t - 1)$	$dlog(r_t)$	$log(I_{t-1})$	$log(Y_{t-1})$	$(AR1)$	DW	$R2$	Sample
A	-0.025 (-2.828)***	0.110 (0.830)		1.881 (7.359)***							2.018	0.526	1962-2013
B	-0.632 (-4.595)***		0.239 (2.290)**	2.387 (6.527)***	0.234 (2.340)**			-0.247 (-4.107)***	0.330 (4.789)***		1.932	0.638	1963-2013
DK	-0.038 (-4.448)***	0.321 (1.948)*		2.929 (11.168)***		-0.008 (-2.310)**					1.883	0.751	1963-2013
FIN	-0.038 (-3.451)***	0.174 (1.588)		2.067 (9.138)***						0.322 (2.186)**	1.841	0.752	1963-2013
F	-0.032 (-4.221)***	0.155 (1.646)*		2.214 (12.179)***			-0.002 (-1.300)			0.541 (4.616)***	1.940	0.826	1963-2013
D	-0.021 (-2.196)**	0.121 (0.544)		1.810 (7.149)***						0.360 (2.154)**	1.613	0.590	1963-2013
GR	0.028 (0.513)		0.091 (1.518)	2.293 (9.862)***						-0.265 (-1.907)*	2.017	0.625	1962-2013
IRL	-0.036 (-1.976)*	0.338 (1.967)*		1.802 (5.004)***							1.988	0.416	1963-2013
I	-0.026 (-2.941)***	0.295 (1.761)*		1.722 (7.841)***		-0.003 (-1.172)				0.331 (2.293)**	1.943	0.636	1964-2013
L	-0.029 (-1.420)	0.160 (0.675)		1.728 (4.172)***							2.410	0.273	1963-2013
NL	-0.392 (-2.762)***		0.130 (3.030)***	2.681 (9.527)***				-0.299 (-5.346)***	0.295 (5.237)***		2.299	0.714	1961-2013
P	-0.042 (-2.834)***	0.024 (0.440)		2.119 (6.662)***							2.026	0.485	1962-2013
E	0.099 (1.098)		0.134 (1.664)*	2.720 (9.443)***						0.415 (3.297)***	1.994	0.769	1962-2013
S	0.119 (1.759)*		0.159 (2.384)**	2.406 (9.892)***	0.269 (3.437)***						1.794	0.729	1962-2013
UK	-0.474 (-1.815)*		0.134 (1.581)	2.283 (8.870)***				-0.243 (-3.527)***	0.261 (3.220)***		1.909	0.677	1961-2013

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 5 Price deflator: dependent variable $d\ln(P)$

	c	$dlog(ULC_t - 1)$	$dlog(ULC_t)$	$dlog(P_{t-1})$	$dlog(Pm_t)$	$dlog(Pm_t - 1)$	$(AR1)$	DW	$R2$	Sample
A	0.005 (2.433)**		0.286 (4.952)***	0.453 (5.320)***	0.146 (3.715)***			1.920	0.851	1962-2012
B	0.020 (3.797)***	0.180 (2.226)**			0.154 (5.036)***	0.129 (4.333)***	0.627 (4.829)***	2.163	0.811	1962-2012
DK	0.008 (2.423)**	0.249 (2.698)***		0.465 (4.037)***		0.183 (5.266)***		2.029	0.865	1962-2012
FIN	0.009 (2.511)**		0.388 (5.328)***	0.249 (2.834)***	0.220 (5.520)***			1.890	0.842	1962-2012
F	0.004 (1.718)*	0.194 (1.624)*		0.633 (4.635)***		0.094 (3.580)***		1.795	0.907	1962-2012
D	0.017 (4.333)***		0.382 (7.351)***				0.699 (6.577)***	2.091	0.834	1962-2012
GR	0.019 (2.870)***	0.423 (5.932)***			0.462 (6.435)***			1.758	0.810	1962-2012
IRL	0.031 (2.987)***	0.256 (1.863)*			0.284 (3.744)***		0.431 (2.490)**	2.111	0.678	1962-2012
I	0.014 (3.033)***	0.633 (10.044)***			0.206 (5.279)***			1.715	0.828	1962-2012
L	0.024 (4.180)***		0.345 (3.284)***	-0.482 (-3.605)***	0.523 (5.076)***			1.651	0.479	1962-2012
NL	0.007 (2.492)**	0.255 (2.687)***		0.448 (3.656)***		0.152 (4.599)***		1.997	0.801	1962-2012
P	0.018 (3.200)***	0.471 (7.345)***			0.204 (4.035)***	0.247 (4.491)***		1.803	0.857	1962-2012
E	0.029 (2.904)***		0.585 (8.027)***		0.023 (1.093)		0.798 (8.667)***	2.284	0.937	1962-2012
S	0.016 (2.914)***	0.342 (4.107)***			0.151 (3.926)***	(0.220) (5.499)***	0.359 (2.154)**	1.951	0.817	1962-2012
UK	0.016 (2.968)***	0.582 (7.530)***			`0.184 (3.048)***			1.715	0.695	1962-2012

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 6 Export price deflator: dependent variable $d\ln(P_x)$

	c	$dlog(ULC_t - 1)$	$dlog(ULC_t)$	$dlog(Px_{t-1})$	$dlog(Pm_t)$	$dlog(Pm_t - 1)$	$log(Px_{t-1})$	$log(ULC_{t-1})$	$log(Pm_{t-1})$	$(AR1)$	DW	$R2$	Sample
A	0.002 (1.060)		0.152 (3.490)***		0.616 (15.385)***						2.339	0.867	1961-2013
B	0.001 (0.674)		0.096 (1.920)*		0.789 (26.133)***						2.037	0.949	1961-2013
DK	1.307 (4.828)***		0.085 (1.031)		0.687 (15.211)***		-0.643 (-4.950)***	0.223 (4.748)***	0.385 (4.642)***		2.045	0.916	1961-2013
FIN	-0.003 (-0.811)		0.185 (2.612)***		0.776 (15.279)***						1.569	0.879	1961-2013
F	-0.002 (-1.025)	0.248 (4.124)***		0.142 (3.074)***	0.528 (21.465)***						1.875	0.956	1962-2013
D	0.004 (1.653)*	0.197 (3.122)***		0.224 (3.227)***	0.365 (11.266)***						1.667	0.823	1962-2013
GR	1.115 (3.237)***		0.154 (1.631)*		0.828 (12.355)***		-0.511 (-4.341)***	0.192 (3.250)***	0.297 (3.536)***		1.880	0.914	1961-2013
IRL	0.000 (0.009)		0.171 (1.946)*		0.708 (10.398)***						2.004	0.810	1961-2013
I	0.000 (0.113)	0.185 (3.179)***		0.539 (19.040)***	0.210 (3.630)***					-0.315 (-2.029)**	1.980	0.950	1963-2013
L	0.024 (2.389)**		0.322 (1.704)*			-0.001 (-0.006)					1.800	0.076	1962-2013
NL	0.002 (0.251)	0.370 (1.823)*				0.229 (1.877)*					2.008	0.171	1962-2013
P	0.280 (1.786)*	-0.103 (-1.658)*		0.246 (1.845)*	0.722 (14.862)***	-0.251 (-2.301)**	-0.382 (-4.404)***	0.053 (1.971)**	0.330 (5.082)***		1.834	0.930	1962-2013
E	0.012 (1.483)	0.255 (2.507)**		0.155 (1.716)*	0.421 (11.016)***					0.461 (3.076)***	1.744	0.870	1963-2013
S	-0.002 (-0.616)		0.172 (2.509)**		0.716 (16.126)***						1.928	0.877	1961-2013
UK	0.558 (3.051)***		0.136 (2.084)**		0.577 (13.998)***		-0.486 (-4.725)***	0.101 (3.172)***	0.377 (4.975)***		1.667	0.928	1961-2013

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 7 Exports: dependent variable $d\ln(X)$

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

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 8 Imports: dependent variable $d\ln(M)$

	c	$dlog(P/Pm_{t-1})$	$dlog(P/Pm_t)$	$dlog(Y_t)$	$dlog(Y_t-1)$	$dlog(m_{t-1})$	$log(m_{t-1})$	$log(P/Pm_{t-1})$	$log(Y_{t-1})$	$(AR1)$	DW	$R2$	Sample
A	-0.005 (-0.701)	0.329 (1.786)*		1.970 (8.114)***							2.251	0.648	1962-2013
B	0.004 (0.668)	0.336 (3.790)***		1.649 (8.360)***						-0.272 (-1.917)*	2.131	0.692	1963-2013
DK	0.006 (0.907)		-0.152 (-1.272)	1.868 (8.994)***							2.004	0.618	1961-2013
FIN	-0.007 (-0.886)		-0.115 (-0.946)	1.854 (10.137)***							2.082	0.677	1961-2013
F	-0.001 (-0.159)	0.296 (3.604)***		1.940 (8.884)***							2.008	0.725	1962-2013
D	0.007 (0.923)		0.101 (1.098)	2.010 (9.666)***						0.241 (1.728)*	1.918	0.684	1963-2013
GR	0.019 (1.830)*		0.148 (0.772)	1.268 (6.884)***							1.767	0.510	1961-2013
IRL	-1.578 (-3.623)***		0.174 (1.417)	1.351 (5.249)***		0.230 (1.839)*	-0.527 (-4.032)***	0.163 (1.941)*	0.807 (3.909)***		2.091	0.559	1962-2013
I	0.000 (-0.010)	0.195 (2.236)**		2.829 (10.797)***	-0.858 (-3.394)***						2.032	0.719	1962-2013
L	0.010 (1.107)		-0.025 (-0.168)	1.230 (6.925)***							2.146	0.490	1961-2013
NL	0.007 (1.341)	0.145 (1.930)*		1.589 (9.536)***							1.873	0.727	1962-2013
P	-2.121 (-3.979)***		0.340 (2.408)**	1.641 (5.161)***			-0.555 (-4.128)***	0.411 (3.773)***	0.858 (4.141)***		1.636	0.551	1961-2013
E	-0.009 (-0.769)	0.225 (2.073)**		2.443 (8.171)***							1.581	0.649	1962-2013
S	-0.009 (-1.317)	0.252 (2.808)***		2.063 (9.993)***							2.210	0.678	1962-2013
UK	-4.300 (-5.583)***		-0.010 (-0.184)	1.778 (11.126)***			-0.594 (-5.721)***	0.098 (2.633)***	1.083 (5.677)***		2.114	0.798	1961-2013

*, **, *** stand for 10%, 5% and 1% significance levels respectively.

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

Table 9 Calculation of 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	0.329	0.361	0.306	-0.161	0.396		
B	0.180	1.220	0.096	0.000	0.000	0.603	0.897	0.491	0.000	0.336	0.074	0.487	-0.053	0.053		
DK	0.465	1.870	0.347	-0.627	-0.406	0.582	0.866	0.305	0.185	0.000	0.000	0.261	0.000	0.185		
FIN	0.516	2.067	0.185	-0.576	-0.220	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	0.296	0.332	0.163	-0.078	0.140		
D	0.382	1.617	0.253	-0.379	-0.155	0.600	0.913	0.207	0.049	0.000	0.000	0.195	0.000	0.049		
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	0.256	1.344	0.171	0.000	0.000	0.588	0.896	0.455	0.000	0.310	0.107	0.456	-0.074	0.074		
I	0.633	2.723	0.235	-0.307	-0.196	0.586	0.913	0.165	0.050	0.195	0.336	0.165	-0.087	0.137		
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	0.145	0.124	0.385	-0.069	0.069		
P	0.471	1.889	0.139	0.000	0.000	0.638	0.913	0.161	0.000	0.741	0.659	0.194	-0.182	0.182		
E	0.585	2.410	0.301	-0.277	-0.201	0.614	0.913	0.149	0.044	0.225	0.318	0.144	-0.068	0.113		
S	0.342	1.519	0.172	-0.508	-0.132	0.517	0.815	0.273	0.057	0.252	0.131	0.273	-0.056	0.113		
UK	0.582	2.393	0.207	-0.518	-0.257	0.612	0.890	0.199	0.074	0.165	0.230	0.198	-0.066	0.140		

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 WS.

5.1. National Effects

Table 10 summarizes the effects of a 1-% point increase in π on the components of AD, namely consumption, investment, exports and imports. The first column presents the marginal effects on consumption. The differences in consumption propensities are negative (as expected) in all countries[126], which reflect that the MPC out of profits is lower than that of wages, hence a rise in π leads to a subsequent decline in consumption[127]. The differences between MPC range mostly between -0.23 (Ireland) and -0.564 (Greece).

The second column gives the partial effects of π on investment. A 1% increase in π leads to an increase in investment with the values ranging between 0.07% points (the Netherlands) and 0.20% points (Belgium).

If we sum up both effects we find the effects of a change in the profit share on domestic private demand, the negative effect of π on consumption is substantially larger than the positive effect on investment in absolute value in 13 out of 15 countries. The only two exceptions are Belgium and Denmark. Thus, domestic demand in the EU15 countries is clearly wage-led.

The integration of the foreign sector, however, has a crucial role in determining whether an economy is wage-led or profit-led (Blecker, 1989). The effects of a 1%-point increase in π on net exports range between 0.05%-points (Germany) to 0.40%-points (Austria).

Column F reports the partial effects on private excess demand when π increases in each country in isolation. Overall, large economies such as the UK, Germany, France, Italy, and Spain as well as some small economies such as Greece, Portugal, Sweden, Finland, Netherlands, and Luxemburg are wage-led. Two small economies, Austria and Ireland are profit-led when integrating the foreign sector, as well as Belgium and Denmark, which already had profit-led domestic demand due to low consumption differentials and high investment effects.

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126 Our mean differential is 0.312 and hence in alignment with previous studies, e.g. Marglin and Bhaduri (1992) report a savings differential of 0.37 for a sample of sixteen OECD countries. Only for Belgium, Denmark and Luxembourg we found surprisingly low marginal effects.

127 We have run several robustness checks estimating (C/Y) as a function of unadjusted wages and unadjusted profits as well as unadjusted and adjusted WS. In contrast to other studies (Storm and Naastepad, 2012), we did not find statistical significance (different time periods also did not alter the results). However, the estimations by Storm and Naastepad (2012) have unit root problems. The ECM specification gave statistically significant cointegration indicating long run effects for Belgium.

Column G reports the multiplier, which was calculated using the elasticities of C, I, and M with regard to Y. The multipliers are mostly above one and range between 1.01 in Ireland and 4.16 in Spain, with only three small open countries having a multiplier less than one (Belgium, Luxembourg and the Netherlands)[128].

When the multiplier effects are taken into account the effect of an initial change in income distribution on demand are amplified (if the multiplier is greater than one). Column H reports the % change in demand after the multiplier mechanism. The effects are significantly amplified in Greece and Spain due to larger multipliers with demand decreasing by -1.52% and -0.87% respectively.

The effects of a 1%-point increase in π on investment are diverse as can be seen in Appendix D. Investment regime is wage-led, i.e. the effect of a rise in π on I/Y is negative in Finland, Germany, Greece, Luxembourg, Portugal, Spain, and the UK whereas the investment regime is profit led in Austria, Belgium, Denmark, France, Ireland, Italy, Netherlands, and Sweden. The effects are ranging from strong negative effects in wage-led countries such as Greece (-0.70) to moderate positive effects in profit-led countries (0.31) such as Denmark.

The effects on the trade balance are almost always positive ranging between 0.07 (Ireland) and 0.31 (Austria). Belgium is an exception with a negative effect due to very low positive net export effects via the price channel and a strong increase in imports following the increase in aggregate demand. The total effects on net exports are larger than the partial effects via price channels in wage-led economies, and lower in profit-led countries (compared to the partial effects reported in Column E in Table 10).

[128] The IMF (2009) reports capital spending multipliers between 0.5 and 1.8. Qazizada and Stockhammer (2014) find multipliers between 1 and 3 in a panel study for 21 OECD countries between 1979 and 2011.

Table 10 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	The effect of a simultaneous 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 (F*G)	I
A	-0.277	0.000	0.234	-0.161	0.396	0.119	1.262	0.150	-0.232
B	-0.151	0.206	0.000	-0.053	0.053	0.108	0.824	0.089	0.007
DK	-0.155	0.169	0.185	0.000	0.185	0.198	1.621	0.321	0.120
FIN	-0.243	0.000	0.074	0.000	0.074	-0.169	1.700	-0.287	-0.401
F	-0.324	0.101	0.062	-0.078	0.140	-0.083	2.092	-0.174	-0.317
D	-0.397	0.000	0.049	0.000	0.049	-0.348	1.337	-0.465	-0.525
GR	-0.564	0.000	0.099	0.000	0.099	-0.465	3.264	-1.519	-1.706
IRL	-0.229	0.161	0.000	-0.074	0.074	0.006	1.008	0.006	-0.083
I	-0.410	0.156	0.050	-0.087	0.137	-0.117	2.192	-0.257	-0.372
L	-0.153	0.000	0.000	0.000	0.000	-0.153	0.560	-0.086	-0.154
NL	-0.322	0.078	0.000	-0.069	0.069	-0.175	0.926	-0.162	-0.231
P	-0.402	0.000	0.000	-0.182	0.182	-0.219	2.026	-0.445	-0.630
E	-0.410	0.088	0.044	-0.068	0.113	-0.210	4.156	-0.871	-1.072
S	-0.388	0.128	0.057	-0.056	0.113	-0.147	1.225	-0.180	-0.319
UK	-0.252	0.000	0.074	-0.066	0.140	-0.112	1.491	-0.167	-0.265
EU15*									-0.423

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

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

Table 11 Elasticities of C, I, M with respect to Y and the multiplier.

	e_{CY}	e_{IY}	e_{MY}	h	Multiplier
A	0.776	1.881	1.970	0.208	1.262
B	0.631	1.334	1.649	-0.214	0.824
DK	0.891	2.929	1.868	0.383	1.621
FIN	0.819	2.067	1.854	0.412	1.700
F	0.800	2.214	1.940	0.522	2.092
D	0.577	1.810	2.010	0.252	1.337
GR	0.748	2.293	1.268	0.694	3.264
IRL	0.703	1.802	1.531	0.008	1.008
I	0.948	1.722	1.970	0.544	2.192
L	0.453	1.728	1.230	-0.785	0.560
NL	0.731	0.985	1.589	-0.080	0.926
P	0.711	2.119	1.547	0.506	2.026
E	0.948	2.720	2.443	0.759	4.156
S	0.642	2.406	2.063	0.184	1.225
UK	0.911	1.076	1.823	0.329	1.491

Table 11 shows the elasticities of C, I, and M with respect to Y, as given by the coefficient estimates in tables 3, 4, and 8 and the national multiplier for each country in isolation, calculated as explained section 3.1.

5.2. European Effects

Next, we analyse the effects of a simultaneous 1%-point increase in π taking place in all EU15 countries. Column I in table 10 illustrates the results.

Most strikingly, two economies, which were profit-led in isolation – Austria and Ireland, – also start to contract after the incorporation of further effects on their net exports due to decreasing wage shares of their trade partners, which reduce export prices and GDP of the trade partners, which are wage-led. Thus, when everyone is pursuing the same wage competition strategy in Europe the expansionary effects of an increase in π are reversed as relative price effects are moderated and external demand dampens.

Comparing columns H and I, wage-led economies experience even stronger negative effects on demand. Demand in the large economies (rather closed) such as Germany, France, Spain, Italy and the UK now decrease by 0.27% to 1.07%. Demand in small open economies such as Austria, Finland, Greece, Ireland, Portugal and Sweden decrease by values between 0.08% and 1.71%.

Greece, albeit a small open economy, stands out as a strongly wage-led economy due to very low sensitivity of exports to labour costs[129], no significant effect of labour costs on imports and no significant effects of profitability on private investment. Even in isolation, a rise in the profit share leads to a 1.52% fall in demand, and the effect increases further after a race to the bottom in the wage share in Europe. Indeed, only Belgium and Denmark do not contract as an outcome of a simultaneous increase in π; however, the effects on growth diminish significantly in these countries as well and become almost economically insignificant, close to zero in the case of Belgium.

Overall, a simultaneous decline in the ws in all countries leads to a decline in the EU15 GDP by 0.42%.

Next, we report the total effects on investment and net exports following a simultaneous 1%-point increase in π in Appendix D Table D2. In this case 10 countries have a wage-led investment regime (including Austria, France, and Sweden now). The negative effects of a simultaneous rise in π on investment are larger (in absolute value) in countries with wage-led investment regimes, and countries with profit-led investment regimes now experience smaller increases in investment due to more moderate growth effects.

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[129] The EC (2013a) itself highlighted the incomplete pass-through of labour-cost moderation into prices. Wage cuts were not passed on to export prices but absorbed by increasing profit margins, particularly in the tradable sector.

Regarding the net exports effects, in all countries, the total effects of a simultaneous rise in π is lower (Table D2) compared to the effects of an isolated change in π due to the fall in external demand. On average, however, net exports would still increase by 0.20%-points in the EU15 as a whole. Net exports decline only in Belgium.

5.3. Robustness Checks

In order to account for the exceptional behaviour of the economies during the crisis years we have checked the robustness of our results using a reduced sample size between 1960 and 2007. The results are robust when estimations are repeated excluding the Great Recession years. As a second robustness check, we used unadjusted wages[130].
We again found that the results are robust.

Third, we also estimated a seemingly unrelated regression model (SUR) to check for the robustness of our results. Indeed, we found cross-correlation among the error terms of all six equations (C, I, P, P_x, X, M) for the EU15 countries to be statistically significant. This is plausible since the EU15 represent a highly integrated economy, i.e. are affected by a common monetary policy[131]. However, SUR methodology comes at a cost. First, our SUR estimations show that we do not increase statistical significance by applying a systems approach. In contrast, in the investment specifications effects of π on investment becomes insignificant in the case of France, Spain, and Sweden, as opposed to the significant effects in the single equation estimations. Moreover, there are strong 'contagion effects' within the systems approach; thus a miss-specified equation in one country leads to a change in otherwise significant results in other country specifications. Most importantly, our overall findings remain robust when estimating a SUR model, e.g. the EU15 GDP declines by 0.34% according to the SUR results, which is very close to the result based on single country simulations and still indicates that Europe as a whole is wage-led.

6. Comparison with Empirical Literature

In this section we compare our results with the previous empirical research, particularly on the EU MS. Since the seminal paper of Bhaduri and Marglin (1990)[132], a

[130] The data for unadjusted wages comes from AMECO online (2016). 'Unadjusted' here means that there is no statistical correction for self-employment income (e.g. does not include any imputed income to the labour of the self-employed). Hence, the unadjusted wage share is usually significantly lower than the adjusted wage share, particularly in countries with a high degree of self-employment.
[131] This relates to all countries except Denmark, Sweden and the UK.
[132] Also Blecker (1989) opened up the possibility for countries to be wage-led or profit-led.

vast body of empirical literature has attempted to determine whether various countries have wage-led or profit-led demand regimes.

There are two main estimation strategies, accompanied by an on-going debate about the nature of the demand regime in advanced economies. One strand of literature is motivated by the analysis of a Neo-Kaleckian version of Goodwin's cyclical growth model (e.g. Barbosa-Filho and Taylor, 2006; Kiefer and Rada, 2015; Tavani et al., 2011). These studies focus on the systemic linkages between demand and distribution and treat the latter as endogenous. This literature applies a VAR approach to jointly estimate economic activity and distribution[133]. These models estimate a reduced form long run model with short-run cycles typically consisting of only the wage share and capacity utilisation[134]. In alignment with the theoretical assumption that higher profits lead to higher investment, these studies typically find the demand regime to be profit-led.

Stockhammer (2015), however, argues that this literature needs to provide more evidence on the behavioural equations, in particular on the investment function, since it is viewed as the driving force of finding profit-led demand. Furthermore, a series of relevant financial control variables are omitted that might bias the overall findings (Stockhammer, 2015).

Kiefer and Rada (2015) estimate a VAR with only distribution and growth for a panel of 13 OECD countries including 8 European MS[135] and find weak profit-led regimes; however they include a mix of small open and large economies in the panel, which may have quite different structural parameters. Barbosa-Filho and Taylor (2006) find demand to be profit-led but focus exclusively on the US. A notable exception is Stockhammer and Onaran (2004) that estimate a VAR model for France, the UK, and the US and find weak evidence for wage-led demand. Tavani et al. (2011), confirm previous results of a profit-led regime in the US but a wage-led regime in Netherlands. Jump and Mendieta-Munoz (2015) test the wage-led demand hypothesis for the UK using a structural VAR approach and find evidence in favour of a wage-led demand regime.

A larger group of papers apply a SEA estimating behavioural functions for consumption, investment and the external sector separately. These studies use annual

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133 Barbosa-Filho and Taylor (2006) further decompose aggregate demand into individual components, rather than estimating behavioural equations.

134 Capacity utilisation is usually defined as real GDP over potential GDP (e.g. Barbosa-Filho and Taylor (2006). Kiefer and Rada (2015) take the OECD output gap. However, as the authors note themselves, this methodology can be questioned due to both methodological and theoretical problems in measuring potential output or output gap.

135 Finland, France, Germany, Ireland, Italy, Netherlands, Sweden, and the UK.

data and usually interpret the effects as partial goods market equilibrium with a focus on the medium run (Stockhammer, 2015).

Table 12 gives an overview of the existing empirical results for the countries covered in this study[136]. Overall, the majority of the conducted econometric studies find that domestic demand regimes tend to be wage-led, whereas international trade can turn demand regimes in some economies into a profit-led regime.

[136] For surveys of the empirical literature see Onaran et al. (2011), Onaran and Galanis (2014), or Blecker (2015).

Table 12 Overview econometric on wage-led and profit-led demand regimes

	Domestic Demand		**Total Demand**	
	Wage-led	*Profit-led*	*Wage-led*	*Profit-led*
Austria	Stockhammer & Ederer (2008), Hein and Vogel (2008), Stockhammer and Stehrer (2011)			Stockhammer & Ederer (2008), Hein and Vogel (2008),
Denmark	Storm and Naastepad (2012)		Storm and Naastepad (2012)	
Germany	Onaran and Galanis (2014), Stockhammer et al. (2009), Bowles and Boyer (1995), Stockhammer and Stehrer, 2011, Hein and Vogel (2008)		Hein and Vogel (2008), Naastepad and Storm (2006), Onaran and Galanis (2014)	Bowles and Boyer (1995)
Finland	Storm and Naastepad (2012), Stockhammer and Stehrer (2011)		Storm and Naastepad (2012)	
France	Bowles and Boyer (1995), Naastepad and Storm (2006), Onaran and Galanis (2012), Ederer and Stockhammer (2007), Storm and Naastepad (2012), Stockhammer and Stehrer (2011)		Naastepad and Storm (2006), Hein and Vogel (2008), Storm and Naastepad (2012), Onaran and Galanis (2014)	Bowles and Boyer (1995), Ederer and Stockhammer (2007)

Italy	Storm and Naastepad (2012)		Storm and Naastepad (2012)	
Luxembourg	Stockhammer and Stehrer (2011)			
Netherlands	Stockhammer and Stehrer (2011)	Hein and Vogel (2008)	Naastepad and Storm (2006)	Hein and Vogel (2008)
Spain	Storm and Naastepad (2012)		Storm and Naastepad (2012)	
Sweden	Storm and Naastepad (2012), Stockhammer and Stehrer (2011)		Storm and Naastepad (2012)	
UK	Bowles and Boyer (1995), Naastepad and Storm (2007), Hein and Vogel (2008), Onaran and Galanis (2014)	Stockhammer and Stehrer (2011)	Bowles and Boyer (1995), Naastepad and Storm (2006), Hein and Vogel (2008), Onaran and Galanis (2014), Storm and Naastepad (2012)	
Panel Studies of OECD countries	Stockhammer and Wildauer (2015); Hartwig (2014)			

In this group, our results are in alignment with those of Onaran and Galanis (2014), Storm and Naastepad (2012), Stockhammer et al. (2011), Stockhammer and Ederer (2008) for Austria, Finland, Germany, France, Italy, Netherlands, Spain, Sweden and the UK.

Storm and Naastepad (2012) find Denmark to be wage-led in domestic demand as well as total demand and Belgium to be undefined. However, their estimations do not pay attention to unit root issues. Furthermore, international trade is modelled by means of estimating the effects of real ULC directly on exports, and they do not estimate the effects on imports.

Bowles and Boyer (1995) find profit-led regimes in total demand in Germany and France. However, while their paper is seminal in terms of testing strategy, they do not discuss the time series properties of their variables and hence do not apply difference or error correction models.

Stockhammer and Stehrer (2011), focusing on domestic demand only, find mixed results for Ireland, depending on the amount of lags included. However, they find perverse but statistically insignificant consumption effects. In alignment with our findings, the authors find domestic demand in Luxembourg to be wage-led.

Hein and Vogel (2008) differ from our results regarding the Netherlands only, which they find to be profit-led. However, the unconventional finding that domestic demand is profit-led drives these results.

Hartwig (2014) finds that demand in the OECD is slightly wage-led based on panel data estimations for single components of demand. Stockhammer and Wildauer (2015) also apply panel data estimations for single equations and find demand in 18 OECD countries on average to be wage-led[137].

Overall, our results confirm the findings of the majority of studies that domestic demand tends to be wage-led; aggregate demand in large economies also tend to be wage-led, whereas small open economies may be profit-led due to international trade effects. To the best of our knowledge, this research is the first to estimate the aggregate demand regime in Greece, Portugal, Ireland and Luxembourg.

While the results of single country versus panel data estimations are not comparable, it is worth noting that single equation and VAR estimation strategies have yielded contradicting results in some cases, mostly for the case of the US, and although the US

[137] Including 12 EU MS: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Spain, Sweden and United Kingdom.

is not the focus of this dissertation, the differences in methodologies may need further explanation[138].

Blecker (2015) emphasizes that studies, which have found profit-led economies using a VAR approach, have used methodologies that focus on short-run cyclical relationships[139]. The diversity of findings across the single equation estimation studies might be explained by the fact that, depending on the specifications in the econometric model, they pick up short-run as well as long-run relationships[140].

The argument to pay attention to the time dimension of the effects has some merit since both studies that find profit-led demand regimes, Barbosa-Filho and Taylor (2006) for the US, and Kiefer and Rada (2015) for a panel, analyse short-run cyclical dynamics. Moreover, as Stockhammer and Stehrer (2011) show, the estimated effects on domestic demand are quite sensitive to the lag length in separate time series equations for 12 OECD countries. With regards to the study by Barbosa-Filho and Taylor (2006), Stockhammer and Stehrer (2011) point out that the econometric results might suffer from autocorrelation problems. Moreover, they found the results to be very sensitive to the lag length. Increasing the lag length (two to four lags using quarterly data) turns the original finding of a profit-led regime into a wage-led one. In addition, the empirical findings for the consumption function (negative effects of an increase in the wage share on consumption) in Barbosa-Filho and Taylor (2006) are perverse.

To summarize, there are single equation based as well as systems based estimations, which deliver similar results regarding the wage-led nature of the demand regime in several European countries (e.g. Stockhammer and Onaran, 2004 or Jump and Mendieta-

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138 It should be noted that both scholars, in the Kaleckian and Goodwin tradition, agree on the partial effects, that is an increase in the wage share should increase consumption and depress investment. The disagreement is based on the relative size of the effects, and hence the total effects. However, as Stockhammer and Stehrer (2011) note, even though the Goodwin cycle based studies find profit-led demand regimes, it might not be due to reasons implied in Goodwin's theory of the business cycle. As the authors show, the link between investment and profits seems not to be strong. We also find that changes in investment are predominantly driven by changes in demand rather than in income distribution. The finding of a negative consumption differential is, however, robust across all countries in a wide range of studies.

139 Blecker (2015) argues that the positive effects of increased profits on investment and net exports are stronger in the short run, while it appears that the negative effects on consumption are likely to be more significant in the long run. Therefore, he suggests that while there is evidence for demand to be profit-led in the short run it is not relevant to the impact of a change in the wage share on long-term economic performance.

140 In our analysis, we first estimate ECM and then choose a difference specification if there is no significant error correction mechanism. Hence, the short run effects are arguably the same as the long run effects. We also calculate long-run coefficients in our difference specifications taking into consideration lagged effects of the explanatory as well as dependent variables.

Munoz, 2015) and the differences between findings in the case of the US seem to be driven by the treatment of auto-correlation and lag length issues.

In another attempt to address the potential reasons behind the profit-led finding in the Goodwin's cyclical growth model, Stockhammer and Michell (2014) demonstrate theoretically that in a simple Minsky model extended by a reserve army distribution adjustment mechanism, the wage share responds positively to output but generates no feedback. Instead, cycles are generated through the interaction of financial fragility and demand with the latter not being influenced by changes in functional income distribution. This holds true even if a wage-led demand regime is introduced to the model by allowing for a positive feedback effect from the wage share to output. Hence, finding a counter-clockwise motion in output-wage-share space might not be enough evidence to rule out the possibility of a wage-led demand regime.

As a result, empirical studies based on Goodwin cycle models that do not control for debt variables might base their findings of profit-led demand on spurious correlations (Blecker, 2015; Stockhammer, 2015).

However, our research in this chapter, as most other studies using the single equation approach, also omits debt variables due to lack of long time series data for each EU15 country[141]. A notable exception is Stockhammer and Wildauer (2015) who control for effects of personal income distribution, asset prices and debt[142]. Also, Onaran et al. (2011) integrate housing and financial wealth effects on consumption and find the US to be a moderately wage-led demand regime.

Detached from the literature on wage-led and profit-led demand regimes a study by the IMF (Decressin et al., 2015) has simulated a 2% wage moderation scenario in a coherent multi-country model including five European countries (Greece, Italy, Ireland, Portugal, and Spain), to discuss the short run economic impact on output. Following an exogenous 2% reduction in wages in all Euro area economies over two years, Euro area GDP declines by 1% below its level and inflation decreases by 2% points, given that monetary policy is constrained by the zero lower bound. The dissertation thus confirms one of our core results: A simultaneous decline in the wage share in all EU15 countries eliminates the positive competitiveness effects on net exports.

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141 We will introduce public debt as a ratio to nominal GDP in the government augmented model in chapter 5 below.

142 Carvalho and von Rezai (2016) also introduce personal income distribution to explain divergence in the wage share.

7. Wage-led recovery scenarios

In this section, we set out the effects of an alternative scenario of a simultaneous wage-led recovery in the EU15 countries over the next 5 years on growth, investment, net exports and inflation. Obviously, if all countries increase their wage share by 1%-point EU15 GDP would go up by 0.42%[143]. In this scenario, however, the small open economies Belgium and Denmark would contract. In table 13, we illustrate an alternative scenario that takes into account country specific room for manoeuvre to increase the wage share.

In this scenario, all EU15 countries follow a differentiated increase in the wage share with a 5%-point increase in the wage-led countries, a 3%-point increase in the intermediate group of Ireland and Austria, which become wage-led in the race to the bottom scenario, and a 1%-point increase in Belgium and Denmark, which remain profit-led also in the race to the bottom scenario. In this scenario, all EU15 countries can grow along with an improvement in the *ws* leading to an increase in EU15 GDP of 2.14%. Hence, there is an empirical case for wage-coordination to stimulate growth with equality in Europe.

[143] This implies a level effect, rather than a faster growth rate. GDP hence increases by an additional 0.42% in one year.

Table 13 The effects of a differentiated increase in the wage share on growth, investment and net exports

	Change in profit share	% change in aggregate demand	Total effect on I /Y	Total effect on NX/Y
	A	*B*	*C*	*D*
A	-3.00	1.427	0.537	-0.561
B	-1.00	0.313	-0.126	0.184
DK	-1.00	0.672	0.118	0.101
FIN	-5.00	1.967	0.855	-0.948
F	-5.00	1.557	0.123	-0.866
D	-5.00	2.613	0.814	-1.054
GR	-5.00	8.507	3.915	-2.148
IRL	-3.00	0.420	-0.351	-0.081
I	-5.00	1.846	-0.200	-1.031
L	-5.00	0.773	0.201	-0.337
NL	-5.00	1.154	-0.190	-0.680
P	-5.00	3.137	1.182	-1.162
E	-5.00	5.345	2.445	-2.209
S	-5.00	1.504	0.002	-0.919
UK	-5.00	1.304	0.196	-0.855
EU15*		*2.139*	*0.493*	*-0.985*

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

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

The effects on investment are shown in column C. In 11 European countries the positive accelerator effects overpower the negative profitability effects leading to a wage-led investment regime. Greece experiences the strongest positive effects on I/Y of roughly 3.9%-points. We find a profit-led investment regime in only four cases (Belgium, Ireland, Italy, and the Netherlands). While further investment policies are undoubtedly required, particularly in countries with profit-led investment regimes, overall a wage-led recovery could generate an increase of 0.49%-points in I/Y in the EU15.

The effects on net exports are negative in the majority of the EU15 except in Belgium and Denmark as can be seen in column D. While net exports/GDP decrease by only 0.08%-points in Ireland, it decreases by 2.21%-points in Spain. Again further industrial policy is required to address trade imbalances.

Finally, we analyse to what extent a wage stimulus in the EU15 countries would exert inflationary pressures.

On average, annual inflation[144] would rise by 1.4%-point as an outcome of a simultaneous 1%-point increase in the wage share in the EU15 countries, and 1.2%-point following a differentiated increase in the wage share as suggested in alternative our scenario, as reported in Appendix D Table D3. The effects on inflation are not as strong as the effects on nominal ULC since firms might not be able translate higher costs into higher prices, particularly in relatively open economies[145]. As an outcome of our wage-led recovery scenario, the majority of countries would experience increasing inflation rates well below the ECB target inflation rate (2%). In light of a risk of deflation in the Eurozone our findings indicate that a wage stimulus in the EU15 would indeed help keeping the European economy away from deflation.

Labour factor productivity in the EU15 countries increased by roughly 0.7% in the decade between 1997 and 2007 on average excluding the crisis years. Our alternative scenario would be consistent with an annual nominal wage increase of 3.1% in the EU15 on average (e.g. 1.9% in Ireland, 3.6% in Greece).

[144] This presents a one-time rise in the price level.

[145] Stockhammer et al. (2011) find that a change in $rulc$ by 1% will come with an increase of 0.72% in inflation in Germany, and show that increased openness limits the ability of firms to pass on an increase in ulc.

8. Conclusion

The empirical analysis in this chapter shows that a simultaneous decline in the wage share in a highly integrated European economy leads to a decline in growth. Hence there is room to stimulate demand in the current economic climate of deficient demand and sluggish growth: A 1%-point simultaneous increase in the wage share at the European level could lead to a 0.42% increase in EU15 GDP.

The negative effects of a fall in the wage share on consumption overpower the positive effects on investment in 13 European countries. Domestic demand is hence clearly wage-led in the EU15. Some small open economies may have a profit-led regime when the foreign sector is included due to a higher degree of openness of the economy, whereas the net export effects tend not to dominate in relatively closed large economies. In isolation, we have found 11 countries to be wage-led and 4 countries to be profit-led.

One contribution of the research in this thesis is that we have provided new estimates for single EU15 countries. Second, this dissertation went beyond the nation state and estimated the impact of a simultaneous decline in the wage share on demand and hence growth in EU15 countries.

In the case of a simultaneous fall in the wage share, the positive net export effects are essentially wiped out leaving profit-led demand regimes in only two countries (Belgium and Denmark). Thus, when all EU15 countries pursue beggar thy neighbour policies, the competitiveness effects will be minor, while the domestic effects dominate. Reversing these policies would promote growth, albeit the effects are economically not large. A cautious interpretation of the empirical results would suggest a more equal income distribution does not hamper growth in Europe.

The results also illustrate a fallacy of composition. Even if increasing profit shares seem to promote growth at the national level in some profit-led economies, at the European level a simultaneous fall in the wage share leads to European demand deficiency as well as contraction, even in originally profit-led economies such as Austria and Ireland.

The estimated model in this chapter has been kept simple to analyse the role of income distribution in determining private demand. Possible extensions include a richer modelling of the government sector, i.e. the potential crowding in effects on private investment.

The applied estimation approach might introduce some bias resulting from endogeneity issues and single-equation-based estimations. However, our results are

robust across different sample sizes, and estimation methods (i.e. the use of SUR) and in alignment with the findings of the majority of previous studies for single countries. Moreover, our result that the EU15 in aggregate is wage-led is plausible against the background that the EU15 countries have low extra regional trade and hence represent a rather closed economy, and the domestic demand regime (consumption + private investment) in the EU15 is wage-led, which is a very robust finding - in our study as well as in the literature on other countries.

Our results, in line with previous literature, clearly show that the negative effects of a fall in the wage share on domestic consumption outweigh the expansionary effects on investment in the vast majority of the countries. Additionally, a simultaneous decline in the wage share in all EU15 countries eliminates most positive net exports effects among the trade partners in Europe. As a consequence the finding that the EU15 is wage-led in aggregate is in line with intuition.

Policies of internal devaluation have been negative for demand and growth in the EU15. In an alternative scenario of a wage-led recovery, we have shown that it is possible for all countries to grow along a simultaneous differentiated increase in the wage share. If large wage-led economies take the initiative, egalitarian growth becomes feasible including in small open economies. A recovery led by domestic demand and an increase in the wage share would help to restore workers' purchasing power and tackle the issue of reliance on private debt to support consumption, particularly in the periphery of Europe. Debt sustainability would require structural reforms to increase the minimum wages, reinstate collective bargaining institutions, and increase public sector pay with an aim to increase the wage share as opposed to further deregulation in the labour market and wage cuts as suggested by the IMF and the EC for instance in Greece.

Furthermore, a wage-led recovery would still be consistent with annual inflation rates well below the ECB target. A coordinated wage stimulus is what is needed currently to keep Europe away from deflation. An increase in the wage share, interestingly, does not negatively impact the investment performance in the EU15 as a whole with most countries experiencing an increase in investment. The impact of wage increases on trade imbalances across countries, however, require further targeted industrial policy at the European level. Achieving convergence in the level of nominal ULC and overcoming persistent imbalances thus requires a more comprehensive policy mix of wage policies, investment and industrial policies.

Our results have important policy implications. First, if a country is wage-led, increasing the wage share is not an impediment to growth. Second, wage policy coordination in a highly integrated Europe, which tends to be wage-led, can improve growth. Third, a coordinated wage stimulus does not have negative effects on investment in aggregate and induced inflation does not conflict with the ECB target. Finally, a wage-led recovery scenario as an alternative to the current strategy of wage moderation implemented in the European countries is feasible, given that the coordination problem can be overcome.

Appendix

Appendix A - Data Sources

Time-series data	Variable	Definition	Source [Variable construction]
Adjusted wage share	ws	*Compensation per employee as % of GDP at factor cost per person employed*	AMECO Database http://ec.europa.eu/
Adjusted profit share	π		$[\pi = 1 - ws]$
GDP in market prices (real)	Y	*Gross domestic product at 2010 market prices*	AMECO Database http://ec.europa.eu/
GDP at factor costs (real)	Y_f	*Gross domestic product at market prices minus taxes on production and imports, plus subsidies*	AMECO Database http://ec.europa.eu/
Private Consumption (real)	C	*Private final consumption expenditure at constant prices*	AMECO Database http://ec.europa.eu/
Adjusted compensation of employees (real)	W		$[W = ws * Y_f]$
Adjusted gross operating surplus (real)	R		$[R = \pi * Y_f]$
Total Investment (real)	I_t	*Gross fixed capital formation at constant prices; total economy*	AMECO Database http://ec.europa.eu/

Total investment (current prices)	I_{tcurr}	*Gross fixed capital formation at current prices; total economy*	AMECO Database http://ec.europa.eu/
`Private investment (current prices)	I_{pr}	*Gross fixed capital formation at current prices; private sector*	AMECO Database http://ec.europa.eu/
Ratio of private to total investment	I_{ps}		$[I_{ps} = I_{pr}/I_{tcurr}]$
Private Investment (real)	I		$[I = I_t * I_{ps}]$
Real long-term interest rate	r	*Real long-term interest rates, deflator GDP*	AMECO Database http://ec.europa.eu/
GDP Deflator	P	*Price deflator gross domestic product at market prices*	AMECO Database http://ec.europa.eu/
Import price deflator	P_m	*Price deflator imports of goods and services*	AMECO Database http://ec.europa.eu/
Export price deflator	P_x	*Price deflator exports of goods and services*	AMECO Database http://ec.europa.eu/
Exports (real)	X	*Exports of goods and services at constant prices*	AMECO Database http://ec.europa.eu/
Imports (real)	M	*Imports of goods and services at constant prices*	AMECO Database http://ec.europa.eu/
Foreign GDP (real)	Y_{rw}	*GDP of the rest of the world*	World Bank World Development Indicators (WDI)

			http://data.worldbank.org *[World GDP (in constant 2005 US$) - own GDP (in constant 2005 US$)]*
Imports from country j to country i	M_{ji}	*Imports from country j to country i*	IMF, Direction of Trade Statistics, https://stats.ukdataservice.ac.uk//
Exchange Rate	E	*Average of local currency per dollar, euro, and yen*	World Bank World Development Indicators (WDI) http://data.worldbank.org
Real unit labour costs	$rulc$		$[rulc = ws * Y_f/Y]$
Unit labour Costs	ulc		$[ulc = rulc * P]$
Total factor productivity	τ	*Total factor productivity: total economy*	AMECO Database http://ec.europa.eu/

Notes: Private investment, real: For Luxembourg the data starts in 1990; for Belgium, Denmark, France, Ireland, Italy, Netherlands, Spain, and Sweden in 1970. We have reconstructed the data assuming the ratio of private to total investment to stay constant. Real long term interest rate: Data in Portugal starts in 1984, in Greece in 1972, in Ireland in 1970, in Spain in 1977, and in Luxembourg 1972. Imports from country j to country i: 1980-2012 for all countries.

Appendix B

Table B1: Descriptive Statistics of all variables.

Consumption	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	110.1	538.8	946.8	38.9	80.4	319.1	664.8	585.7	6.7	168.6	92.8	58.8	52.6	969.9	498.2
Median	108.7	549.5	932.7	29.9	75.0	281.6	664.9	602.6	5.9	159.0	90.8	49.5	52.7	942.4	442.6
Maximum	170.6	795.0	1392.3	84.2	151.9	565.6	1050.7	868.8	11.9	257.2	145.6	105.7	92.0	1524.5	862.8
Minimum	46.7	252.4	375.7	13.7	21.4	91.7	241.5	195.4	2.3	62.2	36.7	16.3	18.9	507.9	235.7
Std. Dev.	38.7	154.9	319.6	22.3	37.5	138.5	244.7	216.3	3.0	60.0	33.7	30.2	21.6	273.8	207.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Adjusted Profits	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	56.6	290.1	478.2	25.3	36.7	167.0	304.8	300.1	6.2	96.1	43.2	27.2	28.1	494.2	211.7
Median	53.2	277.7	448.3	13.7	34.4	147.9	287.4	313.4	4.6	88.6	37.7	30.5	24.0	508.0	190.3
Maximum	93.6	443.1	831.6	68.3	74.0	340.4	535.3	489.6	14.6	175.9	89.6	48.2	60.2	841.9	376.2
Minimum	27.0	147.2	194.5	3.8	1.1	44.3	94.3	85.3	2.5	42.3	13.1	3.9	7.8	229.7	112.0
Std. Dev.	19.4	97.8	198.3	23.2	20.0	93.3	142.5	132.1	3.6	43.7	24.4	14.8	15.5	192.1	84.5
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Adjusted Wages	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	127.9	629.1	982.8	41.3	71.2	331.3	702.4	601.6	8.2	206.5	99.5	58.5	59.6	1125.2	515.3
Median	125.3	636.3	971.4	31.4	73.4	296.6	711.3	650.3	6.3	193.1	96.5	52.2	61.7	1073.2	475.7
Maximum	205.7	955.8	1432.0	97.8	113.6	564.0	1067.8	807.2	17.1	330.1	156.9	93.4	98.7	1771.1	823.4
Minimum	46.4	258.9	423.1	12.5	28.5	94.5	258.0	243.6	2.5	72.7	41.0	17.2	24.0	524.5	260.8
Std. Dev.	47.2	200.9	297.0	25.1	23.7	132.1	234.5	171.2	4.7	75.9	34.3	24.2	21.6	336.3	174.3
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Private Investment	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	36.7	161.2	270.3	14.5	22.4	115.2	183.9	182.7	2.6	54.4	32.9	18.0	18.6	275.6	113.4

Median	30.8	152.3	238.9	11.4	20.5	93.0	170.9	174.7	1.7	48.4	28.3	15.4	17.9	247.9	98.6
Maximum	64.8	316.3	404.1	39.3	49.3	259.8	312.4	282.3	6.5	95.6	53.9	33.5	31.5	499.5	217.2
Minimum	14.6	48.3	138.0	2.7	8.4	23.6	60.3	82.7	0.9	20.8	10.7	4.3	8.3	117.4	44.0
Std. Dev.	14.4	75.0	85.3	9.7	8.4	62.7	66.9	55.2	1.6	21.2	13.7	9.0	6.5	103.4	48.8
Observations	53	53	53	53	53	53	53	53	23	43	53	53	53	43	53
GDP	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	206.8	1067.4	1605.7	74.3	121.0	548.8	1162.1	1001.5	15.9	334.8	162.1	95.2	99.0	1864.2	823.5
Median	196.8	1097.9	1549.7	50.2	118.1	487.0	1139.6	1028.3	11.9	306.6	152.5	83.9	98.1	1798.5	759.6
Maximum	327.6	1623.0	2471.8	180.4	210.9	988.0	1808.8	1492.7	33.9	561.6	271.5	160.2	173.7	3118.9	1356.9
Minimum	82.1	457.4	689.7	18.5	33.2	153.1	413.4	363.4	5.2	126.2	61.4	27.0	35.5	828.3	408.7
Std. Dev.	74.6	352.0	542.9	53.4	48.8	248.4	431.4	353.1	9.5	135.5	64.4	44.8	41.9	647.3	297.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Profit Share	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Median	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Maximum	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.3
Minimum	0.3	0.3	0.3	0.2	0.0	0.3	0.2	0.3	0.4	0.2	0.2	0.1	0.2	0.2	0.2
Std. Dev.	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Domestic Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	63.1	59.1	69.6	49.5	40.4	47.0	60.5	49.3	60.7	63.3	66.6	44.0	59.0	57.4	54.4
Median	66.7	63.6	73.1	53.7	18.6	42.1	70.3	46.4	61.6	67.2	71.3	33.2	62.9	56.6	51.9
Maximum	114.9	117.4	107.9	105.1	115.9	110.3	112.4	112.8	128.9	109.5	113.1	109.3	115.1	113.8	119.1
Minimum	18.0	9.4	25.4	4.9	1.1	2.9	11.2	3.6	15.6	16.9	20.3	1.8	7.9	9.2	6.4
Std. Dev.	31.5	35.2	27.4	35.2	42.7	38.6	35.4	39.4	33.5	29.2	30.1	41.1	37.1	37.4	38.3
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53

ULC	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.4	0.3	0.4	0.3	0.2	0.3	0.4	0.3	0.3	0.4	0.4	0.3	0.4	0.3	0.3
Median	0.4	0.4	0.5	0.3	0.1	0.3	0.4	0.3	0.3	0.4	0.5	0.2	0.4	0.3	0.3
Maximum	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.6	0.7	0.6	0.7
Minimum	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0
Std. Dev.	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Import Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	71.0	73.6	85.1	62.2	44.8	60.4	74.3	54.8	59.3	83.5	73.6	57.0	64.6	59.7	70.1
Median	86.4	91.9	96.6	77.2	30.8	74.4	97.4	59.0	61.7	96.0	82.7	75.3	75.3	66.6	85.1
Maximum	116.7	112.1	115.8	115.8	128.8	121.3	115.0	122.0	122.9	118.6	119.0	114.1	116.7	108.9	133.7
Minimum	24.5	25.7	48.3	10.1	2.3	8.5	21.0	6.0	17.6	40.6	31.9	5.5	11.0	11.5	12.9
Std. Dev.	30.4	30.4	22.5	37.1	42.7	38.3	35.5	38.7	32.9	26.5	26.9	41.4	36.3	35.9	39.2
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Export Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	71.1	67.6	80.3	64.3	43.4	53.9	75.1	54.5	60.2	82.2	76.0	54.2	68.5	65.5	67.0
Median	86.6	79.4	92.3	82.1	26.9	58.5	99.1	58.8	61.6	92.4	85.2	61.0	81.8	76.1	78.0
Maximum	113.7	113.7	107.1	108.2	123.9	115.7	110.5	114.4	129.9	115.7	112.2	115.3	109.2	110.0	128.5
Minimum	25.4	19.9	41.3	11.9	2.2	4.8	23.6	6.6	19.0	40.2	35.6	4.5	12.9	15.9	12.0
Std. Dev.	29.8	30.7	23.0	35.9	42.2	38.4	34.1	38.5	32.8	25.2	24.5	41.8	36.3	35.8	38.8
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Imports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	120.4	327.3	396.3	41.1	29.1	104.9	224.1	191.0	17.8	152.6	58.9	24.8	28.1	599.0	172.0
Median	89.6	264.4	270.6	18.2	21.2	44.9	167.7	149.4	10.5	102.9	45.0	12.0	20.5	461.2	120.8
Maximum	273.8	832.6	1106.4	130.8	80.5	334.7	536.7	422.9	52.3	407.1	139.7	66.2	73.6	1422.1	413.0
Minimum	22.1	58.0	55.9	3.1	2.7	3.6	27.2	27.2	3.4	23.2	9.2	1.8	5.7	152.3	42.3

Std. Dev.	76.4	238.0	305.4	43.2	22.7	104.3	161.5	124.8	15.3	115.6	41.2	22.3	20.1	380.5	122.7
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
RULC	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Median	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Maximum	0.7	0.6	0.7	0.7	0.9	0.7	0.7	0.7	0.6	0.7	0.7	0.9	0.7	0.7	0.7
Minimum	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.6	0.6
Std. Dev.	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Long-term interest rate	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	3.6	3.5	3.4	4.0	4.1	3.1	3.6	3.7	2.5	3.2	3.5	3.2	3.9	3.9	3.4
Median	3.0	2.9	3.3	5.1	2.6	3.9	3.2	3.6	3.4	2.8	3.8	2.3	3.6	3.9	2.8
Maximum	6.4	7.2	6.0	9.4	22.9	6.5	6.8	8.5	8.7	7.5	5.9	10.9	11.0	8.9	6.9
Minimum	1.0	-1.3	0.0	-1.2	-2.7	-0.9	1.0	1.1	-3.7	-0.1	0.6	-2.1	-1.0	0.5	0.2
Std. Dev.	1.8	2.6	1.4	3.4	5.5	2.4	1.8	1.9	3.6	2.0	1.5	2.9	2.7	2.3	2.0
Observations	53	53	53	42	37	35	53	53	40	53	53	28	53	53	53
Foreign GDP	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	2.84E+13	2.84E+13	2.66E+13	2.85E+13	2.85E+13	2.79E+13	2.74E+13	2.74E+13	2.86E+13	2.82E+13	2.84E+13	2.85E+13	2.85E+13	2.84E+13	2.71E+13
Median	2.62E+13	2.63E+13	2.45E+13	2.64E+13	2.63E+13	2.58E+13	2.52E+13	2.52E+13	2.64E+13	2.61E+13	2.63E+13	2.63E+13	2.63E+13	2.62E+13	2.51E+13
Maximum	5.43E+13	5.45E+13	5.17E+13	5.45E+13	5.45E+13	5.36E+13	5.30E+13	5.30E+13	5.47E+13	5.41E+13	5.44E+13	5.46E+13	5.45E+13	5.43E+13	5.24E+13
Minimum	9.12E+12	9.14E+12	8.37E+12	9.20E+12	9.18E+12	9.04E+12	8.77E+12	8.77E+12	9.22E+12	9.07E+12	9.15E+12	9.19E+12	9.18E+12	9.11E+12	8.52E+12

Std. Dev.	1.33E+13	1.33E+13	1.27E+13	1.33E+13	1.33E+13	1.31E+13	1.30E+13	1.30E+13	1.34E+13	1.32E+13	1.33E+13	1.33E+13	1.33E+13	1.33E+13	1.28E+13
Observations	53	53	43	43	53	53	53	53	53	53	53	53	53	53	53
Relative Prices Imports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.9	0.7	0.8	0.7	0.7	0.7	0.8	0.8	1.0	0.7	0.9	0.6	0.9	0.9	0.7
Median	0.8	0.7	0.8	0.7	0.6	0.6	0.7	0.8	1.0	0.7	0.9	0.5	0.9	1.0	0.6
Maximum	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.1	1.1	1.0
Minimum	0.6	0.4	0.5	0.5	0.5	0.3	0.5	0.6	0.9	0.4	0.6	0.3	0.7	0.7	0.4
Std. Dev.	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.3	0.1	0.1	0.2
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Relative Prices Exports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	1.0	0.9	0.9	1.1	1.0	0.8	1.0	1.0	1.0	1.0	1.1	0.9	1.1	1.2	0.9
Median	1.0	0.9	1.0	1.1	1.0	0.8	1.0	1.0	1.0	1.0	1.0	0.9	1.1	1.2	1.0
Maximum	1.1	1.0	1.0	1.3	1.1	1.0	1.2	1.2	1.2	1.1	1.2	1.0	1.3	1.4	1.0
Minimum	0.9	0.8	0.8	0.9	0.8	0.6	0.9	0.8	1.0	1.0	0.9	0.7	0.9	1.0	0.8
Std. Dev.	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Exchange rate	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.7	4.7	0.9	0.5	0.3	0.5	0.6	0.4	0.7	0.8	0.8	0.4	0.5	4.5	0.4
Median	0.7	4.8	0.7	0.6	0.3	0.5	0.6	0.5	0.7	0.7	0.7	0.5	0.5	4.5	0.4
Maximum	0.9	6.2	1.5	0.7	0.7	0.7	0.8	0.7	0.9	1.1	1.3	0.7	0.7	6.6	0.5
Minimum	0.4	2.4	0.6	0.2	0.0	0.1	0.5	0.2	0.4	0.6	0.6	0.1	0.2	1.8	0.2
Std. Dev.	0.1	0.6	0.3	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.2	0.1	1.1	0.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53

WS	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7
Median	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7
Maximum	0.7	0.7	0.7	0.8	1.0	0.7	0.8	0.7	0.6	0.8	0.8	0.9	0.8	0.8	0.8
Minimum	0.6	0.6	0.6	0.5	0.6	0.6	0.7	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.7
Std. Dev.	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
C/Y	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.6
Median	0.5	0.5	0.6	0.6	0.7	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.6
Maximum	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.7
Minimum	0.5	0.5	0.5	0.4	0.5	0.6	0.6	0.5	0.3	0.4	0.5	0.5	0.5	0.5	0.5
Std. Dev.	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
I/Y	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Median	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Maximum	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Minimum	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Std. Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
X/Y	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.5	0.3	0.2	0.4	0.1	0.2	0.2	0.2	1.1	0.4	0.3	0.2	0.3	0.3	0.2
Median	0.5	0.3	0.2	0.3	0.1	0.1	0.1	0.2	1.0	0.4	0.3	0.1	0.2	0.2	0.2
Maximum	0.9	0.6	0.5	1.0	0.3	0.3	0.3	0.3	1.8	0.8	0.6	0.4	0.5	0.5	0.3
Minimum	0.3	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.7	0.2	0.1	0.1	0.1	0.1	0.1

Std. Dev.	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Observations															
M/Y	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Mean	0.5	0.3	0.2	0.4	0.2	0.1	0.2	0.2	1.0	0.4	0.3	0.2	0.3	0.3	0.2
Median	0.5	0.2	0.2	0.4	0.2	0.1	0.1	0.1	0.9	0.3	0.3	0.1	0.2	0.3	0.2
Maximum	0.8	0.5	0.4	0.7	0.4	0.3	0.3	0.3	1.6	0.7	0.5	0.4	0.4	0.5	0.3
Minimum	0.3	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.6	0.2	0.1	0.1	0.2	0.2	0.1
Std. Dev.	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53

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

Appendix C

Table C1. Augmented Dickey-Fuller unit root tests results for all countries.

Stage	**Included in test equation**	**Countries and Variables**													
	Consumption	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.679	-1.173	-1.522	-0.043	-2.159	-1.259	-1.299	-2.236	0.796	-1.678	-0.718	-1.101	0.155	1.092	0.089
	Intercept and trend	-1.669	-3.237	-1.453	-1.918	-3.959	-2.673	-2.309	2.084	-1.994	-1.979	-2.274	-1.350	-2.671	-1.190	-2.129
First Difference	Constant	-5.797	-5.945	-3.775	-3.349	-0.588	-2.442	-4.198	-3.236	-6.937	-2.722	-8.317	-3.153	-4.404	-4.855	-3.594
	None	-1.013	-4.548	-2.108	-2.684	-0.960	-2.042	-1.861	-2.408	-2.300	-2.081	-0.776	-2.554	-2.958	-3.070	-2.474
	Adjusted Profits	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.432	-0.743	-0.212	0.203	-1.018	0.703	-0.663	-1.635	1.815	0.054	0.663	-0.227	-0.700	-0.288	-0.304
	Intercept and trend	-2.240	-2.714	-3.120	-1.867	-1.894	-1.942	-1.508	0.289	-1.452	-2.533	-2.014	-2.846	-2.141	-4.039	-2.785
First Difference	Constant	-6.302	-7.966	-6.982	-4.033	-6.410	-4.316	-5.790	-5.160	-4.837	-6.717	-6.481	-6.000	-6.296	-6.833	-5.241
	None	-5.491	-7.315	-5.934	-3.513	-5.597	-3.049	-4.580	-4.480	-3.543	-5.689	-5.154	-5.334	-5.990	-6.296	-4.904
	Adjusted	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**

	Wages															
Level	Intercept	-0.555	-1.332	-1.140	-0.222	-1.953	-1.636	-1.461	-4.061	1.919	-0.882	-0.339	-1.628	-0.321	0.111	0.125
	Intercept and trend	-2.234	-2.423	-2.341	-2.226	-1.733	-2.593	-2.089	-0.222	-1.423	-2.571	-2.905	-1.761	-2.770	-1.770	-2.355
First Difference	Constant	-5.435	-4.718	-4.668	-3.506	-2.687	-2.275	-3.359	-4.279	-5.080	-3.901	-4.116	-2.987	-4.259	-5.055	-3.640
	None	-1.724	-3.238	-3.019	-2.965	-2.716	-2.034	-1.794	-3.256	-1.612	-2.252	-1.881	-2.719	-3.144	-3.525	-2.529
	Private Investment	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.579	-1.251	-0.752	-1.556	-1.889	-1.402	-1.074	-1.789	0.247	-1.217	-0.584	-1.507	-1.495	-0.704	-1.078
	Intercept and trend	-2.577	-2.850	-3.274	-5.333	-1.971	-2.726	-2.942	-1.125	-1.829	-2.451	-2.402	-1.497	-3.985	-3.133	-2.731
First Difference	Constant	-5.434	-5.113	-6.193	-4.788	-5.360	-3.921	-5.245	-5.492	-6.597	-5.282	-6.918	-4.502	-5.326	-5.437	-5.461
	None	-5.013	-4.945	-5.477	-4.664	-5.409	-3.805	-4.660	-5.344	-6.756	-5.060	-5.699	-4.462	-5.113	-4.793	-5.290
	GDP	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.461	-1.395	-0.570	-0.523	-1.757	-0.866	-1.425	-2.712	0.890	-0.493	0.494	-1.310	-0.020	0.894	0.034
	Intercept and trend	-2.234	-2.208	-2.874	-2.230	-3.455	-2.447	-2.394	1.303	-1.727	-1.924	-2.157	-1.299	-2.942	-1.069	-2.073

First Difference	Constant	-6.943	-5.641	-6.747	-2.433	-2.409	-2.883	-5.225	-5.126	-4.585	-4.644	-6.195	-3.337	-5.268	-6.038	-4.608
	None	-1.434	-3.889	-3.947	-2.170	-2.362	-2.117	-2.651	-1.721	-3.332	-2.759	-3.112	-2.499	-4.056	-3.929	-3.201
	Profit Share	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-2.295	-2.813	-0.824	-0.603	-2.289	0.104	-1.334	-1.196	-2.718	-2.170	-0.506	-1.754	-1.570	-1.780	-3.216
	Intercept and trend	-1.503	-2.799	-2.521	-2.947	-2.671	-3.708	-1.694	-1.861	-2.699	-3.287	-2.561	-2.568	-2.186	-3.431	-4.023
First Difference	Constant	-5.300	-6.997	-5.819	-5.859	-6.723	-5.307	-5.597	-6.104	-7.746	-7.039	-7.915	-5.361	-6.189	-5.853	-5.810
	None	-5.250	-7.048	-5.815	-5.731	-6.273	-5.274	-5.570	-6.072	-7.810	-7.101	-7.701	-5.419	-6.196	-5.911	-5.871
	Domestic Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	0.021	-0.666	-1.027	-0.730	-2.150	-1.512	-1.153	-0.438	2.918	-0.840	-0.533	-1.502	-0.063	-0.378	0.086
	Intercept and trend	-2.519	-2.923	-1.485	-2.870	-2.574	-2.548	-2.941	-3.930	-1.279	-2.529	-2.255	-2.266	-1.901	-2.058	-3.000
First Difference	Constant	-3.242	-2.128	-3.028	-2.712	-1.120	-1.514	-1.801	-1.995	-5.299	-3.047	-2.464	-1.406	-3.588	-2.852	-2.558
	None	-1.063	-0.593	-1.442	-1.878	-0.880	-0.848	-0.736	-0.747	-0.227	-1.389	-0.859	-0.945	-1.686	-1.529	-1.039

	Unit Labour Costs	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	0.173	0.134	-3.463	-0.981	-0.511	-1.293	-0.661	0.196	1.151	-0.775	-0.730	-1.130	-0.159	-0.216	0.669
	Intercept and trend	-2.360	-2.521	-1.998	-2.500	-3.335	-2.058	-2.468	-2.475	-1.727	-1.984	-1.425	-1.756	-1.948	-2.118	-3.057
First Difference	Constant	-3.790	-4.109	-3.850	-3.283	-2.711	-1.741	-2.334	-3.261	-4.294	-3.862	-4.317	-2.247	-4.195	-4.217	-3.606
	None	-1.766	-2.279	-2.745	-2.666	-2.291	-1.381	-1.256	-1.811	-2.635	-2.289	-1.196	-2.165	-1.582	-2.743	-1.975
	Import Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.514	-0.955	-1.127	-0.467	4.125	-0.439	-1.185	0.659	1.499	-1.002	0.162	-0.114	-0.433	-0.322	-0.508
	Intercept and trend	-1.819	-1.026	-1.325	-1.907	-2.245	-2.445	-1.426	-2.640	-3.007	-1.227	-1.424	-1.423	-1.250	-1.395	-1.717
First Difference	Constant	-5.300	-5.455	-5.440	-4.501	-4.002	-4.637	-4.606	-6.239	-5.205	-5.457	-5.648	-5.175	-5.329	-5.499	-4.749
	None	-4.638	-4.756	-5.212	-3.472	-1.143	-4.048	-4.220	-4.946	-3.971	-5.136	-3.829	-4.413	-4.253	-4.246	-3.848
	Export Prices	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-0.585	-0.456	-1.564	-0.896	1.852	1.114	-1.326	0.888	2.114	-1.063	-0.874	-0.138	-1.394	-0.799	0.045
	Intercept and trend	-1.606	-1.456	-0.329	-1.418	-2.672	-2.476	-1.436	-2.340	-2.119	-1.725	-0.792	-1.896	-0.069	-0.432	-1.311

First Difference	Constant	-5.135	-7.147	-4.632	-4.508	-3.566	-4.685	-3.321	-4.844	-5.370	-5.174	-4.959	-4.055	-4.72	-4.649	-5.010
	None	-4.222	-5.483	-3.513	-1.313	-0.099	-2.831	-2.892	-1.765	-3.929	-4.845	-3.117	-3.014	-3.843	-1.533	-3.896
	Exports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	1.773	1.654	2.894	-0.659	-0.239	2.547	1.106	0.185	1.973	3.194	1.564	2.304	0.622	1.815	1.688
	Intercept and trend	-1.253	-1.612	-2.750	-1.549	-2.249	-1.024	-1.857	-2.575	-0.992	-0.436	-1.272	-1.371	-1.647	-0.988	-4.156
First Difference	Constant	-7.090	-5.770	-0.823	-0.966	-6.439	-5.564	-6.684	-6.670	-5.856	-6.219	-6.476	-2.017	-7.060	-6.516	-6.130
	None	-0.082	-0.902	0.248	-0.147	-5.894	-0.779	-4.973	-0.633	-0.952	0.375	-0.364	-0.402	-1.503	-0.124	-0.021
	Imports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	1.733	1.494	3.179	0.241	-2.130	0.501	1.435	-0.194	-0.747	3.189	1.247	-1.229	0.992	1.387	-1.950
	Intercept and trend	-1.231	-1.218	-0.060	-3.418	-3.727	-1.789	-1.497	-2.224	-1.865	-0.296	-1.596	-3.314	-1.365	-1.103	-2.783
First Difference	Constant	-7.103	-6.066	-5.969	-4.004	-1.151	-4.987	-6.624	-7.245	-0.645	-5.641	-6.663	-1.386	-7.113	-7.152	-1.215
	None	0.282	-4.886	-4.395	-3.472	-0.931	-4.516	-4.867	-6.097	0.420	-0.072	-0.726	-1.025	-6.063	-5.849	-1.117
	Real Unit	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**

	Labour Costs															
Level	Intercept	-2.288	-2.730	-0.521	-0.654	-3.437	-0.689	-1.160	-0.585	-2.548	-1.562	-0.844	-1.242	-1.287	-0.931	-2.776
	Intercept and trend	-2.081	-3.133	-3.933	-1.822	-3.872	-3.263	-1.638	-1.686	-2.611	-3.064	-2.447	-1.281	-3.556	-3.170	-3.706
First Difference	Constant	-5.055	-7.414	-5.497	-6.384	-7.899	-4.457	-5.701	-6.593	-7.315	-6.602	-7.531	-3.721	-6.359	-5.669	-5.818
	None	-5.003	-7.494	-4.991	-6.128	-7.453	-4.438	-5.690	-6.495	-7.389	-6.669	-7.407	-2.932	-6.345	-5.677	-5.866
	Long-term interest rate	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-2.312	-1.254	-3.189	-3.361	1.254	-7.832	-2.073	-1.939	-4.760	-1.921	-2.480	-2.398	-2.826	-2.778	-3.583
	Intercept and trend	-2.281	-1.342	-3.081	-3.567	-1.352	-5.804	-2.024	-2.317	-4.063	-1.234	-1.712	-2.516	-2.781	-2.843	-3.580
First Difference	Constant	-7.448	-11.794	-7.766	-8.656	0.152	-2.264	-8.177	-6.703	-7.132	-9.347	-7.874	-10.522	-8.422	-9.755	-9.250
	None	-7.517	-11.915	-7.844	-8.720	0.206	-2.324	-8.261	-6.760	-7.251	-9.444	-7.950	-10.203	-8.504	-9.855	-9.344
	Foreign GDP	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	3.407	3.411	2.752	2.542	3.422	3.474	3.590	3.710	3.378	3.428	3.394	3.401	3.404	3.401	3.521
	Intercept and trend	-0.387	-0.382	-0.763	-0.861	-0.373	-0.340	-0.295	-0.198	-0.398	-0.364	-0.390	-0.378	-0.386	-0.402	-0.252

First Difference	Constant	-5.247	-5.248	-4.681	-4.898	-5.263	-5.270	-5.190	-5.093	-5.263	-5.239	-5.257	-5.251	-5.255	-5.251	-5.253
	None	1.345	1.340	1.536	1.469	1.363	1.449	1.474	1.474	1.328	1.363	1.336	1.342	1.334	1.338	1.431
	Relative Prices Imports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-1.191	-0.810	-1.428	-1.481	-1.037	-0.929	-0.899	-1.523	-2.687	-1.413	-2.191	-0.218	-1.526	-1.808	-0.719
	Intercept and trend	-1.828	-2.594	-2.002	-2.536	-1.373	-2.154	-1.977	-1.639	-2.636	-1.880	-1.662	-1.437	-1.932	-2.109	-2.165
First Difference	Constant	-5.995	-6.822	-6.117	-5.784	-4.822	-5.424	-7.367	-5.831	-7.860	-6.253	-6.107	-6.013	-6.013	-6.333	-5.703
	None	-5.962	-5.730	-5.963	-5.714	-4.679	-5.215	-7.084	-5.833	-7.883	-5.891	-6.156	-5.580	-6.015	-6.339	-5.561
	Relative Prices Exports	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-1.746	-1.031	-1.979	-0.581	-1.862	-1.911	-1.930	-1.575	-2.851	-1.731	-0.216	-1.375	-0.268	-1.318	-1.920
	Intercept and trend	-1.790	-2.727	-2.727	-3.787	-1.841	-2.509	-2.383	-1.666	-2.736	-2.154	-3.152	-2.067	-1.880	-2.482	-2.906
First Difference	Constant	-6.097	-9.472	-5.851	-7.366	-7.321	-4.948	-8.168	-5.808	-8.655	-7.202	-8.412	-5.296	-5.735	-7.874	-5.812

	None	-6.148	-8.899	-5.886	-7.189	-7.393	-4.869	-8.170	-5.828	-8.740	-7.276	-7.960	-5.308	-5.614	-7.349	-5.872
	Exchange rate	**B**	**DK**	**D**	**IRL**	**GR**	**E**	**FR**	**I**	**L**	**NL**	**A**	**P**	**FIN**	**S**	**UK**
Level	Intercept	-2.269	-2.284	-2.187	-1.425	-0.367	-0.966	-2.509	-0.982	-2.269	-1.823	-1.979	-0.779	-2.474	-2.496	-1.585
	Intercept and trend	-2.533	-2.283	-1.251	-1.262	-2.032	-2.233	-2.703	-1.085	-2.532	-1.487	-1.009	-1.691	-2.759	-2.991	-2.756
First Difference	Constant	-11.701	-10.214	-4.560	-7.203	-3.839	-5.779	-4.884	-5.291	-11.710	-14.986	-16.509	-4.230	-5.854	-8.230	-5.868
	None	-11.735	-10.378	-4.240	-7.166	-3.431	-5.723	-4.925	-5.084	-11.744	-14.516	-15.659	-3.992	-5.729	-8.299	-4.947

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

Appendix D

Table D1. The total effect of an isolated 1% point increase in the profit share on investment and net exports

	Total effect on I / Y	*Total effect on NX / Y*
Austria	0.056	0.305
Belgium	0.229	-0.018
Denmark	0.306	0.028
Finland	-0.125	0.204
France	0.031	0.195
Germany	-0.145	0.231
Greece	-0.699	0.444
Ireland	0.163	0.070
Italy	0.075	0.221
Luxembourg	-0.022	0.106
Netherlands	0.050	0.168
Portugal	-0.167	0.282
Spain	-0.382	0.420
Sweden	0.051	0.215
United Kingdom	-0.025	0.200

Table D2. The total effects of a simultaneous 1% point increase in the profit share on investment and net exports

	Total effect on I / Y	*Total effect on NX / Y*
Austria	-0.087	0.233
Belgium	0.208	-0.052
Denmark	0.220	0.002
Finland	-0.174	0.189
France	-0.027	0.172
Germany	-0.164	0.210
Greece	-0.785	0.429
Ireland	0.135	0.044
Italy	0.039	0.206
Luxembourg	-0.040	0.068
Netherlands	0.038	0.136
Portugal	-0.238	0.232
Spain	-0.491	0.442
Sweden	-0.008	0.179
United Kingdom	-0.040	0.170
*Average**	*-0.088*	*0.199*

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

Table D3. *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**	**Differentiated simultaneous increase in the wage share***
	ULC $\Delta logULC/\Delta ws$	*Annual inflation* $\Delta logP/\Delta ws$	*Annual inflation* $\Delta logP/\Delta ws$	*Annual inflation* $\Delta logP/\Delta ws$
Austria	3.062	1.603	1.652	1.008
Belgium	1.815	0.327	0.434	0.170
Denmark	2.785	1.296	1.374	0.335
Finland	3.025	1.562	1.637	1.626
France	3.059	1.617	1.681	1.674
Germany	2.461	0.939	1.036	1.028
Greece	2.877	1.217	1.293	1.288
Ireland	2.049	0.525	0.612	0.398
Italy	4.242	2.684	2.749	2.744
Luxembourg	2.325	0.541	0.605	0.592
Netherlands	2.680	1.235	1.282	1.276
Portugal	2.702	1.272	1.343	1.340
Spain	3.581	2.095	2.177	2.173
Sweden	2.396	0.818	0.911	0.887
United Kingdom	3.477	2.025	2.092	2.085
Average	*2.836*	*1.317*	*1.392*	*1.242*

*Notes: *The differentiated increase in Δws is based on the scenario illustrated in table 13 divided by 5 to report the annual change in Δws and its effects on annual inflation. ** Change in each country is multiplied by its share in EU15 GDP.*

Chapter 4

CHAPTER 4 - LITERATURE REVIEW ON INTEGRATING THE GOVERNMENT SECTOR INTO THE POST-KALECKIAN DISTRIBUTION AND GROWTH MODEL

1. Introduction

The role of fiscal policy has always been a core issue in macroeconomics. The recent outbreak of the great recession has rekindled the debate among economists from different schools of thought on the effects of government expenditure and taxation on economic growth (Gechert, 2015)[146]. Whereas policymakers considered expansionary fiscal policy as the crucial policy tool to reverse stagnation in employment and growth right after the onset of the outbreak of the crisis[147], this view has been shaken with the on-going sluggish growth and high unemployment among European MS. Concerns have also been raised about the role of government debt with a consensus developing that fiscal expansion, by increasing government indebtedness, has detrimental effects on growth and will be harmful for the long-run health of the economy (Dutt, 2013). After a large reduction in government deficits during the 1990s and beginning of 2000s public finances are back in the deep red in many European countries. Hence, one relevant policy question is whether a stimulus plan will be effective.

Indeed, there is a large literature of the effect of fiscal policy on growth (Blanchard and Leigh, 2013; Ramey, 2011; Qazizada and Stockhammer, 2014, Gechert, 2015) following the long-standing debate among economists on whether public spending crowds out private investment and hence whether a fiscal stimulus should be regarded an effective policy tool. Quantifying the size of fiscal multipliers unites this literature, however, they differ significantly in terms of the theoretical framework, identification strategies and specifications applied. The results are far from being homogenous. Most of this literature has been dominated by mainstream assumptions starting with a steady state in which workers and capital are fully utilised, leaving aside the issue of the state of the economy. However, Ramey (2011) for instance argues that a key question is whether government spending multipliers might be greater if the economy starts out with underutilised resources such as was believed to be the case in 2009 after the Great recession.

The main thrust of this thesis is on wage policy and fiscal policy coordination. The effects of a coordinated increase in the WS are positive, albeit small in magnitude.

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[146] There is a related debate on whether spending or revenue-based fiscal shocks have a bigger impact on output. However, we will not focus on this issue but are rather interested in the range of results concerning spending multipliers.

[147] Whether these represented genuine expansionary fiscal policies (e.g. public infrastructure spending) or whether they rather illustrated measures to stabilize the financial system is open to debate. However, it is clear that the deterioration of public finances in most European economies has been one of the adverse effects of the recent crisis.

Overcoming persistent European imbalances, however, require a more comprehensive policy mix of wage policies, investment and industrial policies[148]. Hence, it is important to estimate the potential growth effects of a fiscal stimulus in the EU MS. The aim of the analysis is to combine both the effects coming from a coordinated change in wage policy as well as fiscal policy and outline an alternative growth strategy in comparison to the current European strategy. Hence, we augment the private sector open economy PKA model presented in chapter 3 by a government sector with regards to tax policy, government spending, and public debt.

The purpose of this chapter is to critically review the PK literature and investigate the effects of fiscal policy, budget deficits and public debt on economic growth. Moreover, the aim is to present the role of government spending and tax policies as an extension of the PK/PKA distribution and growth model leading up to equations for estimation in chapter 5 below. This enables us to have a unified framework capable of analysing the relationship between income distribution, AD and economic growth including an explicit role for the public sector. In this context, we aim to present a unified model that highlights the role of wage and fiscal policy coordination in demand, accumulation and growth. Furthermore, the goal is to theoretically incorporate an explicit distinction between different types of government expenditures, permitting a careful analysis of the different growth effects of each expenditure category.

Issues related to ways of financing the budget are not the primary concern in the following. However, the thinking of 'functional finance' as advocated by Abba Lerner (1943) and widely endorsed in the PK literature (as opposed to 'sound finance' adopted in the mainstream literature) resembles with most of the analysis in relation to expansionary fiscal policy illustrated below[149]. Furthermore, implicitly endogenous money is assumed as commonly done in the PK literature (Moore, 1988; Lavoie, 2014).

We critically review the literature focusing on how taxation is integrated and whether tax shifting between capital and labour can affect consumption and investment and hence alter the economic regime of a wage-led or profit-led country. Moreover, we are interested in the macroeconomic effect of an increase in government spending on AD,

[148] We will not explore different industrial policies in this thesis but remain at the macro level.
[149] Lerner made three important claims (Lavoie, 2014): 1. Fiscal policy ought to achieve proper levels of employment; 2. There is no financial constraint on a government backed by a central bank (assuming a sovereign currency); 3. Public debt will not rise infinitely. We critically review some analysis particularly on the third point in section 4.3. More importantly, this thesis follows Lerner (1943) who was more concerned about the results of expansionary fiscal policy on the economy rather than to assume sound finance from the outset.

and economic growth. In this context, we emphasise how fiscal policy is linked to the relationship between income distribution, AD and economic growth in the PKA framework, which is the workhorse model of this thesis. Moreover, our aim is to show that because an economy's character (e.g. wage-led or profit-led) is endogenous to the structure of the tax system and constellations of public spending (Palley, 2014) this might have significant implications for the empirical findings in the literature on wage-led and profit-led growth. It also allows us to check the robustness of our results obtained in chapter 3.

Section 2 briefly reviews the debate on crowding in versus crowding out effects. Section 3 discusses the empirical fiscal multiplier literature. Section 4 presents the integration of the government sector in the PK/PKA literature. Section 5 concludes.

2. Crowding in versus Crowding Out

Keynes (1936) provided the counterargument to classical economists, that government spending would positively affect economic activity. Indeed, the 'Keynesian revolution' achieved a re-orientation of the way economists view the influence of government activity on the private economy (Blinder and Solow, 1973).

The multiplier process plays a key role on Keynesian economics and was first developed in regard to the MPC (Snowdon and Vane, 2005, pp. 58-63)[150]. However, there is no explicit analysis of variations in spending stimulated by expansionary fiscal policy in the GT. In a simple Keynesian model any change in investment expenditure will have a magnified impact on aggregate output. There are two sectors (households and firms) and planned expenditure in a closed economy is given by the sum of consumption and investment[151].

Keynes developed the concept of the MPC, which in turn determines the size of the multiplier. The multiplier will be large, ceteris paribus, the smaller the propensity to save. Keynes argues that for a given change in investment expenditure income (output) changes by a multiple of the change in investment expenditure. The raise in income will

[150] As is well known, Keynes argued in support of government programmes, in particular public work programmes, to expand AD via deficit financing.

[151] As we have seen in chapter 2, consumption expenditure is endogenous and depends on household income rather than the interest rate. Investment expenditure depends on the expected profitability and animal spirits, and the interest rate as a cost factor of borrowing funds.

in turn raise consumption; the second round increase raises expenditure, which further raises income[152].

Keynes also outlined various factors that could limit the size of the multiplier: increasing rate of interest, adverse effect on confidence, or leakage through both taxation and imports[153]. In a macroeconomic framework, government expenditure could thus impact aggregate planned expenditure (effective demand) and tax policies affect household consumer expenditures.

The theoretical debate on the effectiveness of fiscal policy was first brought forward within the well-known Hicksian IS-LM framework for a closed economy[154]. The orthodox Keynesian faith in the positive effects of expansionary fiscal policy on the level of output was challenged predominantly by monetarists who argue that pure fiscal policy would lead to a crowding out[155] or replacement of private expenditure (Snowdon and Vane, 2005). A number of reasons have been put forward on why crowding out can occur in the IS-LM framework, which do not rely on the limiting case of a vertically sloped LM curve (Carlson and Spencer, 1975). In the classical case, only an increase in the money stock or turnover thereof induced by an increase of government spending can stimulate economic activity (Carlson and Spencer, 1975).

According to Blinder and Solow (1973) crowding out can occur in three ways. First, because the government engages in productive activities otherwise provided by the private sector, which would take place independent on how it is financed (e.g. taxes or bonds). Public spending would simply supplant private investment. Second, as we have seen above, that if deficit spending is not accompanied by an increase in the money supply, it carries the need to be financed through new debt issues, which compete with private debt instruments in financial markets and hence raising interest rates and increasing the cost of capital. This financial side-effect will partly offset the expansionary effect coming from fiscal policy. A zero interest elasticity of the demand for money will

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152 It is assumed that the economy has spare capacity and firms respond to extra demand producing more output. This in turn also implies an employment multiplier.

153 However, even in extended models the multiplier is closely linked to the MPC (Ramey, 2011).

154 However, this represents an orthodox interpretation of Keynes. The model served as the fundamental basis for macroeconomic theorizing in the 1950s and 1960s. There is no controversy over government spending financed by printing money (Blinder and Solow, 1973). Both sides agree that it would be expansionary.

155 The crowding-out hypothesis argues that, if prices are held constant, an increase in real government spending has no lasting effect on real income. In other words, the government spending multiplier is approximately zero (Carlson and Spencer 1975). In a full-employment context, additional government spending can only 'crowd out' the same amount of private spending assuming Say's Law holds (Blinder and Solow, 1973).

render fiscal policy ineffective[156]. Third, proposed wealth effects in the simple Keynesian story might not hold after all. The argument here is that even though there might be significant and positive wealth effects on output (through increasing consumption) in the simple Keynesian story this view is too simplistic. It focuses almost exclusively on first-round effects. However, any increase in the government deficit requires financing through some sort of debt instrument (e.g. interest bearing bonds). According to the monetarist critique greater wealth generated will thus affect financial markets and raise interest rates[157]. Hence, these two effects are opposing each other and the total outcome might by contractionary. In the long run, the fiscal multiplier would be negative. Taking the time dimension into account, monetarism further argues that private consumption expenditures would react to a change in permanent rather than in current income (Qazizada and Stockhammer, 2014).

Orthodox Keynesians, however, reasserted the efficacy of fiscal policy focusing on the positive effects of wealth on consumption (Snowdon and Vane, 2005; Blinder and Solow, 1973)[158]. In an extended version of the Keynesian IS-LM model with wealth effects and the incorporation of a government budget constraint Solow and Blinder (1973) argue that there are still good reasons to believe in the efficacy of fiscal policy[159]. The authors examine a conventional short run model in which the capital stock is fixed and conclude that, if such an economy is stable under bond finance, fiscal policy will be effective. The wealth effects on consumption (which shifts the IS curve to the right) will outweigh that for demand for money (which shifts the LM curve to the left) and the deficit will be removed. Furthermore, if increased interest payments arising from issuing bonds are taken into account, income will further rise and balance the government budget[160]. Allowing the capital stock to vary, changes the results only slightly. One particular objection to this analysis derives from the Ricardian Debt Equivalence Theorem (Snowdon and Vane, 2005). According to this thinking, the burden of

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156 This notion is based on that assumption of exogenous money supply. However, several PK authors have challenged this view and argue in favour of endogenous money supply (Lavoie, 2014).

157 In the IS-LM model this would represent contractionary monetary policy and hence shift the LM curve to the left, which reduces output. Advocates of the crowding out argument thus believe that in the long run, the fiscal multiplier would be negative.

158 In typical IS-LM fashion the price level is exogenously fixed. However, if taxes are progressive in terms of money income, inflation will increase the real yield of the tax system lowering the IS curve. This will not change the sign of the multiplier but might reduce its magnitude (Blinder and Solow, 1973).

159 Blinder and Solow (1973) view the Keynesian as an economy with underemployed resources. However, in contrast to PK authors persisting unemployment is explained through sticky wages. For a graphical illustration see Snowdon and Vane (2005, pp. 110-112).

160 However, if the system is unstable, monetarists are right that fiscal policy would be impotent.

government expenditure on the private sectors is equivalent independent of the mode of finance (increase in taxation or bond sales). Barro (1974) for instance argued that government bonds should not be regarded as net wealth; hence selling bonds will not affect private sector's wealth. On the opposite, it would lead to an increase in savings to meet future tax liabilities. In other words, rational expectations of future tax liabilities would deprive debt-financed government expenditure of its positive macroeconomic effects on growth. This argument has been called the 'balanced-budget multiplier'. Several theoretical arguments have been raised against this concept, however, due to reasons of space, we will not explain them here but refer to the relevant literature[161]. Following monetarist thinking, it should be clear that a decline in government debt would be key to restore investment and ensuring long-term regeneration of growth (You and Dutt, 1996).

In conclusion, there is long-standing disagreement about the effectiveness of fiscal policy as well as the size of fiscal policy multipliers in economic theory. The magnitude will depend on several assumptions such as: whether consumers are Ricardian (forward-looking) or follow rule-of-thumb behaviour, the conduct of monetary policy, the size of the MPC, whether prices are rigid or whether the interest rate matters as a cost of borrowing. As a result, empirical research is necessary to answer the question of the effectiveness of fiscal policy.

3. Fiscal Multipliers – Empirical Literature

Before the outbreak of the great recession in 2007 mainstream macroeconomics has assigned only a minor role to fiscal policy (e.g. automatic stabilizers). However, the IMF has highlighted that existing macro models underestimated the magnitude of fiscal multipliers (Blanchard and Leigh, 2013).

The empirical fiscal multiplier literature is vast and comprised of different types of studies, e.g. applying various theoretical models and econometric techniques. The results are far from a consensus and range from negative multipliers (e.g. expansionary austerity) to large positive multipliers (self-financing stimulus). One stream of literature differentiates the fiscal policy mix into tax cuts and government spending increases analysing whether a fiscal stimuli based on tax cuts are more likely to increase growth

[161] For instance Feldstein (1982) critically discusses the Ricardian debt equivalence theorem.

than those based on spending[162]. However, our primary concern is with public spending multipliers following a deficit financed increase in government purchases.

We aim to briefly compare the range of the magnitude of fiscal multipliers empirically estimated in the mainstream as well as heterodox literature and outline some of the conditions that help to explain the different results. We also primarily relate to survey studies to have a brief discussion of the results.

Ramey (2011) classifies the empirical literature on fiscal multipliers into four groups: estimates from structural models, estimates from exogenous aggregate shocks, estimates from structural vector autoregression models (VARs), and 'local multiplier' estimates. The author assesses the likely range of fiscal multipliers following a temporary deficit-financed increase in government spending. She concludes that the multiplier is between 0.8 and 1.5[163]. Theoretically, the neoclassical model can predict negative or positive multipliers (ranging from -2.5 to 1.2) depending on the extent and timing of distortionary taxes. In the Keynesian model, assuming rule of thumb consumers and excess labour supply, multiplier can be as large as 2.0. In the Neo-Keynesian model, which is essentially a neoclassical model with the edifice of sticky prices, the effects are muted by neoclassical assumptions and the multiplier consequently reduces to roughly unity[164].

The survey study conducted by Ramey (2011) highlights that the multiplier estimates depend on various factors such as: how increased government purchases are financed, whether government expenditure is productive, whether the economy is a state of full or under-utilisation of resources, timing and extent of distortionary taxes etc. However, the survey study has focused on research presenting evidence for the U.S and considered public spending in general.

In a meta-regression analysis of 104 studies on multiplier effects, Gechert (2015) finds the public spending multiplier to be close to 1. When differentiating between public investment and public spending the former is even larger than the latter by approximately 0.5 units. The author presents several influential factors (e.g. model class or identification strategy), their significance and magnitude.

Gechert (2015) argues that when considering fiscal multiplier estimates, a paramount distinction relates to the types of fiscal stimulus considered in the studies. The author

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[162] Alesina and Ardagna (2010), in a study of OECD countries between 1970 and 2007 using simple regression analysis, for instance find that tax cuts are more expansionary than spending increases in the case of a fiscal stimulus.

[163] According to Ramey (2011), a less conservative estimate would be between 0.5 and 2.0.

[164] However, in the case of a zero-lower-bound even in the neo-Keynesian model the multiplier can be as high as 2.3.

identifies 8 different measures such as public consumption, public investment, or military spending. In alignment with Ramey (2011) the author further categorizes the literature by discriminating between different model classes such as new classical real business cycle models, new Keynesian dynamic stochastic general equilibrium models, structural macroeconometric models, VAR models, and various single-equation estimation techniques. The range of multipliers estimated varies with the theoretical assumptions imposed under the different model classes. For instance, in new Keynesian models[165] that allow for possible demand-side effects of fiscal policy in the short run estimates usually range between 0 and 1. On the other side, structural macroeconometric models with backward-looking macroeconomic consumption and investment functions usually find multipliers larger than 1, for instance by crowding-in of private investment[166]. Hence, public investment is seen as the most effective fiscal impulse.

New classical real business cycle models (e.g. Baxter and King, 1993) include a utility-maximizing representative agent for whom Ricardian equivalence holds. They feature an economy with fully competitive labour and goods markets. This literature emphasizes supply side effects of labour and capital (e.g. neoclassical wealth effects or substitution effects that foster increased labour supply) in response to expansionary fiscal policy. The multiplier effect of public spending usually ranges between 0 and 1. Some modifications to the household's utility function (e.g. complementarity of public and private consumption), or allowing for productivity-enhancing effects of public spending, may raise the multiplier to values larger than 1. Negative multipliers in these models may come with public employment lowering private labour supply or distortional effects of taxation (Fata´s and Mihov, 2001).

There are several other reasons why estimated multipliers might have been underestimated. Gechert and Mentges (2013) for instance show that studies that omit financial variables create a general downward bias in the estimation of spending multipliers. They test for the hypothesis that credit market and asset market developments have considerable effects[167] on the estimated fiscal multipliers. In a study

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[165] New Keynesian models are distinguished from Old Keynesian Models in that they have forward looking, or rational, expectations by individuals and firms, and some form of price rigidity, usually staggered price or wage setting.

[166] Cogan et al. (2010) investigate the difference in the size of fiscal multipliers by distinguishing new and old Keynesian models. According to the author, there are basically two (theoretical) factors that will reduce the size of the fiscal multiplier: Rational expectations, e.g. a change in microeconomic behaviour of households and firms, as well as more loose (more responsive) monetary policy.

[167] They distinguish two effects: (A) Wrong identification of fiscal shocks; and (B) omitted variable bias. Credit cycles and asset price swings predominantly impact on tax revenues and less on government spending.

of three baseline VAR models[168] they find that controlling for asset and credit market movements increases the multipliers by 0.3 to 0.6 units on average. Fiscal multiplier estimations might be biased because asset and credit market movements facilitate spurious correlations of government revenues and spending with GDP growth. For instance, if an asset price boom leads to higher government revenues (e.g. through a turnover taxation) this would falsely signal an improvement in the fiscal stance of the government. If the increase in asset prices is followed by an increase in output this might then be wrongly attributed to an improvement in the budget balance supporting the argument of 'expansionary contraction'.

The vast majority of studies estimates fiscal multipliers, however, do not take into account of the state of economy. More recently, some papers analyse fiscal multipliers over different periods of economic activity (e.g. expansion or contraction)[169]. This is important since they may be substantially higher in times of economic recession with underutilised capacity. Auerbach and Gorodnichenko (2013) for instance find larger multipliers between 1 and 1.5 in recession, compared to values between 0 and 0.5 in expansion. The paper also acknowledges that in an increasingly globalised world, fiscal policies adopted in one country are likely to affect output in other countries. Hence, a key question is whether and to what extent fiscal policies spill over into other countries. Furthermore, the authors find that this spillover effect might be even more significant depending on whether the economy is in a depressed state. They conclude that coordination of fiscal policy might be more relevant than previously thought. Qazizada and Stockhammer (2014), in a panel study of 21 advanced economies between 1979 and 2011, find a government spending multiplier between 1 during expansion and 3 during contractions[170].

In conclusion, the impact of public spending and the size of fiscal multipliers surveyed vary with sample size, econometric estimation approach, identification of fiscal shocks, model class, and openness of the economy as well as the state of the economy. However, a key difference relates to the setting chosen. A question is whether one should (analytically) start with an economy is starting in a steady state of fully utilised resources,

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[168] Estimations are based on US quarterly data from 1960 to 2012. They include the wealth-to-debt ratio as an additional endogenous variable to capture both asset and credit market movements. Government spending includes government consumption and government investment; tax revenues are total tax revenues minus transfers. They test three models: A cyclically adjusted public budget approach; a structural VAR identification (recursive approach); and structural VAR identification.

[169] DeLong and Summers (2012) also argue that in a depressed economy the multiplier is likely to be substantially larger than in 'normal times'.

[170] The study covers an unbalanced panel of 21 OECD countries using annual data including 14 EU MS.

or, whether it makes more sense to start with the actual state of the economy and hence under-utilisation of resources should be taken into account. In this thesis, we assume the latter case to be more relevant one and hence intend to extend the private sector open economy model presented in chapter 3, which assumes excess capacity and excess labour supply to be a feature of the economy, by a government sector. In this context, we expect fiscal multipliers to be larger on average for the EU15 countries. We also expect the effects to be stronger when cross-country effects following a simultaneous change in fiscal policy are taken into account.

We also intend to distinguish between different types of public spending (e.g. public consumption and public investment) as suggested by Gechert (2015) to take into account the relative effectiveness of different fiscal stimulus. In addition, previous studies (e.g. Auerbach and Gorodnichenko, 2013) have pointed out that fiscal coordination might be more valuable than previously thought.

To the best of our knowledge, this issue is relatively under-researched in a PK/PKA model and has only been discussed at a theoretical level in the PK demand-led growth literature. The presented studies are predominantly concerned with the size of the estimated multiplier and do not present a unified models of the role of wage and fiscal policies on demand, accumulation and growth. Hence, we intend contribute to the literature by conducting an empirical analysis based on a multi-country demand-led growth model augmented by a government sector. We want to enrich the policy debate by outlining an alternative analysis of the impact of wage and fiscal policies on demand and growth in Europe.

4. Integration of the government sector in the PK/Post-Kaleckian literature

Most of the PKA/PK distribution and growth models are private sector open economy models, leaving government activity aside. Government enters the model only sparsely (e.g. Lavoie, 2014, pp. 312-315). There is one strand of literature that theoretically discusses tax and transfer policies in the context of a demand-led growth model (Blecker, 1989; Blecker, 2002; Mott and Slattery, 1994; Laramie, 1991; Laramie and Mair, 1996; Laramie et al. 1996; Palley 2014). Another strand of literature focuses on different types of government spending and discusses the sustainability of public debt (Commendatore, 2011; Dutt, 2013; Palley, 2009; Palley, 2013; Seguino, 2012, Tavani and Zamparelli,

2015; You and Dutt 1996). Some of these papers also distinguish long run from short run analysis and thus conduct both comparative statics and a dynamic analysis[171].

In the following, we review the literature that integrates government into the basic Kaleckian distribution and growth model with the aim to assess which questions have been addressed in that literature. We examine how taxes and government spending have been integrated in the various papers. Furthermore, we are interested in how the introduction of the government sector might alter the likelihood of an economic regime to be wage-led or profit-led. In other words, we are interested in the macroeconomic effects of taxation and government spending on AD and growth. As Palley (2014) notes: An economy's character is influenced by policy making. A wage-led or profit-led character of an economic regime thus depends on fiscal policy settings and hence is endogenous to the structure of the tax system as well as the constellation of government spending.

Therefore, it is important to investigate the role of government in determining the wage-led or profit-led character of the economic regime in the EU15 countries. For example, the tax rate on profits and wages may affect the MPC of the EU15 MS estimated in chapter 3. Moreover, considering the after-tax profit share might change the profitability effects in our investment function. In the light of the debate about the diversity of empirical findings for different countries presented in chapter 2, the theoretical extension of the PK/PKA model can be insightful. The literature review will provide the basis for developing a comprehensive and unified PK/PKA, which will be presented and empirically tested in chapter 5.

4.1. Tax Policy

In this section, we critically review the PK literature that integrates different types of taxation (e.g. capital and labour income tax) into the Kaleckian distribution and growth model. Our focus will be on three questions in particular: How are taxes and transfers integrated into the PK/PKA Model? How does this affect consumption and investment spending? What are the macroeconomic effects of taxation on growth? We are interested in the effects of tax shifting of income taxes, from capital to labour and vice versa, and how this might alter the likelihood of an economic regime to be wage-led or profit-led. Furthermore, we are examining the integration of value added tax (VAT) into the model.

[171] In this chapter we mainly focus on the short run analysis conducting comparative statics analysis.

Kalecki's essay on 'A Theory of Commodity, Income and Capital Taxation' (1971[1937]) provides the basis for PK theory of the incidence and macroeconomic effects of taxation (De Vecchi, 2008). Kalecki based his theory of taxation on Keynes's theory of effective demand while at the same time marking a break from orthodox public finance theory. He intended to verify whether, in an economy with excess labour supply and underutilised resources, it was possible to have an increase in national income and employment with a tax financed balanced budget. Kalecki analysed the impact of commodity, income and capital taxation in a closed economy framework with no savings by workers, a balanced budget[172], perfectly elastic money supply, and assuming that any increase in taxation is spend on officials' salaries or doles for the unemployed and considering only the short run period by assuming capital stock and money wages to be given. He further assumed that the commodity tax is exclusively levied on wage goods[173] and the income tax on capitalist's income. The rate of investment is determined by previous investment decisions[174], and the MPC by capitalists is only induced by an actual change in income, and not dependent on future expectations.

Under these assumptions, Kalecki showed that an increase in the consumption tax, ad valorem, on wage goods[175] increases prime costs and the value of sales increase, but leave gross profits and level of national income unchanged. Since workers spend all they earn in wages and the budget is balanced, gross profits remain a function of capitalist's consumption and investment in an economy with commodity taxes. The commodity tax does merely raise prices of the goods and shifted purchasing power from the consumers of wage goods to the dole receivers (De Vecchi, 2008).

An increase in the income tax on capitalist's income (which is not part of prime costs) will increase gross profits by the same amount of the tax increase, but leaves unaffected the share of gross profits received by capitalists. This increases employment but does not positively affect the profitability[176] of investment because lenders were able to shift the

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172 Kalecki (1971[1937]) suggested that this could be also extended to the case of an unbalanced budget taking into account state activities of borrowing or repaying debt. We integrate the issue of debt-financed government spending into this thesis.

173 A wage good implies a good that is purely used for consumption and not for the purpose of making a profit such as an investment or capital good.

174 Kalecki (1971 [1937], pp. 110-123]) discusses four determinants of firms investment decisions (savings, profits, capital stock, technological progress). In this context, he assumes that firms consider after-tax profits.

175 Kalecki (1971[1937]) assumes a constant rate for all kinds of wage goods. National income is now equal to gross profits, workers' wages and the taxes imposed on wage goods.

176 According to Kalecki, an increase in the taxation of capitalists' income must increase the rate of interest due to the desire to maintain the net (after tax) reward for lending. This would diminish the willingness of

tax to entrepreneurs. Producers would increase production to respond to the increase demand coming from dole receivers since they perceive a risk of losing market shares (De Vecchi, 2008). The introduction of taxes on capital (on every type of owned capital) unambiguously increases national income and employment. The increased spending of the dole receivers increases production and hence employment. In addition, the capital tax increase would positively affects profitability of investment due to increasing future profits and employment[177]. Kalecki thus concludes that introducing a capital tax might be the best way to stimulate economic activity and reduce unemployment[178].

These results thus stand in stark contrast to orthodox public finance theory and provide an alternative way of understanding tax incidence and macroeconomic effects in the light of the theory of effective demand[179]. Several PK authors have taken this intuitive analytical apparatus and extended the theoretical framework. We review this literature below.

Generally speaking, PK/PKA tax incidence theory analysis the effect of taxes on spending out of different types of income[180] and hence links it to the issue of income distribution, which in turn affects AD and output. Tax policy is integrated by introducing taxes on capital and labour (and introducing VAT in some cases). Furthermore, most of the studies are concerned with the impact of taxes on capital and labour on the national income multiplier and thus a change in output.

The issue of taxes and the macroeconomic effects of a balanced budget expansion financed by taxation have been cursorily discussed in the stagnationist literature (Steindl, 1979; Rowthorn, 1981; Blecker, 1989).

Steindl (1979) discusses the effects of a budget expansion financed by increased taxation, also assuming a balanced budget with tax receipts being spent immediately, as Kalecki did. In a uniform and proportionate way taxes are levied on profits and wages

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entrepreneurs to invest, but, due to the higher level of gross profits, increases expected sales leaving the total effect to be ambiguous.

177 He assumes that investment and capitalists consumption remain unaltered in the short run but the additional proceeds from the new tax will be spend on dole payments, and hence an increase in employment so that gross profits would increase by the amount of the increment of capital taxes. In contrast to the introduction of income tax, the rate of capital taxation does not adversely affect net profitability of investment or raise the rate of interest. Kalecki argues that whether an entrepreneur lends money or not does not affect the capital tax he or she pays.

178 It thus provides an equivalent to debt financing without having to incur the associated costs (Laramie and Mair, 2000; De Vecchi, 2008).

179 For a criticism on Kalecki's method by Keynes see De Vecchi (2008). In short, Keynes demonstrated that Kalecki based his theory on the hypothesis that expectations of future returns of capital assets and capitalists' propensity to consume are independent from or unaffected by the introduction of taxation.

180 This affects consumption spending or the MPC as well as investment spending or the marginal propensity to invest.

thus reducing savings and disposable income. According to his reasoning[181], levying taxes on profits is more likely to stimulate demand and increase utilisation than in the opposite case of levying taxes on wages.

Rowthorn (1981) includes taxes when he derives the profit rate in a simple stagnationist model. He argues that what matters for investment are net profits, that is, the profits that remain after allowing for taxes and depreciation. A higher tax (including taxes levied on dividends paid to shareholders) represents a rise in costs and will consequently reduce the rate of profit.

Blecker (1989) introduces government into the stagnationist neo-Kaleckian growth model by integrating income taxes into a one-sector short run macro model. For simplicity, it is assumed that labour is the only variable input, the national economy is treated as an aggregation of one representative firm producing one commodity and hence abstracts from inter-firm competition. Monetary relations are not modelled either. The money wage is assumed to be exogenous, given through labour contracts. Blecker (1989) also argues that introducing income taxes on profits and wages (assumed to be taxed at the same rate) has several implications for the national income as well as capital accumulation in the closed economy stagnationist growth model. For instance, as we have shown in chapter 2, in the Neo-Kaleckian approach equilibrium is established by an adjustment in the level of output (rate of utilisation) and the rate of profit, which is now defined as the after-tax profit rate. Hence, in this model with a government sector firms are assumed to consider the after-tax profit rate.

This brief introduction of the issue of taxes on wages and profits indicates some of the macroeconomic effects of taxation. However, tax policies in the context of a demand-led growth model have been discussed in more detail in a series of papers (Blecker, 2002; Mott and Slattery, 1994; Laramie, 1991; Laramie and Mair, 1996; Laramie et al. 1996). In alignment with our research interest we will primarily focus on the macroeconomic effects of taxation, how taxes are integrated, and how this might alter a given wage-led or profit-led demand regime[182].

Blecker (2002) takes the analysis of taxation further by allowing for progressivity between taxes on labour and capital, which will have further implications for the outcome of a given wage-led or profit-led demand and growth regime. He integrates effective tax

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[181] Steindl (1979, p. 5) argues that since savings are very unequally distributed, the wage tax will reduce it less than proportionately, while the tax on profits will largely reduce savings.

[182] For a comprehensive introduction and discussion of dynamic taxation theory in a Kaleckian framework see Laramie and Mair (2000).

rates on capital and labour to assess income tax effects in a simple stagnationist model with a closed economy and a government sector. The author hypothesises that a more regressive tax system makes the economy likely to be more profit-led, whereas a more progressive tax system [183] makes the economy more likely to be wage-led [184]. Furthermore, income taxes are viewed as 'leakages' from income-expenditure flows and firms are assumed to consider after-tax profits. A higher taxation of wages (relative to profits), ceteris paribus, can thus have detrimental effects on growth in wage-led economy. By the same token, a more progressive tax system can have positive effects on growth.

Palley (2014) also adds fiscal policy to the Neo-Kaleckian model[185] to show how this impacts the economy's regime. He focuses exclusively on the impact of taxes, ignoring government spending and the effects of budget deficits and surpluses[186]. In addition to Blecker (1989, 2002) he further differentiates taxes on labour and capital by including a corporate profits tax rate (t_π), the wage tax rate (t_w), and distributed profits (dividends to shareholders) tax (t_D) in the model which has further implications for investment and the likelihood of an economy to be wage-led or profit-led. Firms consider after-tax profits in their investment decisions and workers and capitalists pay the same tax rate on wage and profit income (hence there is no tax shifting or progressivity of taxation considered).

A reduction in the corporate tax rate (t_π) makes investment more sensitive to an increase in the profit share, and hence the economy is more likely to be profit-led (conversely a higher corporate profit rate increases the likelihood of a wage-led economy). In contrast, a reduction in the tax wage rate (t_w) means a larger demand effect from an increase in the WS increasing the likelihood of a wage-led demand regime. A lower tax rate on profits paid out to shareholders (t_D) makes the economy more profit-led assuming that there is a larger AD effect coming from an increase in the profit share (increase in disposable income of shareholders).

As a result, the wage versus profit-led character of an economy depends on fiscal policy constellations and it is therefore important to introduce into taxation the model

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[183] Progressivity is defined as the extent to which taxes on profits exceed taxes on wages.

[184] He further argues that even where savings out of wages are relatively small, the progressivity or regressivity of the tax system can affect whether an economy (demand and growth regime) is wage-led or profit-led.

[185] The Neo-Kaleckian model, as outlined in chapter 2, includes the profit rate, instead of profit share as in the PKA model, in the investment function. Palley (2014) further introduces a more comprehensive representation of income and wealth distribution, however, this is not the focus of the present review.

[186] A more comprehensive treatment of the government in a distribution and growth model is given in Palley (2013), which will be reviewed below.

that might help to explain cross-country differences in regards to finding a profit-led and wage-led demand regime (Palley, 2014).

Laramie (1991) examines the impact of the tax structure in an economy on the post-tax distribution of income, profits and national income. The paper also addresses the policy question concerning the best method of raising tax revenues to maximise national income. Starting from Kalecki's views on the incidence and impact of taxation the author considers various types of taxes (e.g. consumption tax rates) and treats business taxes as either prime or overhead costs. In alignment with our research interest we focus on the impact on national income (output) and only draw on the analysis of income distribution and profits if it is related to the macroeconomic effects of taxation on output.

The model Laramie (1991) develops assumes a closed economy with surplus labour and excess capacity. The state budget is balanced and hence all expenditures are financed by taxation and spent such as in Steindl (1979). Prices are cost determined with firms setting the mark-up price over prime unit costs (wage and material costs).

Whereas the level of taxation has no explicit role in the level of national income (under a balanced budget) an increase in taxes could, insofar as it increases government purchases cause the level of national income to expand, through the Kaleckian multiplier. However, this abstracts from the taxation impact on the distribution factors. If for example tax revenues were raised through increasing taxation on the wage of workers, then the WS and the national income multiplier would decline, counteracting the impact of taxation and consequent government spending on national income. In contrast, an increase in the effective tax rate on firm's profits simply increases tax revenues and reduces the profit share.

As a result, it is crucial to pay attention to the distributional effects of raising taxation on profits or wages[187]. It can be concluded that a reduction in the effective tax rate on wages adds a stimulus to the economy. For instance, a reduction in the social security tax rate could increase WS in national income, and increase the income multiplier and hence after-tax salaries. In other words, a change in income distribution towards labour would have positive affects through the multiplier mechanism. In contrast, a reduction in capital gains taxation is likely to have no impact on the distribution factors and hence no impact on national income. The conclusions, however, depend on the assumptions (e.g. firm's treatment of taxation as a direct or overhead costs) of the model and might

[187] As a further complication one could take into account social benefit payments. However, the literature focuses on earned income.

not hold in a longer period model since changes in the tax structure could lead to further responses of labour and capitalists affecting the mark-up and the propensity to consume. If the goal is to maximise national income, Laramie (1991) argues that the best method of raising the required tax revenues would be one that does not affect the distribution of income, for instance taxes on distributed profits.

Mott and Slattery (1994) also discuss PK/Kaleckian theory of tax incidence and macroeconomic effects of taxation. However, in comparison to other papers, the authors postulate four different pricing equations in which prices are added to output, the mark-up, treated as a prime cost or not considered in the pricing decision at all, in order to analyse the macroeconomic effects of tax shifting on output, wages and profits in a PK/PKA macroeconomic model. In addition, they allow for an effect of profits on investment in order to deal more comprehensively with the question of redistributive and macroeconomic effects of the tax structure. The total effect will depend on whether positive effects of redistribution from profits to wages on output and employment outweigh that possibly negative effect of reduced profits on investment spending.

The author's outline the conditions for the conditions for wage-led and profit-led demand regime. They emphasize the importance of firm's considering after-tax profits, rather than gross profits, which in turn are affected by the mark-up. Reducing the model to two equations – a goods market equilibrium (SI) and the distribution of national income (D) - the authors show that an increase in the mark-up unambiguously and positively affects real profits but the effect on real output is indeterminate (Mott and Slattery, 1994, pp. 395-397). If the MPS out of profits is greater than the MPI out of profits and this taken together is greater than the MPS of wages an increase in the mark-up reduces real output and the economy is wage-led. In the reverse constellation it is a profit-led regime or 'exhilarartionist' to use the terminology of Bhaduri and Marglin (1990).

Mott and Slattery (1994) introduce a balanced budget government sector with profits (t_Π), commodity (t_c) and wage taxes (t_w), In the first scenario, they consider the government sector without tax shifting that is firms do not respond to any of the changes in tax rates. An increase in commodity taxes[188] might reduce real profits. Nevertheless, one might expect firms to raise the mark-up enough to restore the previous level of profits. The authors further illustrate different scenarios of increasing (t_Π), (t_c) or (t_w),

[188] Mott and Slattery (1994) emphasize the importance of integrating commodity taxes, as they are indirect taxes in output. In their model they consider a VAT.

however, 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. Hence, the integration of taxes affects the parameters of the model with the total outcome being indeterminate[189].

Next, the authors integrate three additional price equations and analyse the effects of tax shifting on incidence, income distribution, and output. The first price response by firms is captured by assuming that firms simply add some or all of the perceived tax to the price of their output. Another possibility includes forms adding taxes to unit prime costs by actually attempting to mark up on the tax. Both of these responses can be imagined, in particular when firms try to respond to some version of a commodity tax such as value added tax (VAT). The final case occurs when firms simply add the perceived tax rate to their mark-up. Here, taxes such as property or profit taxes are perceived as overhead costs, relatively independent of the level of output.

Changes in the tax shifting variables have the same effects on the goods market equilibrium and distribution of national income as changes in the mark up in the basic model introduced above, hence the D curve slopes unambiguously upward from the origin and the SI curve slope depends on the values of the propensities to save and invest out of changes in profit income. An increase in the tax shifting parameter will increase profits but reduce wages, with the total effect on output being ambiguous (in the second case of firms to mark-up on the tax). In case of a positive equilibrium[190] an increase in the tax shifting parameter, analogous to an increase in the mark-up, will increase real profits, wages and output.

In conclusion, the specific contribution by Mott and Slattery (1994) lies in considering the importance of profits for investment in analysing the effects of taxation. By including the effect of reduced profits on investment the authors show that a higher corporate profit tax might be harmful on investment demand. Moreover, that changes in the tax shifting parameter in all varieties of pricing response of firms to taxation are behaving qualitatively identical to changes in the mark-up. Some of the policy implications the authors draw from their analyses include: Taxing retained earnings would provide the highest level of equilibrium output and employment. The major difference concerning the macroeconomic and distributional effects between a profit and VAT may be

[189] Hence, this invites empirical analysis of the issue that will be conducted in chapter 5 below.
[190] Positive equilibrium means an upward sloping D and SI equation as illustrated in figure 2 on page 396. Here, the stability condition must hold.

primarily based on firms pricing response. Depending on the magnitude of the parameters of the propensity to save out of wages (s_w), the propensity to save out of profits (s_π) and propensity to invest (α) different tax shifting effects can occur. For instance, in a wage-led regime with low (s_w), and ($s_\pi > \alpha$) taxing corporate profits increases wages and output, while not largely affecting aggregate profits. However, this only works unless firms attempt to shift them. Based on the theory of imperfect competition the author's hypothesize that prices should change more quickly following an industry wide increase in costs, such as by introducing a sales tax, rather than following an increase in the profit tax. In other words, higher prices might be more easily and quickly rolled over when the commodity tax rate (e.g. VAT) is affecting all firms.

Laramie and Mair (1996) extend the short-period framework used by Kalecki's theory of tax incidence to the long period by integrating it with his theory on the business cycle. More specifically, the authors demonstrate how the amplitude of the business cycle might be affected by taxes on wages and profits. Incorporating the tax system they analyse the effects on the rate of depreciation[191], the level of profits, and the structure of the business cycle. Finally, they consider the consequences of tax shifting between wage and profit taxes. In alignment with our research interest we will focus on how taxes are integrated and the macroeconomic effects of taxation on profits and investment.

To simplify the analysis, Laramie and Mair (1996) assume a balanced government budget with government purchases being equal to tax receipts. Furthermore, they abstract from the inventory investment component of the business cycle, assume a closed economy and exchange the autonomous component of capitalist's' consumption with a variant of Weintraub's consumption coefficient as used in Laramie (1991)[192], exclude overhead (salaried) labour and assume a fixed mark-up with respect to change in tax rates[193].

Taxes are first introduced in order to express national income as a function of post-tax profits implying that the relationship between profits and national income can be directly influenced by taxes on profits and wages. Laramie and Mair (1996) modify the

[191] We do not discuss these effects because we abstract from depreciation in our model. However, the assumption is that an increase in the profits tax would increase the rate of depreciation, given the rate of technical progress. The depreciation effect may diminish the overall positive effect coming from a reduction in the profit tax rate on investment.

[192] This implies to drop the assumption of zero savings of workers. However, this is not critical to their argument.

[193] They loosen this assumption later.

expression of the WS to include wage taxes[194], with wage taxes reducing the post-tax WS by a factor equal to the tax rate on wages.

In order to show the impact of the tax system on the business cycle and trend the authors develop an investment function following closely the original thought of Kalecki where fixed investment decisions is determined by entrepreneurial savings, investment that generates standard profit rates and an innovation factor. According to Kalecki aggregate profits is the sum of gross private investment, government budget deficit, the trade surplus, and the difference between capitalist consumption and workers savings[195], or simply the difference between aggregate sales and materials and wage costs. Assuming a balanced budget constraint and the trade balance to be zero, taxation affects the level of profits through two channels: changes in government purchases and the WS. A balanced budget multiplier effect will increase both national income and the wage bill and hence has a positive effect on profits. In contrast to neoclassical theory[196], an increase in the wage tax rate is thus likely to reduce profits and hence depress investment.

The paper thus suggests that investment could be stimulated by a more equal income distribution of income through the tax system. They also highlight that changes in average taxes (as opposed to marginal tax rates) matter for investment decisions. A reduction in the profit tax rate may or may not stimulate investment. A change in the profit tax has no impact on the basic income multiplier but increases profits through the consequent government spending (balanced budget multiplier effect). However, if the profit tax is shifted the latter effect might be reduced. Hence, the issue of the impact of taxation on investment becomes an empirical one.

Laramie et al. (1996) provide some empirical evidence on the impact of taxation on investment[197]. The author's conduct time series analysis where private investment expenditures is a function of the average profits tax rate, the average wage tax rate, assuming that the tax system affects investment through the level of profits and

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194 Kalecki (1937) does not introduce a tax on wages, but on capitalists' income only. Laramie (1991) introduced wage taxes into the model.

195 Laramie and Mair (1996) introduce Weintraub's consumption coefficient (ratio of consumption expenditures to the wage bill) to capture the difference between capitalists' consumption and workers savings.

196 In the neoclassical theory of investment, decisions of firms to invest are governed by the objective to maximise the present values of the net proceeds of the representative firm, that is, when the marginal revenue product of capital equals the rental cost of capital (Laramie and Mair, 1996). Also, the authors argue that in contrast to neoclassical theory what matters are changes in average as opposed to marginal tax rates that matter more for changes in investment decisions.

197 They analyse the effect of a wage tax and profit tax rate on gross private non-residential fixed investment. The study uses evidence from quarterly data between 1980 and 1993 for the United States.

depreciation as in Laramie and Mair (1996). Furthermore, they run a series of different variations with independent variables including the lagged dependent variable of investment, and the constant representing a trend coefficient. They find that an increase in the wage tax rate has a robust and quite large negative effect on private investment. In contrast, the average profits tax rate has a relatively small effect on investment in comparison. A small increase in the wage tax rate, given it has a relatively large tax base, may result in a significant reduction of profits and investment, and hence contradicts conventional investment tax incentives policies (e.g. broadening the definition of tax incentives to include the impact of non-business taxes).

4.2. Government Spending

In this section, we critically review the PK literature with regards to the integration of government spending into the PKA model[198]. Our main research interest related to the integration of government spending into the PK/PKA model and its effects on AD and economic growth. We are also exploring different effects of different types of government expenditure and how this might impact demand (e.g. multiplier effects) and the business environment (e.g. crowding in effects). We explore the literature to assess possible extensions of our economic model developed in chapter 3.

The literature integrates total government expenditure discussing crowding in effects on private investment and a possible stimulus effect on AD, with some papers take a more differentiated view clustering different types of public spending (e.g. considering investment in social infrastructure in addition to investment in public infrastructure).

Regarding public investment Rowthorn (1981) outlines the possibility of the government stimulating the economy through deficit financing. Government expenditure will increase the level of demand and consequently lead to more investment and faster growth. In an environment of excess capacity the increase in productivity will be followed by a rise in real wages[199].

In terms of the macroeconomic effects of expansionary fiscal policy, Blecker (1989) argues that, in a short run macro model, this increases AD, stimulates capacity utilisation, and increases realised profits through the multiplier process, hence raising the desired rate of capital accumulation at any given WS. An increase in government spending would

[198] Commendatore et al. (2011) states that the PK school of thought has largely overlooked the topic, even though its founders paid significant attention to it.
[199] Seguino (2012) argues that an increase in real wages following productivity is not guaranteed but has to be supported by the institutional environment such as labour bargaining institutions.

thus act as an additional stimulus shifting up the capital accumulation curve (I/K) (Blecker, 1989, p. 399) in the model. He thus concludes that expansionary fiscal policy is a harmonious way of increasing output and would still be effective for stimulating accumulation in the short run in an open economy context.

Seguino (2012) considers how human development concerns might be integrated into a heterodox macroeconomic framework that incorporates income-based equity concerns from the start. Fiscal policy is included with a focus on public investment in physical and social infrastructure [200], which enhances private investment, stimulates AD and employment growth. Public investment has positive effects on the economy; it can increase economy-wide productivity and create fiscal space in terms of future income growth and hence expands the tax income base. However, the crowding in effect of public investment [201] might not increase demand for labour if the additional private investment simply adds to excess capacity due to a lack of AD.

Seguino (2012) develops a demand-constrained growth model for the short-run and long run period[202] and examines the impact of a change in government investment and the profit share on capacity utilisation (as a proxy for AD). The issue of income distribution is integrated via an exogenous change in the real wage[203]. In alignment with Kalecki's postulate that workers do not save, private saving is determined by the saving propensity out of profits and the profit rate. Taxes on labour and capital income are introduced as a flat tax rate. Private investment is positively dependent on firms considering after-tax profits, capacity utilisation capturing the accelerator effects as well the government investing into physical and social infrastructure, which reflects crowding in effects.

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[200] Seguino (2012) discusses both categories in detail and emphasizes that public investment should be targeted taking into account key social and economic groups, as well as strategic industries and sectors. Targeted investments can increase economy-wide long-run productivity growth. Regarding social infrastructure investment, investments in people's capabilities are viewed as public goods in a sense that they generate increased productive capacity in an economy. This definition of investment in social infrastructure closely corresponds to our understanding of the term using data on individual consumption government spending in the empirical analysis in chapter 5.

[201] Agenor (2008) provides a review on studies on this topic. Bose et al. (2007) show that government capital expenditures and economic growth are positively correlated; particularly government investment in education is significantly associated with growth.

[202] In alignment with our research interest we will focus on the short run comparative statics analysis. According to the author the model is in a Keynes/Kalecki/Kaldor tradition with featuring a special role for public investment.

[203] Seguino (2012) integrates another concern of equality: The distribution of capabilities. Government investment policies can stimulate growth and enhance employment. Therefore, income of households increases and can be directly invested in improving human capabilities.

The level of AD can be stimulated by an increase in public investment and government consumption spending. Moreover, taxes can alter the MPS of capitalists and change the multiplier effect. It is an empirical question as to whether economies are wage-led or profit-led. More importantly, however, state-level policies can influence the relative strengths of the effects[204] and public investment can serve as a vehicle to promote equality-based growth. Public investment represents an additional stimulus to output (and employment) via the crowding in effect, which is a key feature of the model.

As a result, Seguino (2012) illustrates the potential positive effects of public investment in physical and social infrastructure as well as government consumption spending[205], on demand and the possibility of additionally enhancing private investment. Crowding in effects can also sustainably stimulate output and employment because they are potentially self-financing through increasing future income and hence tax receipts. Hence, there are two effects of public investment, a 'demand effect' and a 'crowding in' effect.

Seguino (2012) further argues that public expenditures have the potential to raise the long-run productivity growth rate of the economy and thereby reducing inflationary pressures with the central bank's propensity to raise interest rates being reduced[206].

Commendatore et al. (2011) consider a government sector with a balanced budget including both Kaleckian and Classical Harrodian perspectives. The authors analyse the impact of different types of government expenditure on growth and outline under which conditions they might be beneficial or detrimental to growth. Following Barro (1990) the authors define productive and unproductive expenditure[207]. In the former case it has a positive effect on labour productivity and in the latter it does not.

The model is a single-good closed economy model with two input factors: Labour (L) with perfectly elastic supply and fixed capital (K), which does not depreciate. There is no technical progress and the production function is of Leontief type. There is excess

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[204] Seguino (2012) reiterates the danger of falling into the trap of Say's law, which automatically assumes that supply creates its own demand. The government can actively stimulate the level of AD to absorb excess capacity created and moreover restore labour's bargaining power to ensure that more productive worker will find employment and take part in rising income levels through higher wages.

[205] Includes defence spending, pension transfers, non-innovation subsidies to businesses etc. This definition is closely related to our interpretation of the data on collective consumption spending in chapter 5, which includes similar categories.

[206] We do not discuss long-run growth and distribution here. The interested reader is referred to the appendix in Seguino (2012). However, the model abstracts from monetary and inflationary dynamics.

[207] This could also be distinguished as capital and current government expenditure. Most of the literature looks at the impact on the rate of growth. However, Commendatore et al. (2011) consider their ability to affect labour productivity instead.

capacity and workers do not save and the investment function is non-linear[208]. Due to reasons of space we do not outline the model in detail[209] but focus on the Kaleckian interpretation of the model.

The derived equilibrium solutions of capacity utilisation (u^*) and equilibrium capital accumulation (g^*) show that public spending thus has a positive externality effect on input coefficients of production[210]. Like Barro (1990) the authors assume that government expenditure enhances productivity by purchasing goods and services that are provided to the private sector.

The focus in the paper is on how government expenditure influences labour productivity (supply side) and after-tax profits (demand side). There are three cases in which the effect of government expenditure is neutral or negative: (a) Government activity does not affect labour productivity; (b) government expenditure affects labour productivity and wages rise at the same rate, which implies that pre-tax profits do not increase; (c) government expenditure affects labour productivity but the increase in pre-tax profits is not sufficient to counteract the increase in taxation, leading to a decrease in after-tax profits. Moreover, when the increase in pre-tax profits more than compensates the increase in taxation, this will lead to a rise in after-tax profits.

There can be three solutions in this model, depending on the value of government expenditure. The total effect depends on the effect of government expenditure on after-tax profits. Government expenditure can have a negative effect on profits and thus an expansionary effect on capacity utilisation as well as growth (wage-led demand). In the opposite case government expenditure has a positive effect on profits and leads to a profit-led demand regime. The expansionary effects on capacity utilisation and growth, despite falling profits, occurs due to the Kaleckian paradox of costs holding true in an economy with government playing an active role (Rowthorn, 1981).

To summarise the paper analyses the effects of different types of government expenditure on growth in a PKA framework. It shows how these effects are generated by adding changes (e.g. variation in the distribution of income) occurring on the demand side to those working through the supply side. The analysis finds that the influence of government expenditure on the rate of growth depends on the induced change in after-

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[208] This equation assumes that investment is an 'S' shaped function of the degree of capacity utilisation assuming that when capacity utilisation is low the propensity to invest is weak. It improves with rising capacity utilisation and slows down when it has reached a high level.

[209] For a full presentation of the model see Commendatore et al. (2011, pp.4-8).

[210] Productivity changes in Kaleckian equilibrium growth are assumed to be exogenous such as in Rowthorn (1981).

tax profits. The rate of growth moves in the contrary direction to after-tax profits, hence the rate of growth is minimised when after-tax profits reach their maximum. This confirms the typical Kaleckian assumption of the paradox of costs and that growth is driven by demand. In the Kaleckian interpretation the influence of unproductive expenditures is always beneficial to growth. In terms of productive government expenditure influencing labour productivity the total affect is ambiguous and depends on how it affects after-tax profits.

The model did not include the issue of public debt and also rules out issues of financial crowding out due to inflationary pressures. In contrast to other papers, it considered a non-linear investment function taking a dynamic perspective of the relationship between investment and capacity utilisation.

Palley (2013) sets out to compare two growth models: Cambridge and Neo-Kaleckian growth models (e.g. Dutt, 1984). The author assesses the comparative effects of fiscal policy on growth in both models. In alignment with our research interest, we focus on the role of fiscal policy in the neo-Kaleckian model, and only draw upon a comparison with Cambridge growth theory[211] if useful. We outline the implications of his analysis model in more detail since it incorporates various ideas that are close to our research aim.

Palley (2013) conducts 6 'experiments' with regard to fiscal policy applying comparative statics to find the influence on the profit share, capitalist's ownership, and growth. These experiments combine tax policy and government spending and consist of: A lump-sum tax transfer from capitalists to workers, and vice versa; balanced budget spending financed by a lump sum tax on capitalists; balanced budget spending financed by a tax on profits; balanced budget spending financed by a tax on business profits; public investment financed by a tax on household profit income; and finally bond-financed government spending. The first two experiments represent a redistributive tax policy that shifts income between capitalists and workers, e.g. through a lump-sum tax on profit or wage income. The third experiment denotes an increase in government expenditure financed through a lump-sum tax on capitalists profit income. The fourth experiment illustrates an increase in government spending financed (and balanced) through a lump-sum tax on firm's profits, which will subsequently not just affect only consumption but

[211] The Cambridge approach is related to the models developed by Kaldor (1956) among others. They distinguish themselves from neo-Kaleckian growth theory by assuming full capacity utilisation and a class structure of saving.

also investment behaviour of firms. This allows a more careful distinction of taxation occurring at the household and firm level.

The fifth experiment also discusses expansionary fiscal policy financed through a lump-sum tax on household profit income. However, in this scenario the focus is exclusively on an increase in public investment (and not total government spending) and hence allows for possible crowding-in effects of public capital spending on private investment. In the final experiment the assumption of a balanced budget is relaxed and the government can now accumulate a deficit to finance an increase in spending. Hence he integrates tax policy, government spending and public debt into the neo-Kaleckian model.

Palley (2013) derives a basic Neo-Kaleckian model assuming variable capacity utilisation, excess labour supply and an independent investment function. Variations in AD affect capacity utilisation, which in turn impacts on growth[212]. The profit share is determined by firm's mark-up and workers have a higher propensity to consume than capitalists do. The mark-up is independent of capacity utilisation[213]. The nature of the economic regime can be wage-led, profit-led or conflictive, which we have outlined before in chapter 2.

The introduction of a lump-sum tax (t) on profit income that is transferred to wage income raises capacity utilisation and growth because there is an increase in AD due to the higher propensity to consume out of wage income. In the second case, the reverse holds for redistribution from wages to profits.

Next, Palley (2013) assumes a balanced budget government spending financed by a lump-sum tax on households profit income that leads to an expansionary effect due to the stimulus provided by an increase in government spending which spends all the tax revenue, whereas households would have saved some of this income[214].

Another experiment introduces balanced-budget government spending but now this is financed by a lump-sum tax on firms' profits[215] with the total effect being ambiguous. On the one hand, increased government spending and reduced saving increase capacity

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[212] Palley (2013) argues that this in fact makes the model strictly Keynesian and hence distinguishes it from the Cambridge model, which also includes classical features such as an emphasis on the role of profit dynamics in determining growth.

[213] Palley (2013) states that there is empirical uncertainty about any relationship and it remains unclear whether a lower mark is due to increased bargaining power or, alternatively, whether a higher mark-up correlates with tighter goods markets and thus increased pricing power of firms.

[214] As we will show below, Dutt (2013) makes the same argument to show the positive effects of government expenditure on output.

[215] Palley (2013) gives one example for firm's profits: corporative profits.

utilisation and growth. On the other hand, there is a negative effect on investment caused by the introduction of a profit tax. The negative profit tax effect may dominate the positive capacity utilisation effect. Hence, tax-financed government spending via levying taxes directly on corporate profits might be less likely to be expansionary[216].

Another experiment is a balanced-budget public investment financed by a lump-sum tax on household profit income. In this context, public capital is assumed to have a positive effect on private sector productivity thus enhancing private sector investment (e.g. Aschauer, 1989)[217]. In this case, reduced saving increases public and private investment and both capacity utilisation and growth increase.

A final experiment is government expenditure financed by bond issues, but limited by the assumption that the bond stock grows at the steady-state rate of capital .accumulation. Therefore, the model is augmented by interest payments that on the one hand add to household capital income and increase saving and on the other hand represent an income transfer and thus reduce government saving. Palley (2013) thus follows the same logic of You and Dutt (1996) here in that an increase in the debt ratio increases interest payments to households, which increases their disposable income, AD, and hence capacity utilisation. An increase in government spending increases capacity utilisation, the steady state public debt ratio and growth. The debt ratio can fall if the impact of government spending on accumulation and growth is stronger than on the interest rate.

To summarise Palley (2013) integrates lump sum taxes on capital and labour and government spending financed by either taxes or by bond issues and analysis their impact on capacity utilisation and growth in a series of experiments. He finds that a lump sum tax redistribution from profit to wage income, a balanced budget spending financed by a lump sum tax on profits or household profit income as well as a bond-financed government spending all have positive effects on both capacity utilisation and growth in the neo-Kaleckian model. The effect on capacity utilisation is negative when the balanced budget spending is financed through a lump sum tax on business profits with the effect on growth being indeterminate. The effect is ambiguous because whereas increased government spending and reduced saving increase capacity utilisation there

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[216] Palley (2013) outlines the neoclassical perspective in which managers and shareholder are the same, hence taxing profit income at the household level and taxing profits at the corporation level are identical in a way that they all discourage private investment. However, the PK literature argues in favour of separation of managers and shareholders. Taxing profit income at the firm and household level therefore has differential impacts.

[217] The impact of public investment on growth has been subject to on-going debate and hence led to a significant amount of theoretical and empirical research (e.g. Easterly and Rebello, 1993; Baxter and King, 1993; Gupta et al. 2005; Bose et al. 2007).

might be a negative effect on investment spending. He thus indicates that tax policy financing a balanced budget spending through levying taxes on firm's profits might be less expansionary. In alignment with other authors (e.g. Seguino, 2012; Dutt 2013) he introduces a positive crowding in effect of public investment on private investment, which increases both capacity utilisation and growth. Introducing debt into the model he shows that the debt to capital ratio can raise or fall depending on whether it raises the interest rate by more than it raises capital accumulation and growth.

Palley (2009) modifies a simple income-expenditure textbook macro model to appropriately account for imports. He argues that this modification causes government expenditure to have an even larger expenditure multiplier and important implications for fiscal policy. The argument is that the standard income-expenditure mode only accounts for the import leakage resulting from induced expenditures but not import leakage related to first rounds of spending. In this case the multiplier is reduced. The leakage holds for both household and government spending. More importantly, as opposed to assuming a single marginal propensity to import in this re-specified version there are now different marginal propensities to import – for each component of AD[218]. Government's import propensity is likely to be low since most government spending constitutes labour costs and thus goes directly into wages and salaries of domestic workers. Using some back of the envelope calculations Palley (2009) shows that while the multiplier for both government spending and taxes are reduced the relative efficacy of government spending compared to tax cuts has increased.

Therefore, it is important to better account for the impact of imports, which yields significant implications regarding the relative size of government spending and tax multipliers. Fiscal stimulus based on increased government spending might be even more expansionary relative to tax cuts than assumed in the traditional income-expenditure model[219].

4.3. Government Debt

There is one stream of literature, that in addition to introducing taxes and government expenditure allow the public sector to accumulate government debt and hence to run a budget deficit (You and Dutt, 1996; Dutt, 2013; Tavani and Zamparelli 2015). Generally

[218] Palley (2009) argues that since imports consist of imported final consumptions goods as well as inputs used in the production of domestically produced consumption goods both types must be subtracted from aggregate consumption to get the true demand for domestic consumption goods.
[219] In fact, in chapter 5 different fiscal policies (e.g. change in tax rate or increase in public spending) are analysed indicating the different magnitudes of these changes.

speaking, these studies find that the integration of government debt has ambiguous effects in the short run but expansionary fiscal policy positively affects the growth rate in the long run. Moreover, these studies look at the composition of government expenditure (government current and capital spending) and how this might affect the labour productivity growth rate[220]. They examine its effects on capacity utilisation and capital accumulation and discuss potential financial crowding out effects and the sustainability of the debt to capital ratio.

Before outlining the complex relationship the budget deficit and economic growth it is useful to ask why the budget deficit occurs in the first place. There are potentially several reasons why the government decides to run a budget deficit, e.g. discretionary fiscal policy or the implementation of automatic stabilisers[221]. Arestis and Sawyer (2012) for instance emphasize the importance of counter-cyclical fiscal policy to respond to inadequate demand.

Sawyer (2012) argues that in a Kaleckian framework fiscal policy needs to be introduced because the budget deficit corresponds to the difference between savings and investment. Hence, it absorbs the imbalance between savings and investment (e.g. excess savings over investment). Sawyer (2012) further illustrates that capacity utilisation is positively affected by an increase in government demand. Hence, another function of the budget deficit is to secure high levels of economic activity.

A formal treatment of the government in PK theory of distribution and growth can be found in You and Dutt (1996). The paper analyses the effects of a rise in government debt on growth and income distribution. The paper also highlights the possibility of an expansionary effect of a rise in government debt.

The developed model is a PK distribution and growth model with the following assumptions: The rate of growth is constrained by AD rather than supply factors; Demand largely depends on the animal spirits of firms; and money supply is endogenous to demand. Furthermore, income distribution is introduced through assuming different propensities to save out of wage and capital income.

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220 Indeed, endogenous technological change (adjusting to demand growth) is one of the driving forces of the results in the long run. In our model, presented below, we abstract from labour productivity growth affecting the long run growth rate in an economy. Consequently, in what follows we focus on the short run comparative statics and implications of the respective papers.

221 Supporters of the New Consensus Macroeconomics (mainstream) framework would reduce the role of fiscal policy down to (rather endogenous than policy driven) automatic stabilizers (Arestis and Saywer, 2012). Hence, government should take a passive role and only be concerned with balancing government expenditure and taxation. We have outlined some of the arguments behind this reasoning in section 2 and section 3. This literature for instance assumes Ricardian equivalence to hold and crowding-out of private investment by government activity to prevail.

First, the authors analyse the model for the short run, with a goods market clearing through changes in output and capital stock as well as debt are given. They consider a closed economy with excess capacity and unconstrained labour supply. In alignment with previously outlined papers the authors consider net income for wages and profits. However, they consider consumption rather than introducing a savings function[222]. The distinctive feature here is the introduction of interest payments on public debt that accrue to capitalists and is assumed to increase their pre-tax capital income and hence consumption. Assuming a fixed mark-up the profit share is given exogenously. Also, the interest rate and prices are assumed to be constant.

Investment demand depends on market prospects and firm's expectations regarding profitability and thus follows the general investment specification of the Bhaduri and Marglin model, with the introduction of after-tax profit share. The interest rate is not included assuming it is fixed and hence following PK theory of the money supply being endogenously determined by demand at a given interest rate. Real government expenditure is a constant fraction of the capital stock. In the short run, the goods market clears through changes in output where national income is equal to consumption demand plus investment demand and government expenditure.

An increase in the stock of government debt positively affects output through an increase in interest payments and hence stimulates consumption demand by raising disposable income of capitalists. Moreover, a change in the distribution of profits and wages has an ambiguous effect on income distribution with the total effect depending on whether the negative effects on consumption demand overpower the possibly positive effects on investment demand. The analysis shows that in the short run government debt can have a positive effect on AD and hence capacity utilisation and capital accumulation. The analysis, does not specifically take into account crowding out effects since the interest rate is assumed away.

In the long run dynamic model including government debt the paper assumes that issuing debt finances the total deficit. The development of the debt to capital ratio depends on the primary deficit and the difference between interest rate and growth rate in the economy such as in Palley (2013). The authors show, in a series of equations, that the evolution of the debt to capital ratio is stable in the long run equilibrium. The interplay between the multiplier and the accelerator effect are responsible for this result,

[222] We follow the same modelling approach using consumption rather than a savings function in the Kaleckian model with government introduced below.

which requires that the economy is operating below its capacity limit[223]. In alignment with our research interest we do not further consider the long-run dynamics and interplay between income distribution and government debt here.

There are two key findings in this paper relevant to our analysis: First, an increase in public debt can increase disposable income of capitalists and hence increase consumption demand. Second, an increase in the stock of government debt has a positive effect on capacity utilisation and hence, through the accelerator effect, on capital accumulation. However, the simple distribution and growth model has ruled out the possibility of financial crowing out due to rising interest rates, as well as issues of inflation and open economy considerations.

Dutt (2013) develops a Keynesian model of growth to examine the effects of fiscal policy from a theoretical point of view. The long-run rate of growth is determined by both demand and supply forces allowing for endogenous technological change[224]. The paper shows that government fiscal policy is effective in the short as well as long run and that different types of government spending have different effects. First, the budget is balanced, but in a second stage government deficits and debt are introduced. In contrast to You and Dutt (1996) the analysis thus also takes into account adverse effects of debt accumulation on long-term interest rates. Since our analysis below is very close in spirit to the ideas and arguments presented by Dutt (2013) we outline this paper in more detail. However, it should be mentioned that we abstract from endogenous changes in technology (following a change in demand) in our model and again focus mainly on the short run comparative static analysis.

In the short run, the stock of private and government capital are fixed and there is no depreciation. The goods market clears through variations in the level of output and capacity utilisation, which in turn depends on excess demand for goods and services. In a simple closed economy model without government debt it is assumed that government raises revenues through levying income taxes at a certain rate and spends all proceeds on either government consumption expenditure or government investment expenditure. Substituting between government investment and government consumption expenditures will be key in examining changes in fiscal policy. Dutt (2013) introduces private savings

[223] Hence the authors assume excess capacity to hold also in the long run and follow Kalecki in conceptualising the long run as a succession of short runs, rather than assuming a fictitious time frame.
[224] Unlike in the neoclassical paradigm in which the natural rate of growth is exogenously given, the model in this paper allows the growth rate of labour productivity to adjust endogenously to labour market conditions. As a result, fiscal policy can have a positive effect on employment and output, in the short run but also in the long run, which stands in contrast to mainstream theory.

as a fraction of disposable income and hence does not distinguish between different income groups and their respective marginal propensities to consume. Private investment is dependent on capacity utilisation and the ratio of government investment to the privately-owned capital stock.

Dutt (2013) argues that private investment and public investment are complementary to each other because of crowding in effects, for instance positive effects of government investment in infrastructure and technology on private investment. Moreover, even though a shift from government consumption expenditure to government investment expenditure does not affect the level of AD directly, it has a positive indirect effect on private investment through the crowding in effect and hence also expands AD and output. The equilibrium level of capacity utilisation increases with the level of autonomous investment and falls with an increasing savings rate (paradox of thrift). It further increases with raising the tax rate and the subsequent increase in government investment, as a ratio to output[225].

Hence, there are a number of reasons why government investment spending increases economic growth. It does so through the standard multiplier effect raising AD and employment (and therefore is no different from government consumption expenditure); by crowing in private investment; and it accelerates technological change and thereby increases the long-run rate of growth in the economy[226]. Dutt (2013) consequently argues that for government policy to be effective it is important to consider the impact of different kinds of investment having in mind these diverse effects.

In the next stage, introducing government debt and deficits augments the model. It is assumed that the entire deficit is financed by debt (ignoring monetary and other assets) and that government pays an interest rate on it[227] as well as imposes a tax rate on households. Including interest payments on debt that accrue to capitalists and hence increase disposable income now augments the consumption function. Regarding private investment demand the possibility of financial crowding out effects through increased

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[225] Dutt (2013) argues that this holds true due to the balanced government budget assumption which implies that all tax revenue is automatically spend by the government resulting in an increase in AD, while disposable income is only partially reduced due to the fact that a fraction is saved.

[226] As stated beforehand we do not consider this channel and focus on the short run comparative static analysis. It should be pointed out, however, that the long-run rate of growth here is similar to natural rate of growth in the mainstream literature. It is similar, because it is determined by the population growth rate and the growth rate of labour productivity (or technological change). However, the latter is affected by changes in AD and hence income distribution. Thus, only if technological change is not affected by a change in demand the special case of the neoclassical 'natural' rate of growth occurs.

[227] The analysis abstracts from changes in prices. Stock of government debt and interest rates can be interpreted in both nominal and real terms.

government indebtedness and an increase in the long-term interest rate is now allowed for.

The mechanisms assumed behind the positive effects on growth are similar to the model without government debt. Here we have an additional AD effect now financed by the increase in the deficit (e.g. an additional increase in government demand), which directly increases capacity utilisation through the standard multiplier effect. Additionally, it increases capacity utilisation indirectly through the induced expansion of private investment. Hence, we have a direct output effect coming through an increase in government spending demand and an indirect crowding in effect on private investment[228].

Focusing on a short run change in government debt there are two contradicting effects: On the one hand there is a positive effect on AD through the higher level of interest payments on higher debt. On the other hand, there is a negative effect on investment and hence AD through financial crowding out (e.g. higher interest rates). Hence, the relative strength of these two opposing effects determines the total effect on AD and capacity utilisation, which is an empirical matter. If the crowding effect is weak, and the consumption effect strong, the effect of government debt may be expansionary. However, if interest payments mainly accrue to high-income households that generally have a lower MPC, the effect will be contractionary. In this model, however, issues of income distribution are not explicitly modelled since a constant saving rate out of disposable income is assumed.

To summarise, the analysis in Dutt (2013) shows that fiscal policy can alter the growth rate, in the short and long run. The paper finds that, despite the possibility of adverse effects of debt accumulation on long-term interest rates and investment, fiscal expansion can lead to positive growth effects. Regarding possible financial crowding out effects the author argues that this is an empirical matter, which requires empirical research and is likely to be context-dependent. In addition, the paper has shed light on what kind of government expenditure are most growth-inducing. A tax-financed increase in government consumption expenditure increases the short-run rate of capacity utilisation and capital accumulation. Private and public investment are complementary due to

[228] Hence, if the government decides to increase only consumption expenditure (current spending), this effect will be less than for an increase in public investment due to the absence of positive (indirect) crowding in effects on private investment.

positive crowding in effects. Hence, government investment in in physical infrastructure provides an additional boost to private investment.

The model is limited in assuming a closed economy and hence does not consider issues concerning such as foreign debt, and its effects on external competitiveness. It has not explicitly incorporated the dynamics of inflation, and it's presumably effect of raising borrowing costs and thereby reducing private investment[229]. More importantly it did not take into account issues related to income distribution, and the effect of different tax rates on higher and lower income groups.

Tavani and Zamparelli (2015) analyse a demand-driven growth and distribution model with a public sector and further extent the framework to integrate the role of government debt. In their model, distribution is neutral with respect to growth in the short run and wage-led in the long run because of the induced innovation hypothesis. According to this thinking, productivity growth is an increasing function of the wage share (e.g. Dutt 2013). In their model, labour productivity depends thus not only on income distribution but also on fiscal policy[230]. Furthermore, investment is a function of the realised profit rate and AD determines the short run equilibrium capacity utilisation and accumulation rate.

Starting with production technology the paper assumes that private firms need public infrastructure. Hence, potential output depends on both private capital and public capital assuming they are imperfect substitutes. Total government spending is composed by government consumption that is used to pay wages to public employees and public investment, which finances the accumulation of public capital. In the short run, the budget is balanced and fiscal policy is fully constituted by government expenditure and its composition. Two types of workers are included: public and private employees. It is assumed that workers earn the same wage and labour demand adjusts to existing wage conditions.

In PK tradition the authors introduce a separate savings and investment equation. Assuming a two-class structure of the economy the private sector consists of workers who consume all their labour income, do not pay taxes and do not save, and capitalists who earn profit incomes, pay taxes and consume as well as save out of their disposable income. Public workers also consume all their income. The short-run growth rate (capital accumulation) is independent of income distribution but increasing with government

[229] However, this also ignores the possibility of inflation to reduce the value of real government debt.
[230] However, in this thesis we abstract from changes in labour productivity.

spending through the effect of the autonomous spending multiplier. Demand is wage-led and government spending led in the short run.

Tavani and Zamparelli (2015) further extend this framework to include the role of government debt relaxing the initial assumption of a balanced budget. The interest rate paid on debt is assumed to be an exogenous variable[231]. Hence, money supply adjusts to match the interest rate targeted by the central bank. Capitalists own government debt, and thus interest payments on debt provides an additional income stream. This introduction of interest payments does not alter the savings function (growth rate of the capital stock) but impacts the investment function since capitalists look only at the profit share net of interest income (this is still gross of taxes).

In alignment with the analysis of Dutt (2013) this paper introduces the mainstream notion of crowding-out arguments of private investment through an increase in public debt. According to Tavani and Zamparelli (2015) this is, however, at most a short run phenomenon and does not hold in the long run. Since the public sector can issue debt now, fiscal policy is now constituted by three factors that is government deficit, total government expenditure, and the composition of the latter. Hence, the inclusion of public debt mainly introduces the interaction between the financial side and real side of the economy.

Both the debt to capital ratio and the interest rate lower the equilibrium level of activity, which links the accumulation rate of public debt with economic growth creating a potential negative effect on the latter. Simultaneously, however, the size of government deficit to GDP ratio increases the value of the growth multiplier of autonomous spending everything else being equal. Thus, the total effect is ambiguous.

As a result, government spending can positively affect the short run growth rate through the autonomous spending multiplier of public spending. Moreover, introducing the issue of public debt the total effect on growth is ambiguous. For instance, interest payments on public debt increase disposable income of capitalists such as in You and Dutt (1996) and Dutt (2013). Moreover, similar to Palley (2013) the accumulated government deficit increases, ceteris paribus, the value of the growth multiplier of autonomous spending. On the contrary, allowing for financial crowding out (e.g. through

[231] Hence, money supply needs to adjust to meet the interest rate targeted by monetary authorities.

an increase in public debt) this might lower the equilibrium level of economic activity and cause a higher public debt to capital ratio[232].

5. Conclusion

This chapter has briefly discussed the role of fiscal policy in macroeconomics by focusing on the crowding in versus crowding out debate and surveying the empirical fiscal multiplier literature. We have discussed the long-standing theoretical debate on the relative effectiveness of fiscal policy, and summarised some of the major arguments related to the crowding out and crowding in discourse in macroeconomic literature. It has been argued that there are still good reasons to believe in the efficacy of fiscal policy. Some of the crowding out arguments (e.g. Ricardian Equivalence) are questionable and seem to rule out prematurely the potential positive impact of expansionary fiscal policy on economic growth.

This thesis also takes issue with neglect of government consumption as a useful source of AD. The strong emphasis on public investment as the only productive government expenditure type narrows the focus down on supply-side effects and thus disposes any effects coming from the demand side (e.g. through changes in functional income distribution). Moreover, proponents of sound finance (e.g. fiscal austerity) reduce the role of fiscal policy to automatic stabilizers and hence dismissing the important role of discretionary fiscal policy.

There is a vast range of results in the fiscal multiplier literature and the findings are from a consensus. We have outlined various conditions that help to explain the variety of results. We have highlighted the significance of the theoretical assumptions in the different model classes and emphasized that the state of the economy has not been properly accounted for and, among other factors, might have caused the underestimation of fiscal multipliers before the crisis. Removing unrealistic assumptions (e.g. rational expectations of households) increases the effectiveness of fiscal policy.

In this chapter we focused on critically reviewing a series of papers that integrate the government sector into the stagnationist as well as the PK/PKA distribution and growth model and shed light on the possible questions that can be addressed when government plays a role. Moreover, we presented different theoretical propositions that support the

[232] According to the authors, crowding out effects of government debt is a short-run phenomenon. In their model, public debt might adversely affect investment demand in the short run, but the long-run growth rate is independent of the size of public debt. The sufficient condition for this to hold true is that the economy must grow at a higher rate than the ratio of the interest rate over the net MPC out of profits.

further analysis in this thesis, e.g. in formulating the equations of the empirical model presented in chapter 5 below.

Tax policy, government spending, and public debt potentially alter the nature of a given wage-led or profit-led economic regime in a number of different ways. In addition to positive crowding in effects of public capital on private investment the theoretical outcomes are also driven by changes in income distribution. Hence, this literature complements workings through the supply side with those working through the demand side. In this context, the issue of fiscal policy is directly linked to the relationship between a change in income distribution, AD, and economic growth. It shows that an economy's character (wage-led or profit-led regime) is influenced by policy making and hence endogenous to the structure of the tax system as well as constellations of government spending.

The review on the macroeconomic effects of taxation has shown that equalising the distribution of income through the tax system may stimulate AD, investment and growth. A more progressive tax system, as defined by Blecker (2002), potentially stimulates demand, capital accumulation, and hence growth. Steindl (1979), Laramie (1991) and Palley (2014) come to the same conclusion that a reduction of the effective tax rate on wages would add a stimulus to the economy through the national income multiplier. Hence, there is wide-ranging agreement among PK authors on the beneficial effects for growth through shifting taxes from labour to capital, and the detrimental effects on growth if the process takes place vice versa.

Several papers (Rowthorn, 1981; Mott and Slattery, 1994; Blecker, 2002) agree that firms consider after-tax profits when making investment decisions. Hence, it is important to take into account the possible negative effect of reduced profits on investment demand. Palley (2014) for instance suggests that a reduction of the corporate tax rate or a lower tax on distributed profits might make investment more sensitive to an increase in the profit share and increases the likelihood of a profit-led regime. Mott and Slattery (1994) recommend taxing retained earnings as a method to provide the highest level of equilibrium output and employment. Overall, the total effects of taxing different types of capital income is ambiguous and an empirical matter. Consequently, there are different proposals on which types of owned capital might be taxed in order to achieve the highest level of equilibrium output and employment. Mott and Slattery (1994) also considered the issue of integrating a VAT into the analysis and evaluate possible different pricing response of firms.

The integration of taxation on capital and labour and the analysis of tax shifting between both has shown that this might alter the likelihood of a given wage-led or profit-led demand regime. It is thus important to take into account taxation on capital and labour and assess its implications for consumption and investment demand.

The macroeconomic effects of government spending on output have shown to be positive and different transmission channels crystallised. Most papers consider different types of government expenditure. Commendatore et al. (2011) distinguishes productive from unproductive government expenditure. Similar to Dutt (2013) they define expenditure as 'productive' when it increases labour productivity. However, in contrast to neoclassical theory, 'unproductive expenditure' (current government consumption spending) also has expansionary effects through income multiplier and accelerator effects. Moreover, while Dutt (2013) argued that crowding in effects are mainly caused by government investment in infrastructure and technology, Seguino (2012) has argued that public investment in social infrastructure also generates increased productive capacity in an economy. As a result, government spending in physical and social infrastructure can both lead to an additional positive effect on the business environment in an economy, enhancing private investment. Therefore, it is a crucial empirical question what the macroeconomic effects of different types of government expenditure on private investment and output are.

The total effect of an increase in public debt is ambiguous. On the one hand, it has a positive effect on capacity utilisation and hence, through the accelerator effect, on capital accumulation and economic growth. Moreover, it increases disposable income of capitalists through providing an additional income stream in form of interest payments on the accumulated government debt and hence potentially increases consumption demand. On the other hand, it might have negative effects on output due to financial crowding out effects. Hence, it becomes an empirical question to whether the public debt to capital ratio rises or falls following expansionary fiscal policy.

There are, however, some limitations of the models reviewed. Most of the models presented here considered a closed economy context with constant prices and fixed interest rates. Hence the possibility of financial crowding out was ruled out in some of the theoretical models. Also, issues of the external trade balance such as the effects of higher imports on the multiplier have not been discussed other than in Palley (2014). Moreover, the implications of accumulating foreign debt on competiveness have been ruled out. In the next chapter, we extend the PKA distribution and growth model with a

government sector and integrate several of the crucial features and arguments reviewed here.

Chapter 5

CHAPTER 5 - ESTIMATING THE GOVERNMENT AUGMENTED POST-KALECKIAN DISTRIBUTION AND GROWTH MODEL FOR THE EU15

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).

Moreover, 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)[233]. However, recent research shows that since the outbreak of the crisis in 2007 this trend has been reversed to some extent with global inequality, however, remaining higher than in the 1980s[234]. 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 PK demand-led growth models (Onaran and Galanis, 2014; Stockhammer et al, 2009; Hein and Vogel, 2008; Naastepad and Storm, 2006). The empirical impact of income inequality has been extensively researched in the PK 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 PK 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

[233] The study comprises a panel of 43 developing countries and 28 advanced economies (1970-2007). In the advanced economies (all high income OECD countries except South Korea) the wage share has fallen from 73.4 per cent in 1980 to 64.0 per cent in 2007. In the developing countries (include all countries that are not classified as high income countries by the World Bank), on average, there has been a pronounced decline from levels of roughly 70 per cent down to levels of approximately 53 per cent in the wage share with country trends being more varied and data being less reliable. For the EU15 MS we have outlined the trends in chapter 3. In regards to personal income distribution (measured by the Gini coefficient) we can also see an upward trend in the OECD G7 countries (Obst, 2015). The only exception to this trend was France where the Gini coefficient decreased slightly between the mid 1980s and later 2000s (OECD, 2011).

[234] Recent research (e.g. Worldbank, 2016) shows a reversal of this trend after the outbreak of the crisis in 2007/08. Global inequality (measured by the Gini coefficient) fell from 66.8 in 2008 down to 62.5 in 2013. However, this primarily relates to between countries inequality rather than within country inequality. It remains to be seen whether this illustrates only a temporary change or whether this represents a new trend.

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 chapter is the development of a Post-Kaleckian theoretical 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. Hence, the analysis allows us to move beyond the basic Kaleckian model because (a) it incorporates an explicit distinction between different types of government expenditures, permitting a careful analysis of the different growth effects of each expenditure category and (b) it allows us to empirically estimate the joint effects of income distribution and fiscal policy.

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. Hence, we move beyond Onaran and Galanis (2014) and Onaran and Obst (2016) who presented the impact of simultaneous changes in income distribution in the G20 and the EU15 but did not incorporate the impact of public spending and taxes.

While chapter 3 presented the impact of simultaneous changes in income distribution in the EU15[235], we 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 WS, 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

[235] Onaran and Galanis (2014) present this for the G20 countries.

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 chapter is organised as follows. Section 2 outlines data sources, scope and stylised facts. Section 3 outlines the theoretical model. Section 4 outlines the estimation methodology. Section 5 presents and discusses the estimation results. Section 6 discusses an alternative policy mix and the implications for growth, private investment, trade balance, and budget balance. Finally, section 7 concludes.

2. Data and Stylised Facts

The data used in the econometric estimation comes from the annual macro-economic database of the EC 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*, 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[236] and is mostly available between 1970 and 2012[237]. 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).

In our econometric estimations, we focus attention only on components of government expenditures that are part of GDP. On average, G_i, G_C and I_g constitute roughly 50 per cent of total government expenditures in our sample. An important part

[236] Due to unavailable data regarding capital tax in Luxembourg we include the estimations from chapter 3. 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.

[237] 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).

of the remaining government expenditures are social benefits in kind and other current transfers. These are included in our theoretical model but not in our empirical estimations due to limited data availability, (e.g. social benefits in cash start only in 1995 for most EU15 countries)[238].The descriptive statistics and number of observations are given in appendix B[239].

Appendix C outlines the ITR on consumption, labour and capital in the EU14 countries. Figure C1 shows the evolution of the ITRs on consumption in the EU14 countries. The ITR on consumption[240] overall shows an increasing trend in most of the EU14 countries, particularly since the 1980s. The exceptions are Austria, Belgium, France, and Ireland. Figure C2 indicates that the tax burden on labour started growing significantly in the early 1970s. Taxes on labour[241] 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 C3 outlines the development of the ITR on capital income[242] 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 2 shows the evolution of government expenditure (sum of G_i, G_C and I_g), as a ratio to real GDP, between 1960 and 2013Average 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,

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238 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).

239 Due to significant constraints in data availability we will not integrate social benefits (defined as social benefits other than social transfers in kind receivable (D.62) and other current transfers (D.7) in AMECO) into our econometric specifications.

240 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.

241 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.

242 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.

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 C5 in appendix C)[243]. 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 C6 in appendix C)[244]. The trend in gross capital formation by the general government, as a ratio to real GDP, is shown in appendix C figure C7[245]. 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).

Figure 3 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.

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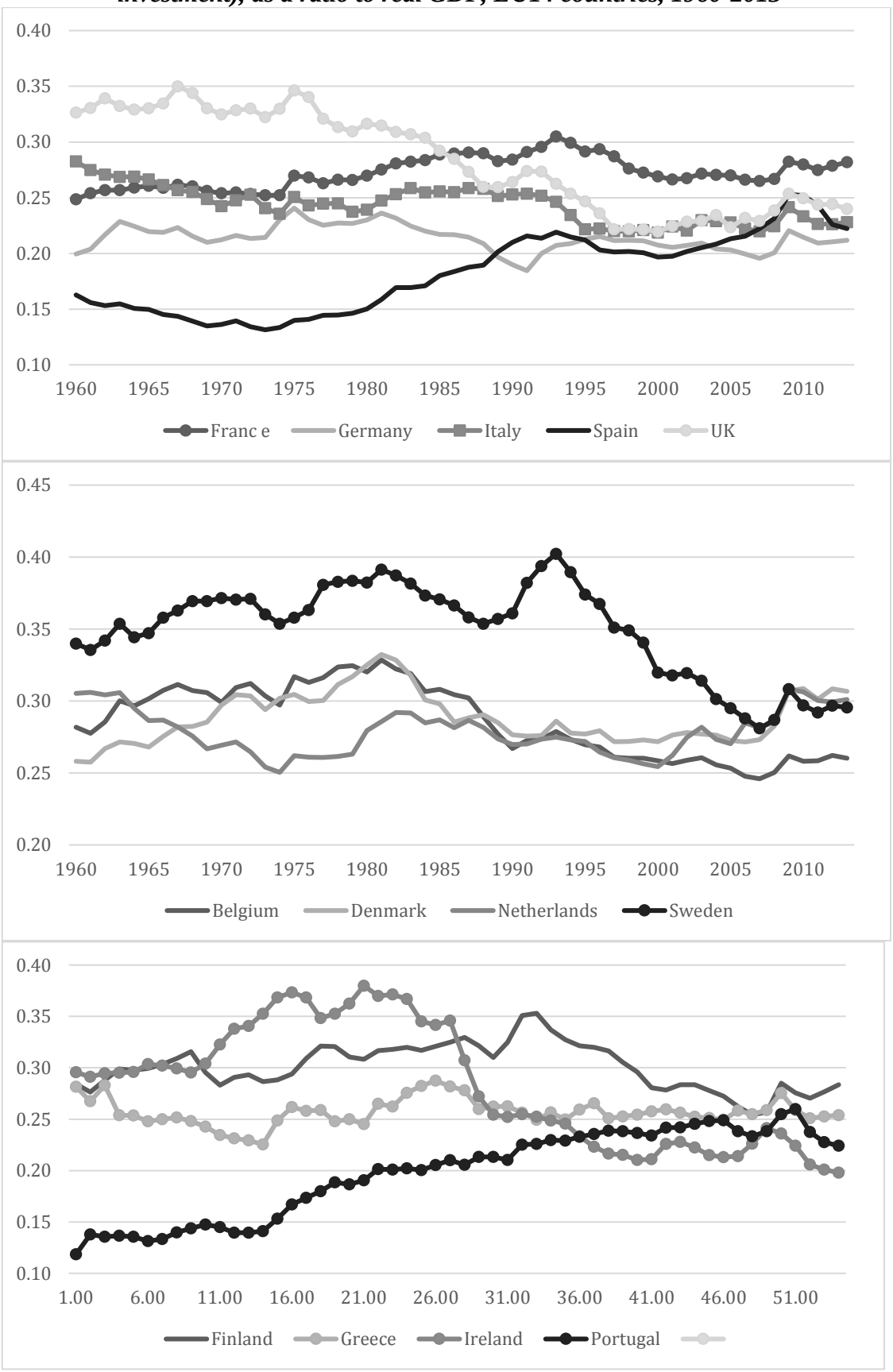
243 Collective government consumption expenditure consists of the following COFOG groups (EC, 2011): General public services; defence: public order and safety; economic affairs; environmental protection; housing and community amenities; general administration, regulation, dissemination of general information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

244 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.

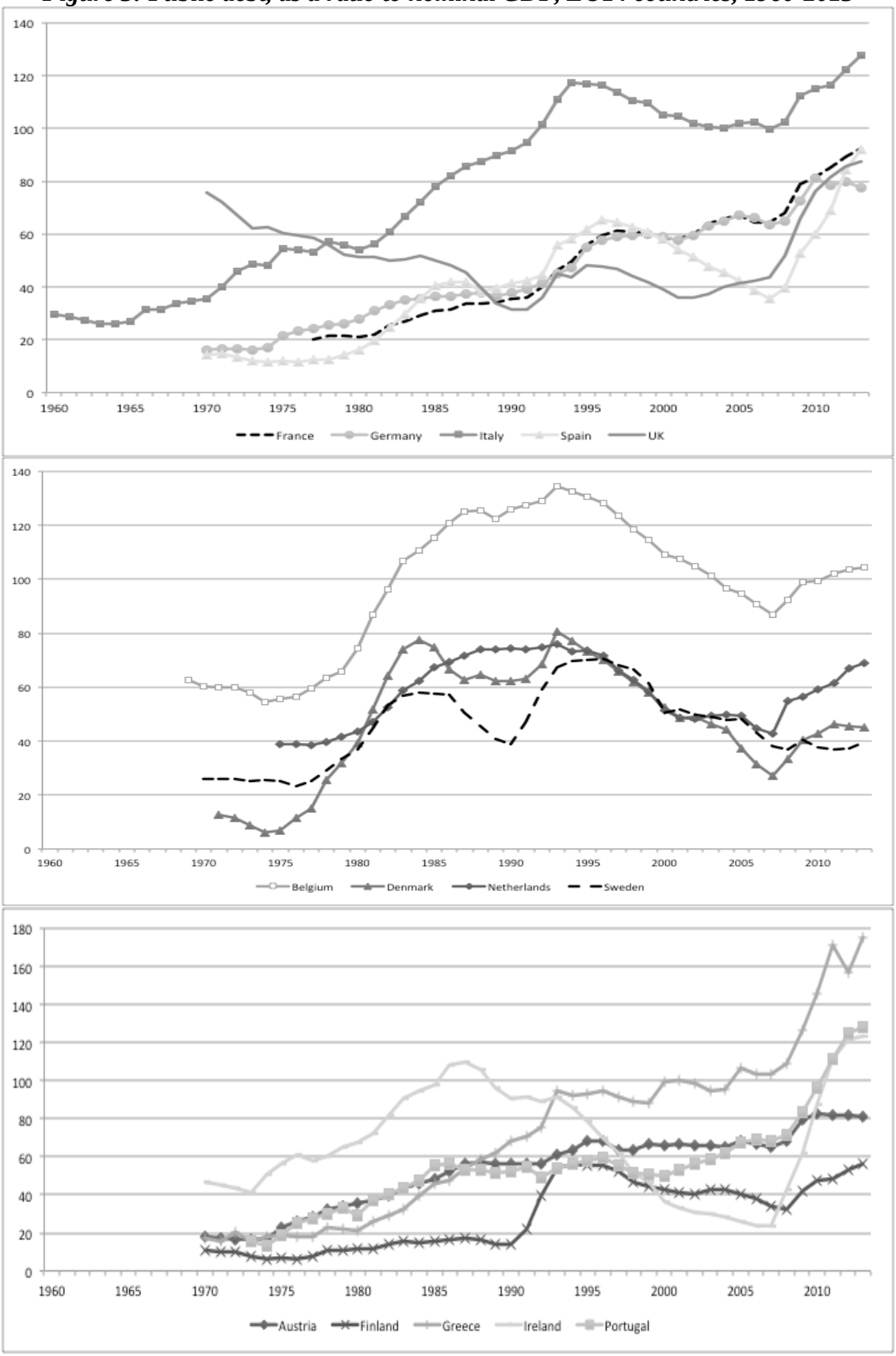
245 Data for Austria starts in 1995 and for Luxembourg in 1990. For Belgium, Denmark, Italy, Ireland, Netherlands, Spain and Sweden it starts in 1970. We have extended the data back to 1960 in these countries assuming the ratio of general government gross capital formation to total investment stayed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

Figure 2: 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 3: Public debt, as a ratio to nominal GDP, EU14 countries, 1960-2013



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

3. PK/Post-Kaleckian 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 PKA framework[246]; 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 chapter 3.

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 ($(1-t_w)W$).

$$log\ C = c_0 + c_r \log((1-t_r)R) + c_w(log((1-t_w)W) + \log \mathrm{B} + \log(\mathrm{CTO})) \quad (5.1)$$

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 MPC than capitalists. We hypothesise that a more progressive tax system (e.g. taxes on capital increasing while those on labour decreasing; a shift of the tax burden from labour to capital as outlined in Blecker, 2002) supports a wage-led economic regime, whereas a more regressive tax system would help growth in a profit-led regime. This specification

[246] 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.

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) that augments disposable income of households. We do not include interest payments on debt as discussed in You and Dutt (1996) or Dutt (2013)[247].

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-% point increase in the profit share (R/Y) we convert elasticities into marginal effects as outlined in chapter 3. 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)[248], 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):

$$logI = i_a + i_y \log(Y_P) + i_\pi \log((1 - t_r)\pi) + i_g \log(G) + i_d \log(\frac{D}{Y}) \qquad (5.2)$$

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[249]. 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 account possible financial crowding out effects which, according to Dutt (2013) among others, is an empirical matter. Third, regarding total government expenditure (e.g. capital spending) we expect positive crowding-in effects as shown in Palley (2013), Commendatore et al. (2011), or Seguino (2012) assuming that it improves business environment and increases future output.

However, in our model total government expenditures consists of three different types (e.g. capital and current spending). Hence, we need to distinguish more carefully what type of crowding in as well as positive effects on output through the multiplier

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[247] 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.

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

[249] 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.

mechanism) can be expected. Hence, 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:

$$logI = i_a + i_y \log(Y_P) + i_\pi \log((1 - t_r)\pi)$$
$$+ \mathrm{i}_i \log(I_g) + \mathrm{i}_{gc} \log(G_c) + \mathrm{i}_{gi} \log(G_i) + i_d \log\left(\frac{D}{Y}\right) \qquad (5.2')$$

Dutt (2013) shows theoretically that different types of government spending have different effects on economic growth. In his analysis, crowding in effects primarily occur through public investment in infrastructure and technology. Government consumption would primarily have positive effects on output through the multiplier mechanism but not any additional crowding in effects. However, 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[250]. 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 thus allows for different effects of different types of public spending on private investment and growth. Public investment in fixed capital (I_g) is expected to have positive crowding in effects on private investment following Palley (2013)[251]. Hence, public and private investment should be complementary. Furthermore, government expenditure into social infrastructure (G_i) is expected to also have additional positive crowding in effects following Seguino (2012)[252]. Regarding collective

[250] However, in her theoretical model the latter is not part of government consumption.
[251] 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).
[252] Thus we follow the argument that investments in people's capabilities have a public goods quality, and hence provide positive spillover effects on economy-wide environment (e.g. a more qualified and productive workforce). However, this should go hand in hand with more capital investment.

consumption spending (G_c) the theoretical expectation is that this primarily increases output through multiplier effects, but does not lead to additional crowding in effects such as in Commendatore et al. (2011)[253]. Hence, in the latter case one might expect to see both crowding in and crowding out effects. We will test for these effects in the econometric specifications outlined below.

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 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[254].

As outlined in chapter 3 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)[255]:

$$G = \kappa_g Y \tag{5.3}$$

In disaggregated form this exogenous increase is equal to:

$$I_g = \mathrm{K}_{ig} Y \tag{5.3'}$$

$$G_c = \mathrm{K}_{gc} Y \tag{5.3''}$$

$$G_i = \mathrm{K}_{gi} Y \tag{5.3'''}$$

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

$$G_{tot} = G + B + CTO \tag{5.4}$$

Taxes[256] (T) can be expressed as:

$$T = t_w W + t_r R + t_c C \tag{5.5}$$

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

$$r = f\left(\frac{D}{Y}_{-1}\right) \tag{5.6}$$

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253 It takes into account the effects of a change in functional income distribution on demand and hence can also be beneficial to growth (e.g. 'paradox of costs'). It thus represents a direct effect on output through an increase in the level of aggregate demand.

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

255 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.

256 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.

The national income identity (Y) is given by:

$$Y = C + I + I_g + G_c + G_i + X - M \tag{5.7}$$

The total wage bill is given by:

$$W = W_p + W_g \tag{5.8}$$

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)[257] (R) are identical to:

$$R = C + I + I_g + G_c + G_i + X - M - W \tag{5.9}$$

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

$$D = D_{-1} + G_{tot} + rD_{-1} - T \tag{5.10}$$

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 ULC, (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:

$$\log P = \; p_0 + p_{ulc} \log(ulc) + p_{tc} log(1 + t_c) + \; p_m \log(Pm) \tag{5.11}$$

[257] Due to limited data availability we assume operating surplus in the public sector to be zero.

$$\log P_x = px_0 + p_{xulc}\log(ulc) + p_{cf}\log(1 + t_{cfi}) + p_{xm}\log(Pm) \quad (5.12)$$

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}):

$$log\ X = x_0 + x_{pxm}\log(Px/Pm) + x_{Yrw}\log(Y_{rw}) + x_e\log(E) \quad (5.13)$$

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:

$$logM = m_0 + m_{ppm}\log(\frac{P}{Pm}) + m_Y\log(Y_p) + m_g\log(G) + m_e\log(E) \quad (5.14)$$

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)[258]. We calculate the marginal effect of a change in the profit share on exports/GDP and imports/GDP as outlined in chapter 3.

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:

$$\log M = m_0 + m_{ppm}\log(P/P_m) + m_y\log(Y_p) + m_i\log(I_g) + m_{gc}\log(G_c) + m_{gi}\log(G_i) + m_e\log(E) \quad (5.14')$$

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[259].

3.1. 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 WS 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 WS, 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[260], a full understanding of the

[258] Palley (2009) argues that appropriately accounting for imports has significant implications for the size of the expenditure multiplier and fiscal policy.
[259] See appendix E for the derivation of the national multiplier integrating fiscal policy.
[260] 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).

simultaneous fall in the WS requires an integrated Europe-wide analysis. Following the modelling strategy in chapter 3 we simulate the effects of a simultaneous decline in the WS 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 % change in GDP of each country is given by:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = E_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} + H'_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + P_{15x15} \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{n15} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (5.15)$$

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 E.

Solving equation (5.15) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - H'_{15x15} - W_{15x15})^{-1}(E_{15x15} + P_{15x15}) \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_{15} \end{bmatrix} \quad (5.16)$$

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 % change in GDP of each country is given by:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = Eg_{15x15} \begin{bmatrix} \Delta\kappa_{g_1} \\ \vdots \\ \Delta\kappa_{g_{15}} \end{bmatrix} + Hg_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \quad (5.17)$$

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[261]. 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 E.

Solving equation (5.17) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect of public spending[262]:

$$\begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - Hg_{15x15} - W_{15x15})^{-1}(Eg_{15x15}) \begin{bmatrix} \Delta\kappa_{g_1} \\ \vdots \\ \Delta\kappa_{g_{15}} \end{bmatrix} \tag{5.18}$$

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:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = Etr_{15x15} \begin{bmatrix} \Delta t_{r1} \\ . \\ \Delta t_{r15} \end{bmatrix} + Ht_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} + W_{15x15} \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} \tag{5.19}$$

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 E.

Solving equation (5.19) for $\left[\frac{\Delta Y}{Y}\right]$ gives us the equivalent of a European multiplier effect of a change in ITR on capital income[263]:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = \begin{bmatrix} \frac{\Delta Y_1}{Y_1} \\ \vdots \\ \frac{\Delta Y_{15}}{Y_{15}} \end{bmatrix} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}(Etr_{15x15}) \begin{bmatrix} \Delta t_{r1} \\ \vdots \\ \Delta t_{r15} \end{bmatrix} \tag{5.20}$$

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261 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).

262 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 E.

263 We follow the same approach for a change in ITR on labour income, which is outlined in appendix E.

3.2 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:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Hg_{15x15} - W_{15x15})^{-1}((E_{15x15} + P_{15x15})\begin{bmatrix}\Delta\pi_1 \\ \vdots \\ \Delta\pi_{15}\end{bmatrix} + Eg_{15x15}\begin{bmatrix}\Delta k_{g1} \\ \vdots \\ \Delta k_{g15}\end{bmatrix}) \quad (5.21)$$

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:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}(Etr_{15x15}\begin{bmatrix}\Delta tr_1 \\ \vdots \\ \Delta tr_{15}\end{bmatrix} + Etw_{15x15}\begin{bmatrix}\Delta tw_1 \\ \vdots \\ \Delta tw_{15}\end{bmatrix} \quad (5.22)$$

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:

$$\left[\frac{\Delta Y}{Y}\right]_{15x1} = (I_{15x15} - Ht_{15x15} - W_{15x15})^{-1}((E_{15x15} + P_{15x15})\begin{bmatrix}\Delta\pi_1 \\ \vdots \\ \Delta\pi_{15}\end{bmatrix} + Eg_{15x15}\begin{bmatrix}\Delta k_{g1} \\ \vdots \\ \Delta k_{g15}\end{bmatrix} + Etr_{15x15}\begin{bmatrix}\Delta tr_1 \\ \vdots \\ \Delta tr_{15}\end{bmatrix} + Etw_{15x15}\begin{bmatrix}\Delta tw_1 \\ \vdots \\ \Delta tw_{15}\end{bmatrix}) \quad (5.23)$$

The details are given in appendix F.

Next, we calculate effects of the policy mix on investment and the budget balance integrating both national and cross-country multiplier effects[264]. The total effect on investment ultimately depends on the character of the accumulation regimes. The total effect of a change in income distribution, government expenditure, and ITRs on capital and labour income on investment is as follows:

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

$$\frac{\Delta I/Y}{\Delta\pi}+\frac{\Delta I/Y}{\Delta k_g}+\frac{\Delta I/Y}{\Delta dt_r}+\frac{\Delta I/Y}{\Delta dt_w}=\frac{\partial I/Y}{\partial\pi}+\frac{\partial I/Y}{\partial k_g}+\frac{\partial I/Y}{\partial t_r}+\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial D/Y}{\partial k_g}+\frac{\partial D/Y}{\partial t_r}+\frac{\partial D/Y}{\partial t_w}\right)+$$
$$\frac{\partial I}{\partial Y}\left(\frac{\partial Y^*/Y}{\partial\pi}+\frac{\partial Y^*/Y}{\partial k_g}+\frac{\partial Y^*/Y}{\partial t_r}+\frac{\partial Y^*/Y}{\partial t_w}\right) \quad (5.24)$$

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:

$$\frac{\Delta BAL/Y}{\Delta\pi}+\frac{\Delta BAL/Y}{\Delta k_g}+\frac{\Delta BAL/Y}{\Delta dt_r}+\frac{\Delta BAL/Y}{\Delta dt_w}=\left(\frac{\partial T}{\partial Y}-\frac{\partial G}{\partial Y}\right)\left(\frac{\partial Y^*/Y}{\partial\pi}+\frac{\partial Y^*/Y}{\partial k_g}+\frac{\partial Y^*/Y}{\partial t_r}+\frac{\partial Y^*/Y}{\partial t_w}\right)$$
$$+\frac{\partial T/Y}{\partial t_r}+\frac{\partial T/Y}{\partial t_w}-\frac{\partial G/Y}{\partial k_g} \quad (5.25)$$

4. Estimation Methodology

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 SEA have been discussed extensively in chapter 3. 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, however, comes with its own issues.

Unit root tests suggest that most of our variables are integrated of order one (see appendix D table D1). 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 chapter 3 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.

5. Estimation Results

The estimation results for consumption are given in table 14. After-tax wages and after-tax profits[265] 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[266] after the outbreak of the Great Recession in 2007[267]. The hypothesis that the MPC out of profit income is larger than out of wage income is confirmed in all countries.

Table 15 presents the effects on private investment based on equation (2)[268] 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[269]. 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 government expenditure stimulus. Only in France, the effects of total government expenditure on private investment are negative[270]. We find strong and significant accelerator effects of private GDP on private investment in all countries. Regarding the after-tax profit share[271] 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[272]. In these cases, the effects are treated as zero when we calculate the total effects on private excess

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265 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 $(1 - t_w)$.

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

267 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.

268 We present further robustness checks of our results regarding private investment in appendix H and discuss the results in section 6.3 below.

269 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.

270 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 H table H4.

271 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.

272 When we compare our results to previous findings in the empirical literature (see chapter 3 for comparison) 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.

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 16 to 19[273]. We include VAT into domestic and export prices[274] as well as total government expenditure in the import function. The results are in line with our expectations, however, 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 G 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.

[273] Our export equation has not been modified; hence the results are identical to table 7 in chapter 3.
[274] 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.

Table 14. 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 chapter 3. 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 15. 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 chapter 3. 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 16. 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 chapter 3. 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 17. 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 chapter 3. 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 18. 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 chapter 3. 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 19. 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 chapter 3. 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

5.1. National Effects

Table 20 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 chapter 3, 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[275].

[275]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.

Table 20. 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 chapter 3. 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.

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 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[276]. 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 E)[277]. As expected, the multipliers are above one and range between 1.04 in Belgium and 5.05 in Greece[278]. In comparison to the multipliers estimated in chapter 3 when integrating fiscal policy[279] 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 per cent change in equilibrium demand after the multiplier mechanism.

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[276] Belgium is the exception in our sample. This finding is in alignment with our estimations in chapter 3. However, domestic demand in Denmark is now wage-led.

[277] The results illustrate short run multiplier effects.

[278] The results for Luxembourg (0.560) do not include government sector in the calculation but are based on the estimations in chapter 3. Stockhammer et al. (2009) find multipliers ranging between 1.4 and 2.7 for the Euro area (hypothetical aggregate of EU12 countries).

[279] 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. Greece and Spain already had larger multipliers in the private sector open economy model presented in chapter 3.

Table 21 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 E.

Table 21. 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 chapter 3. 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 E for details.

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. In France, where we had a negative effect of public spending on private investment, the effect on growth is thus significantly lower (1.7% after the multiplier process).

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 E 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 I table I1 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[280] 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 I3 in appendix I 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 WS 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.

5.2. 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 20 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

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

bottom in the WS in Europe. Overall, a simultaneous decline in the WS in all countries leads to a decline in EU15 GDP by 1.45%[281].

Furthermore, we analyse the effects of a simultaneous 1% point increase in public spending in all EU15 countries. Column D in table 21 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 are 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 ITR on capital and labour income[282] (appendix F).

Table I2 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

[281] In chapter 3 we found a decline in EU15 GDP by 0.45% following a 1%-point fall in the wage share in Europe.

[282] 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.

by 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 I2 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%, as a ratio to GDP. 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 ITR 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%, as a ratio to GDP. 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.

5.3. Robustness Checks

We have run a series of robustness checks for our consumption and investment function. For our consumption function[283] 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 chapter 3. Hence,

[283] 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.

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

Appendix H illustrates the tables for different investment functions we have estimated to test the robustness of our results. Table H1 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 chapter 3 (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% point (0.08% point in benchmark specification) as well as in Belgium with 0.55% point (0.21% point in benchmark specification) and France with 0.25% point (0.10% point). However, we find no statistically significant effects in Denmark (0.17% in benchmark specification).

Table H2 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 H3 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).[284]

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 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

[284] 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).

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[285].

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% points increase in isolation as well as following a simultaneous change (see appendix E for details). The results are presented in table I5 in appendix I. 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 (Column C). Similarly, in the second scenario, 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

[285] 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.

(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%.

6. 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 WS 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 22 (Column A) shows that a combined increase in the WS 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[286]. 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, EU15 GDP increases by 6.63% illustrating the importance of a more comprehensive policy mix of wage, taxation and investment policies.

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

Moreover, we estimate the total effect of a combined policy mix on investment. (Column D in table 22). 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 Ibut with significant negative effect of public debt such as in Belgium (0.82) or in the UK (0.85).

Table 22. 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 chapter 3. 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).

Next, we estimate the impact of each fiscal policy change on the budget balance ($T - G$) as a ratio to GDP. Table 22 outlines the results[287] 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 WS has positive effects on GDP growth. The effects range from 0.007%-point (Greece) to 0.62%-point (Spain). An increase in public spending by 1% point, however, leads to a deterioration of the budget balance with effects ranging from -0.02%-point (Finland) and -0.98%-point (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 ITR 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%[288].

Finally, we analyse to what extent a wage stimulus in the EU15 countries would exert inflationary pressures. Table I4 in appendix I shows the effects for an isolated as well as simultaneous 1% increase in the WS 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 WS. As a result, the majority of the countries would experience inflation rates well below the ECB target inflation rate (2%).

[287] See appendix F for details.

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

Table 23. 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*

Note: Regressions for Luxembourg are based on estimation in chapter 3. 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.

7. Conclusion

This paper developed a multi-country PKA 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 WS 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 WS at the European model could lead to a 1.45% increase in EU15 GDP.

The negative effects of a fall in the WS 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 since domestic demand is strongly wage led in the EU15. 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 WS and 1% increase in public spending leads to a significant increase of 5.56% in 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 WS, 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% 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. WS 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 PKA 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.

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 % 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*	AMECO Database (2016)	1960-2013

		prices, total economy.		
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 capital taxes divided by all potentially taxable business and capital income in the economy.*	European Commission Eurostat	1965-2012
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*	OECD, National Accounts (2016)	1970-2013

		by government on market goods and services provided to households.		
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. Descriptive Statistics

Table B1: Descriptive Statistics of all variables.

Consumption	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	102.7	124.0	608.1	58.7	707.6	1018.9	91.5	38.9	674.5	189.3	67.2	372.1	1078.8	588.2
Median	99.9	122.4	614.7	58.9	700.7	1007.1	84.2	30.0	702.8	177.8	58.6	337.1	1056.3	512.2
Maximum	161.0	191.4	885.8	102.6	1127.3	1500.6	172.4	82.7	994.2	288.0	118.3	644.6	1713.0	1037.2
Minimum	39.9	52.2	282.0	20.5	250.6	398.5	24.0	13.5	223.8	68.6	18.6	106.6	558.3	265.4
Std. Dev.	38.1	43.5	176.3	24.8	269.3	348.3	43.1	22.2	246.7	68.6	34.0	158.1	312.3	263.0
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Adjusted After-Tax Profits	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	44.2	53.3	245.4	26.8	262.0	439.1	54.6	27.6	305.2	99.0	26.1	143.9	501.5	165.0
Median	41.4	55.5	258.0	22.4	279.8	435.7	55.5	19.0	339.2	92.7	30.8	141.1	511.1	144.0
Maximum	77.1	78.8	359.5	52.9	385.0	717.9	79.9	62.9	411.4	178.2	40.9	280.7	802.3	293.9
Minimum	20.5	34.7	0.0	9.0	148.8	215.5	27.3	5.0	148.9	44.5	3.1	43.3	255.1	67.6
Std. Dev.	18.4	13.6	73.7	12.8	83.2	168.3	12.4	20.4	83.8	42.7	10.7	67.3	157.3	71.8
Observations	43	43	43	48	43	48	43	43	43	43	43	53	53	48
Adjusted After-Tax Wages	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	75.7	93.5	493.4	42.8	524.1	698.8	63.8	34.4	462.1	178.8	51.0	268.4	688.0	457.3
Median	77.6	91.9	467.9	41.9	506.3	698.0	62.1	26.7	469.6	165.1	50.6	247.5	614.6	427.7
Maximum	98.5	130.0	680.5	64.8	688.6	930.7	87.6	71.3	510.1	244.5	74.7	452.3	1081.8	710.8
Minimum	48.8	56.7	354.9	26.1	352.6	431.9	46.3	16.0	363.9	121.5	16.7	79.6	548.8	280.0
Std. Dev.	12.9	19.7	99.7	11.0	87.2	136.8	10.6	16.7	30.6	41.2	17.5	101.7	155.7	147.5
Observations	43	43	43	48	43	48	43	43	43	43	53	53	43	48
Private Investment	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	37.32	45.01	187.30	22.85	234.79	298.17	26.67	13.32	202.72	67.28	19.62	127.57	394.22	139.56

Median	32.73	36.85	179.88	21.70	214.63	267.91	25.24	9.81	192.65	59.48	17.48	102.16	351.81	123.15
Maximum	59.86	80.64	359.66	39.54	395.69	466.14	50.80	35.74	318.94	119.10	36.25	287.41	703.30	252.67
Minimum	12.07	17.38	58.10	9.51	76.70	152.67	10.55	2.25	90.42	25.40	4.73	25.88	164.98	50.52
Std. Dev.	15.38	18.55	82.34	8.61	87.77	90.79	8.68	9.39	62.94	26.60	9.70	69.03	149.38	62.83
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Private GDP	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	140.1	169.6	884.3	79.2	943.3	1390.4	107.1	58.1	870.0	281.3	85.5	502.8	1460.0	711.8
Median	129.8	155.5	897.4	74.1	897.5	1331.4	104.2	36.0	879.5	254.2	78.5	457.2	1330.4	636.5
Maximum	237.0	276.0	1365.4	147.2	1481.3	2114.8	187.3	140.3	1316.8	461.7	139.2	862.1	2576.2	1235.9
Minimum	49.3	66.1	392.8	28.0	339.6	600.6	28.2	13.5	295.4	102.0	27.1	143.8	641.7	312.7
Std. Dev.	58.4	66.9	297.5	36.3	355.6	481.6	42.7	44.2	317.5	111.7	36.6	211.3	582.3	312.0
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
After Tax Profit Share	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.2
Median	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.2
Maximum	0.3	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2
Minimum	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.2	0.2	0.1
Std. Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Observations	53	53	52	53	53	53	53	53	53	53	53	53	53	53
Domestic Prices	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	63.1	59.1	69.6	49.5	40.4	47.0	60.5	49.3	60.7	63.3	66.6	44.0	59.0	57.4
Median	66.7	63.6	73.1	53.7	18.6	42.1	70.3	46.4	61.6	67.2	71.3	33.2	62.9	56.6
Maximum	114.9	117.4	107.9	105.1	115.9	110.3	112.4	112.8	128.9	109.5	113.1	109.3	115.1	113.8
Minimum	18.0	9.4	25.4	4.9	1.1	2.9	11.2	3.6	15.6	16.9	20.3	1.8	7.9	9.2
Std. Dev.	31.5	35.2	27.4	35.2	42.7	38.6	35.4	39.4	33.5	29.2	30.1	41.1	37.1	37.4

Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
ULC	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.4	0.3	0.4	0.3	0.2	0.3	0.4	0.3	0.3	0.4	0.4	0.3	0.4	0.3
Median	0.4	0.4	0.5	0.3	0.1	0.3	0.4	0.3	0.3	0.4	0.5	0.2	0.4	0.3
Maximum	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.6	0.7	0.7	0.7	0.6	0.7	0.6
Minimum	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Std. Dev.	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Import Prices	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	71.0	73.6	85.1	62.2	44.8	60.4	74.3	54.8	59.3	83.5	73.6	57.0	64.6	59.7
Median	86.4	91.9	96.6	77.2	30.8	74.4	97.4	59.0	61.7	96.0	82.7	75.3	75.3	66.6
Maximum	116.7	112.1	115.8	115.8	128.8	121.3	115.0	122.0	122.9	118.6	119.0	114.1	116.7	108.9
Minimum	24.5	25.7	48.3	10.1	2.3	8.5	21.0	6.0	17.6	40.6	31.9	5.5	11.0	11.5
Std. Dev.	30.4	30.4	22.5	37.1	42.7	38.3	35.5	38.7	32.9	26.5	26.9	41.4	36.3	35.9
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Export Prices	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	71.1	67.6	80.3	64.3	43.4	53.9	75.1	54.5	60.2	82.2	76.0	54.2	68.5	65.5
Median	86.6	79.4	92.3	82.1	26.9	58.5	99.1	58.8	61.6	92.4	85.2	61.0	81.8	76.1
Maximum	113.7	113.7	107.1	108.2	123.9	115.7	110.5	114.4	129.9	115.7	112.2	115.3	109.2	110.0
Minimum	25.4	19.9	41.3	11.9	2.2	4.8	23.6	6.6	19.0	40.2	35.6	4.5	12.9	15.9
Std. Dev.	29.8	30.7	23.0	35.9	42.2	38.4	34.1	38.5	32.8	25.2	24.5	41.8	36.3	35.8
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Imports	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	120.4	327.3	396.3	41.1	29.1	104.9	224.1	191.0	17.8	152.6	58.9	24.8	28.1	599.0
Median	89.6	264.4	270.6	18.2	21.2	44.9	167.7	149.4	10.5	102.9	45.0	12.0	20.5	461.2
Maximum	273.8	832.6	1106.4	130.8	80.5	334.7	536.7	422.9	52.3	407.1	139.7	66.2	73.6	1422.1
Minimum	22.1	58.0	55.9	3.1	2.7	3.6	27.2	27.2	3.4	23.2	9.2	1.8	5.7	152.3
Std. Dev.	76.4	238.0	305.4	43.2	22.7	104.3	161.5	124.8	15.3	115.6	41.2	22.3	20.1	380.5

Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
RULC	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6
Median	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6
Maximum	0.7	0.6	0.7	0.7	0.9	0.7	0.7	0.7	0.6	0.7	0.7	0.9	0.7	0.7
Minimum	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.6
Std. Dev.	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Public Debt as a ratio to nominal GDP	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	52.9	97.8	47.4	29.0	50.1	45.6	71.5	68.0	76.3	58.3	55.5	40.6	45.3	51.8
Median	56.8	102.0	48.5	27.3	55.8	40.2	72.9	63.9	83.8	58.6	53.5	41.6	45.0	49.2
Maximum	82.5	134.7	80.6	56.2	92.4	81.1	175.0	123.2	127.8	75.8	128.3	92.1	70.3	87.3
Minimum	16.7	54.5	6.2	6.3	20.1	16.2	15.4	23.8	25.8	38.6	13.2	11.5	23.3	31.4
Std. Dev.	20.0	25.8	21.8	17.8	21.3	19.8	44.9	28.6	33.0	12.5	25.4	20.9	14.2	14.4
Observations	44	45	43	44	37	44	44	44	54	39	41	44	44	44
Foreign GDP	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	2.84E+13	2.84E+13	2.66E+13	2.85E+13	2.85E+13	2.79E+13	2.74E+13	2.74E+13	2.86E+13	2.82E+13	2.84E+13	2.85E+13	2.85E+13	2.84E+13
Median	2.62E+13	2.63E+13	2.45E+13	2.64E+13	2.63E+13	2.58E+13	2.52E+13	2.52E+13	2.64E+13	2.61E+13	2.63E+13	2.63E+13	2.63E+13	2.62E+13
Maximum	5.43E+13	5.45E+13	5.17E+13	5.45E+13	5.45E+13	5.36E+13	5.30E+13	5.30E+13	5.47E+13	5.41E+13	5.44E+13	5.46E+13	5.45E+13	5.43E+13
Minimum	9.12E+12	9.14E+12	8.37E+12	9.20E+12	9.18E+12	9.04E+12	8.77E+12	8.77E+12	9.22E+12	9.07E+12	9.15E+12	9.19E+12	9.18E+12	9.11E+12
Std. Dev.	1.33E+13	1.33E+13	1.27E+13	1.33E+13	1.33E+13	1.31E+13	1.30E+13	1.30E+13	1.34E+13	1.32E+13	1.33E+13	1.33E+13	1.33E+13	1.33E+13
Observations	53	53	43	43	53	53	53	53	53	53	53	53	53	53
Relative Prices Imports	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.9	0.7	0.8	0.7	0.7	0.7	0.8	0.8	1.0	0.7	0.9	0.6	0.9	0.9
Median	0.8	0.7	0.8	0.7	0.6	0.6	0.7	0.8	1.0	0.7	0.9	0.5	0.9	1.0

Maximum	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.1	1.1
Minimum	0.6	0.4	0.5	0.5	0.5	0.3	0.5	0.6	0.9	0.4	0.6	0.3	0.7	0.7
Std. Dev.	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.3	0.1	0.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Relative Prices Exports	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	1.0	0.9	0.9	1.1	1.0	0.8	1.0	1.0	1.0	1.0	1.1	0.9	1.1	1.2
Median	1.0	0.9	1.0	1.1	1.0	0.8	1.0	1.0	1.0	1.0	1.0	0.9	1.1	1.2
Maximum	1.1	1.0	1.0	1.3	1.1	1.0	1.2	1.2	1.2	1.1	1.2	1.0	1.3	1.4
Minimum	0.9	0.8	0.8	0.9	0.8	0.6	0.9	0.8	1.0	1.0	0.9	0.7	0.9	1.0
Std. Dev.	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Exchange rate	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.7	4.7	0.9	0.5	0.3	0.5	0.6	0.4	0.7	0.8	0.8	0.4	0.5	4.5
Median	0.7	4.8	0.7	0.6	0.3	0.5	0.6	0.5	0.7	0.7	0.7	0.5	0.5	4.5
Maximum	0.9	6.2	1.5	0.7	0.7	0.7	0.8	0.7	0.9	1.1	1.3	0.7	0.7	6.6
Minimum	0.4	2.4	0.6	0.2	0.0	0.1	0.5	0.2	0.4	0.6	0.6	0.1	0.2	1.8
Std. Dev.	0.1	0.6	0.3	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.3	0.2	0.1	1.1
Observations	53	53	53	53	53	53	53	53	53	53	53	53	53	53
After-tax WS	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.44	0.41	0.43	0.43	0.43	0.43	0.42	0.47	0.42	0.46	0.50	0.47	0.36	0.52
Median	0.44	0.39	0.42	0.44	0.40	0.42	0.39	0.44	0.41	0.45	0.49	0.47	0.34	0.51
Maximum	0.54	0.46	0.49	0.61	0.52	0.50	0.56	0.64	0.57	0.55	0.61	0.54	0.46	0.58
Minimum	0.35	0.37	0.37	0.33	0.37	0.36	0.34	0.37	0.33	0.41	0.42	0.42	0.30	0.47
Std. Dev.	0.06	0.03	0.03	0.08	0.06	0.04	0.07	0.08	0.08	0.04	0.04	0.03	0.04	0.03
Observations	43	43	43	48	43	48	33	43	43	43	33	33	43	48
C/Yp	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.7	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.8
Median	0.8	0.8	0.7	0.8	0.7	0.7	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.8

Maximum	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	0.8	0.7	0.9	0.8	0.9	0.9
Minimum	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.6	0.7	0.6	0.8
Std. Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.1	0.0
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
I/Yp	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.3	0.3	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Median	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Maximum	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Minimum	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2
Std. Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
X/Yp	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.4	0.7	0.4	0.3	0.2	0.3	0.2	0.6	0.2	0.6	0.2	0.2	0.4	0.3
Median	0.4	0.6	0.4	0.3	0.2	0.2	0.2	0.5	0.2	0.5	0.2	0.2	0.4	0.3
Maximum	0.7	1.1	0.8	0.6	0.4	0.6	0.4	1.3	0.4	1.1	0.5	0.4	0.7	0.4
Minimum	0.2	0.3	0.2	0.2	0.1	0.1	0.0	0.2	0.1	0.3	0.1	0.1	0.2	0.2
Std. Dev.	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.4	0.1	0.3	0.1	0.1	0.2	0.1
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
M/Yp	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.4	0.7	0.4	0.3	0.2	0.2	0.2	0.6	0.5	0.2	0.2	0.4	0.3	0.5
Median	0.4	0.6	0.3	0.3	0.2	0.2	0.2	0.5	0.5	0.2	0.1	0.4	0.2	0.5
Maximum	0.6	1.1	0.7	0.5	0.4	0.5	0.5	1.0	1.0	0.5	0.4	0.6	0.4	1.0
Minimum	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.3	0.1	0.0	0.2	0.2	0.3
Std. Dev.	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.2
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Total government expenditure (G)	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	45.0	65.6	358.5	33.5	358.1	374.3	37.1	19.5	272.8	108.4	23.6	122.3	756.9	260.7

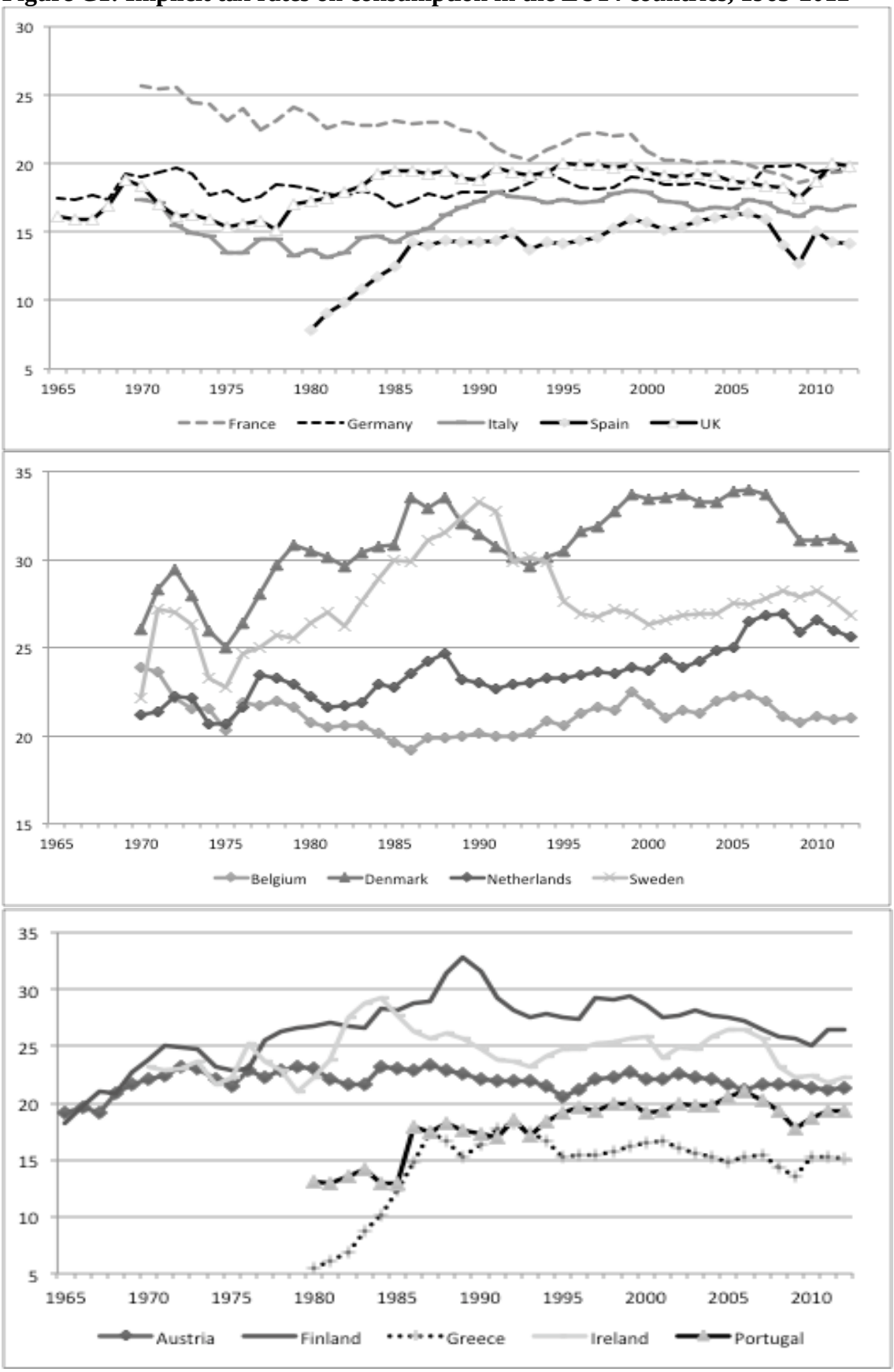
Median	43.8	67.5	358.7	36.5	366.7	365.5	38.5	17.4	303.8	100.8	20.6	104.2	777.2	246.0
Maximum	69.7	97.6	557.6	53.0	578.4	568.2	65.9	42.6	381.3	193.4	46.7	273.4	1081.2	389.3
Minimum	20.1	25.9	136.6	11.1	112.3	149.6	11.1	5.7	116.3	44.8	3.6	28.0	330.3	151.6
Std. Dev.	15.2	19.8	118.1	13.3	142.1	119.3	15.0	10.5	84.8	45.2	14.2	74.8	210.5	66.4
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Final consumption expenditure	**A**	**B**	**DK**	**FIN**	**F**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	38.7	58.7	324.4	29.0	303.5	338.7	30.7	16.8	237.7	92.7	19.8	99.3	644.5	231.8
Median	37.5	61.2	332.0	31.6	313.7	344.4	32.8	15.2	261.9	88.8	17.8	83.0	680.4	223.0
Maximum	60.5	88.4	495.6	45.2	497.0	508.1	52.6	33.8	327.6	167.2	37.8	221.7	915.3	346.6
Minimum	17.7	22.1	123.0	9.2	95.3	137.2	8.8	5.1	101.9	37.9	2.9	24.4	260.9	133.1
Std. Dev.	13.4	19.1	106.2	11.6	123.1	108.1	12.5	8.8	73.7	39.9	11.9	61.8	192.0	61.1
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Gross Capital Formation General Government (I_g)	**A**	**B**	**DK**	**FIN**	**F**	**G**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	6.3	7.0	34.0	4.6	54.6	35.5	6.4	2.7	35.2	15.8	3.8	23.1	112.4	28.9
Median	6.3	6.9	29.4	4.7	53.1	32.5	5.7	2.1	37.3	13.7	3.1	21.2	109.1	26.3
Maximum	9.7	9.9	69.8	7.7	83.4	60.3	13.5	8.8	55.5	26.9	9.5	55.0	166.2	50.2
Minimum	2.4	3.8	13.7	1.8	17.0	12.4	2.3	0.5	14.3	6.9	0.7	3.5	69.4	18.1
Std. Dev.	2.0	1.5	13.1	1.7	19.2	14.4	2.9	1.8	11.5	5.7	2.5	13.9	22.6	8.4
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54
Individual Government Consumption Spending (G_i)	**A**	**B**	**DK**	**FIN**	**F**	**G**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	25.4	39.2	243.6	21.1	210.5	211.1	15.9	12.9	150.7	63.2	13.1	63.9	499.4	139.4
Median	24.4	38.7	227.4	22.2	216.7	212.7	15.4	11.0	157.7	58.1	13.2	58.4	513.0	135.1
Maximum	37.7	56.6	346.5	30.3	319.8	327.5	25.2	21.6	192.1	111.4	21.1	127.7	654.2	219.4
Minimum	13.3	20.5	141.5	9.1	93.2	91.2	6.7	5.3	80.7	26.9	3.7	19.8	300.6	78.0
Std. Dev.	7.7	9.8	59.8	6.4	67.0	69.8	5.1	4.9	32.9	25.9	5.9	34.4	105.3	42.4

Observations	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Collective Government Consumption Spending (G_c)	**A**	**B**	**DK**	**FIN**	**F**	**G**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	17.4	25.4	117.6	11.8	133.8	165.9	19.3	6.4	113.0	17.4	40.5	10.3	49.2	212.1
Median	17.1	25.2	114.4	12.5	145.1	170.9	20.1	5.0	122.7	17.1	40.6	11.3	46.7	225.4
Maximum	23.4	31.9	149.7	15.2	177.3	182.3	26.5	12.9	136.2	23.4	56.9	16.8	94.8	261.0
Minimum	10.9	16.0	81.3	6.1	69.9	122.5	9.0	2.4	62.5	10.9	23.5	3.0	15.8	136.7
Std. Dev.	3.6	4.8	19.6	2.8	30.7	14.4	4.3	3.0	21.8	3.6	10.0	4.4	24.9	34.1
Observations	44	44	44	44	44	44	44	44	44	44	44	44	44	44
G/Y	**A**	**B**	**DK**	**FIN**	**F**	**G**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Mean	0.25	0.29	0.29	0.30	0.27	0.21	0.26	0.28	0.24	0.28	0.20	0.18	0.35	0.28
Median	0.25	0.28	0.28	0.30	0.27	0.21	0.26	0.29	0.24	0.28	0.21	0.19	0.36	0.28
Maximum	0.29	0.33	0.33	0.35	0.30	0.24	0.29	0.38	0.28	0.31	0.26	0.25	0.40	0.35
Minimum	0.22	0.25	0.26	0.25	0.25	0.18	0.23	0.20	0.22	0.25	0.12	0.13	0.28	0.22
Std. Dev.	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.06	0.02	0.02	0.04	0.04	0.03	0.04
Observations	54	54	54	54	54	54	54	54	54	54	54	54	54	54

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

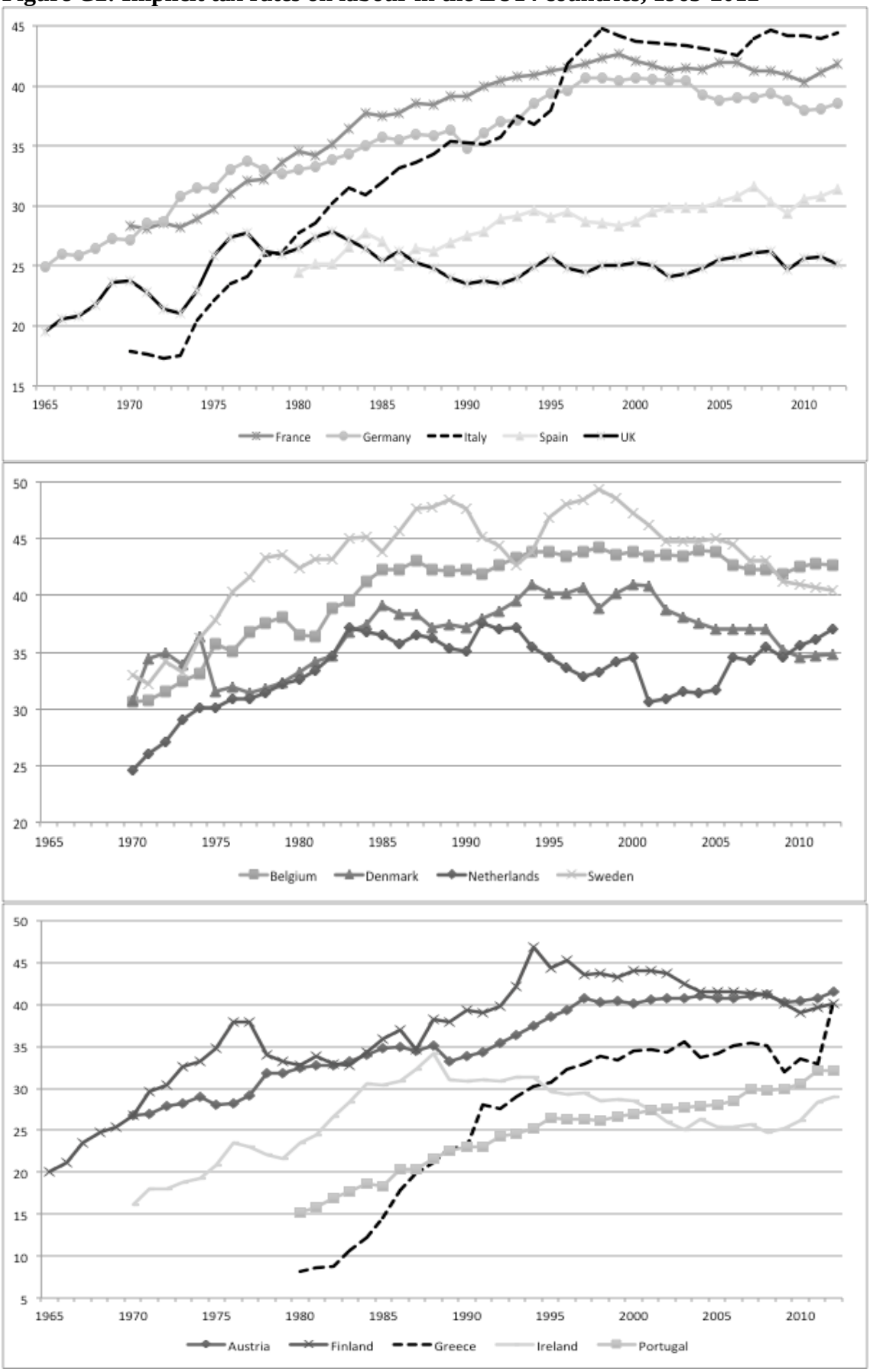
Appendix C. Implicit tax rates on consumption, labour, and capital

Figure C1: Implicit tax rates on consumption in the EU14 countries, 1965-2012



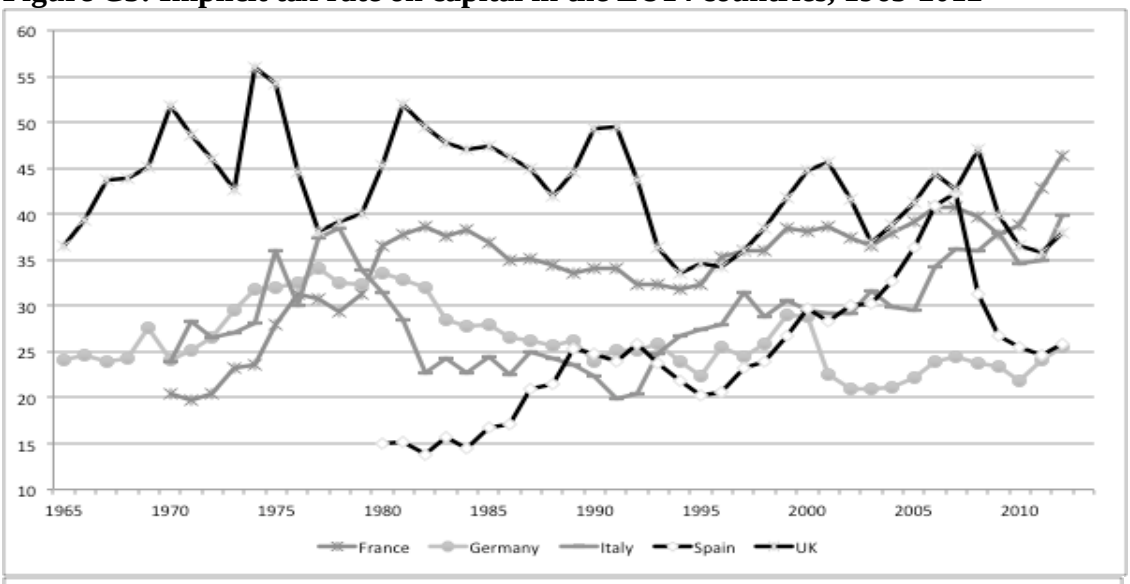
Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

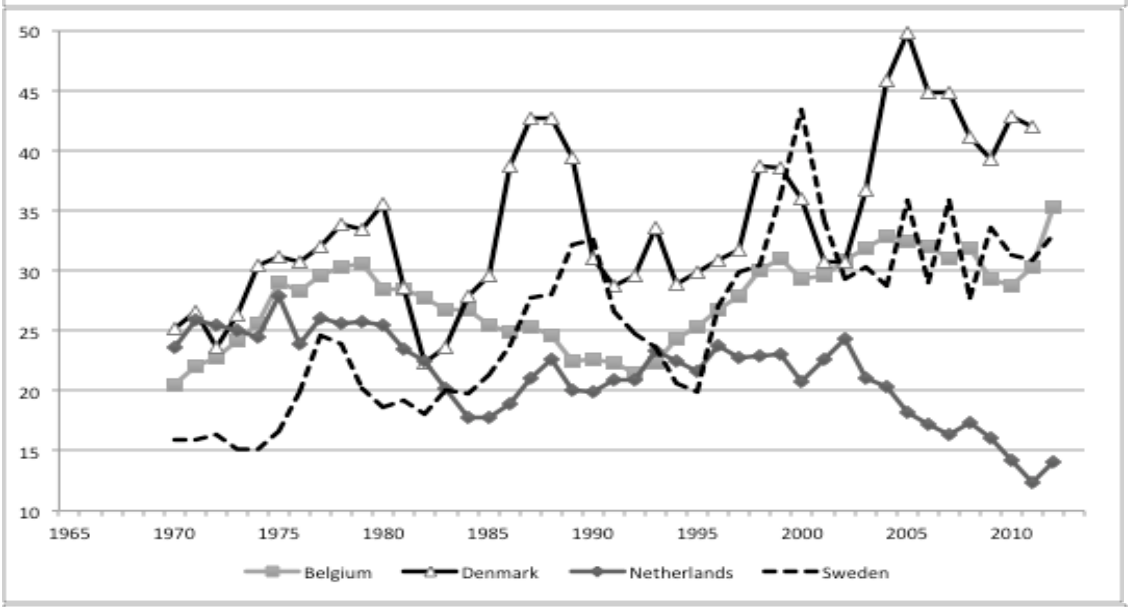
Figure C2: Implicit tax rates on labour in the EU14 countries, 1965-2012

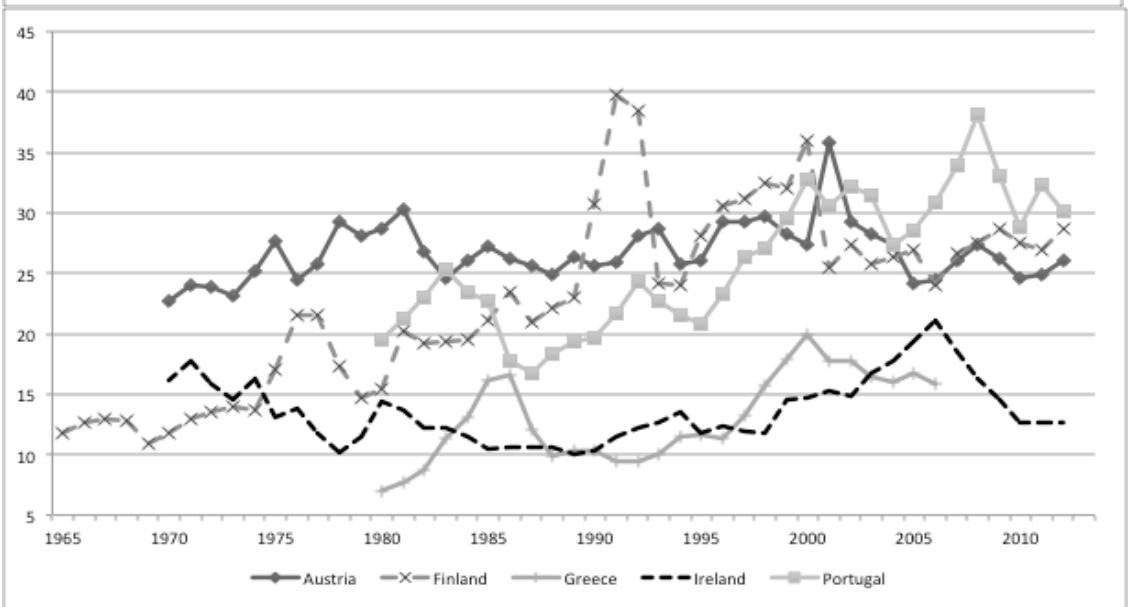


Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

Figure C3: Implicit tax rate on capital in the EU14 countries, 1965-2012

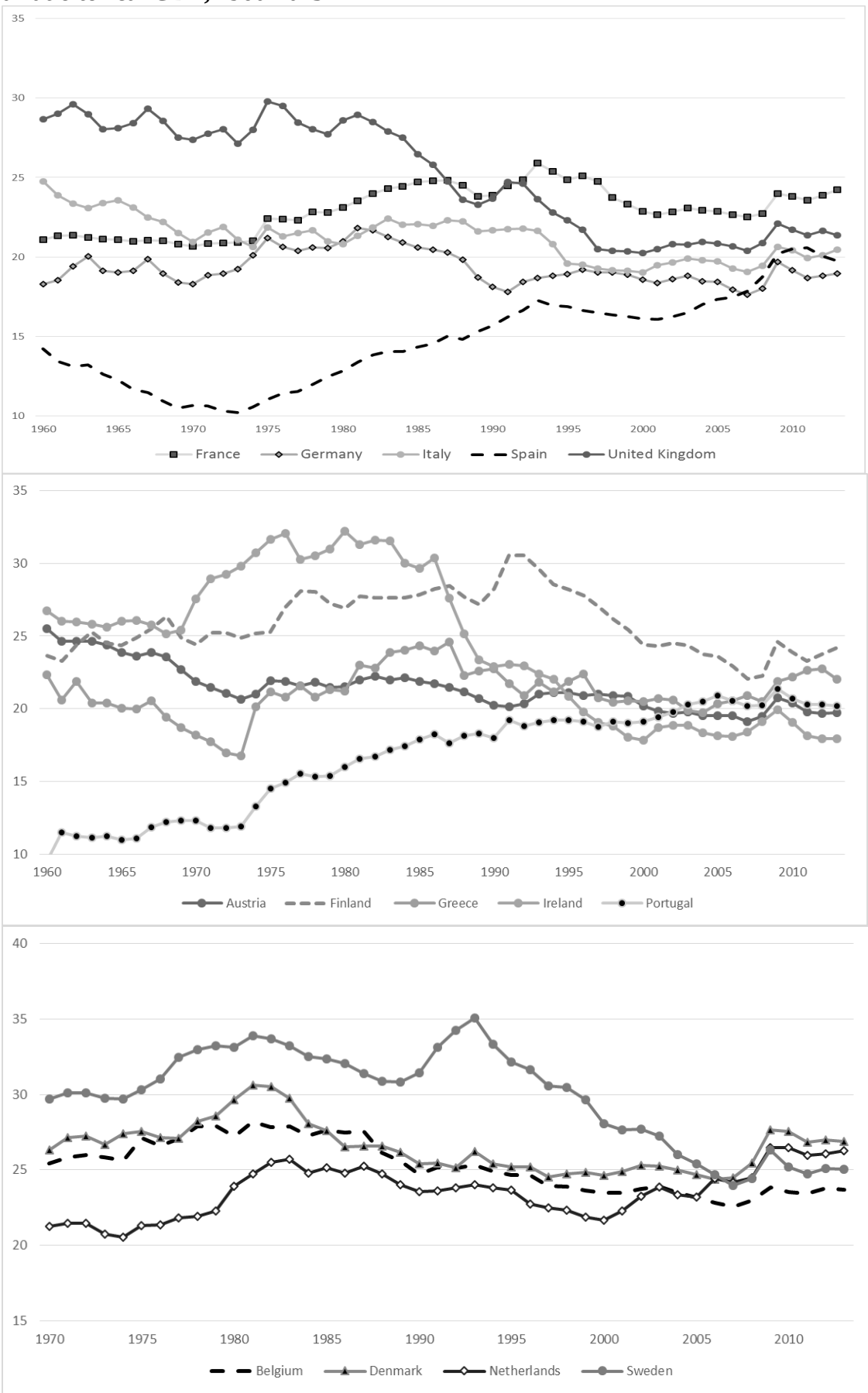






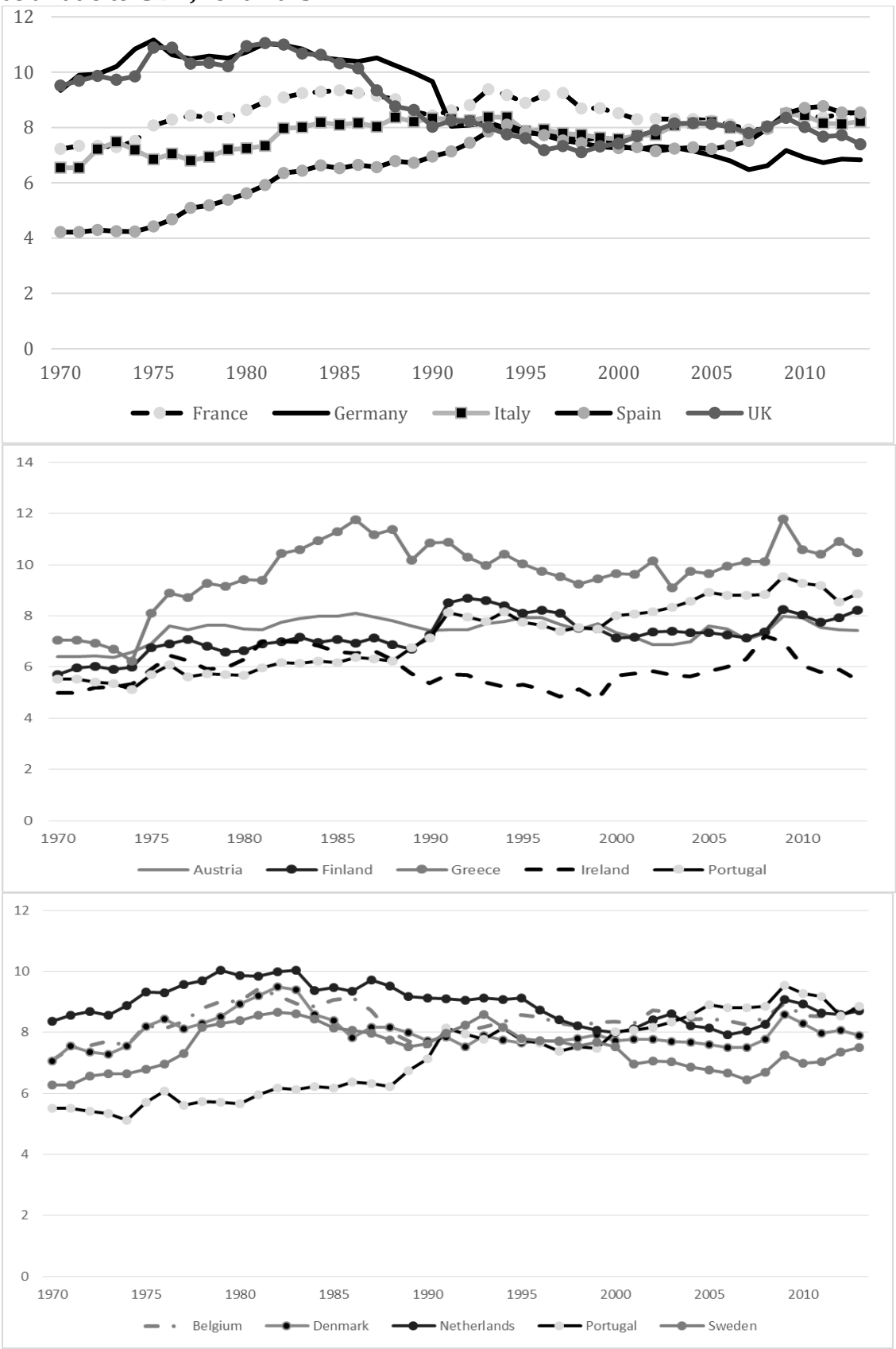
Source: Source: European Commission (2000, 2009); Eurostat online (2015); Onaran et al. (2012). Author's calculations.

Figure C4: Total Government Consumption Expenditure in the EU14 countries, as a ratio to real GDP, 1960-2013



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

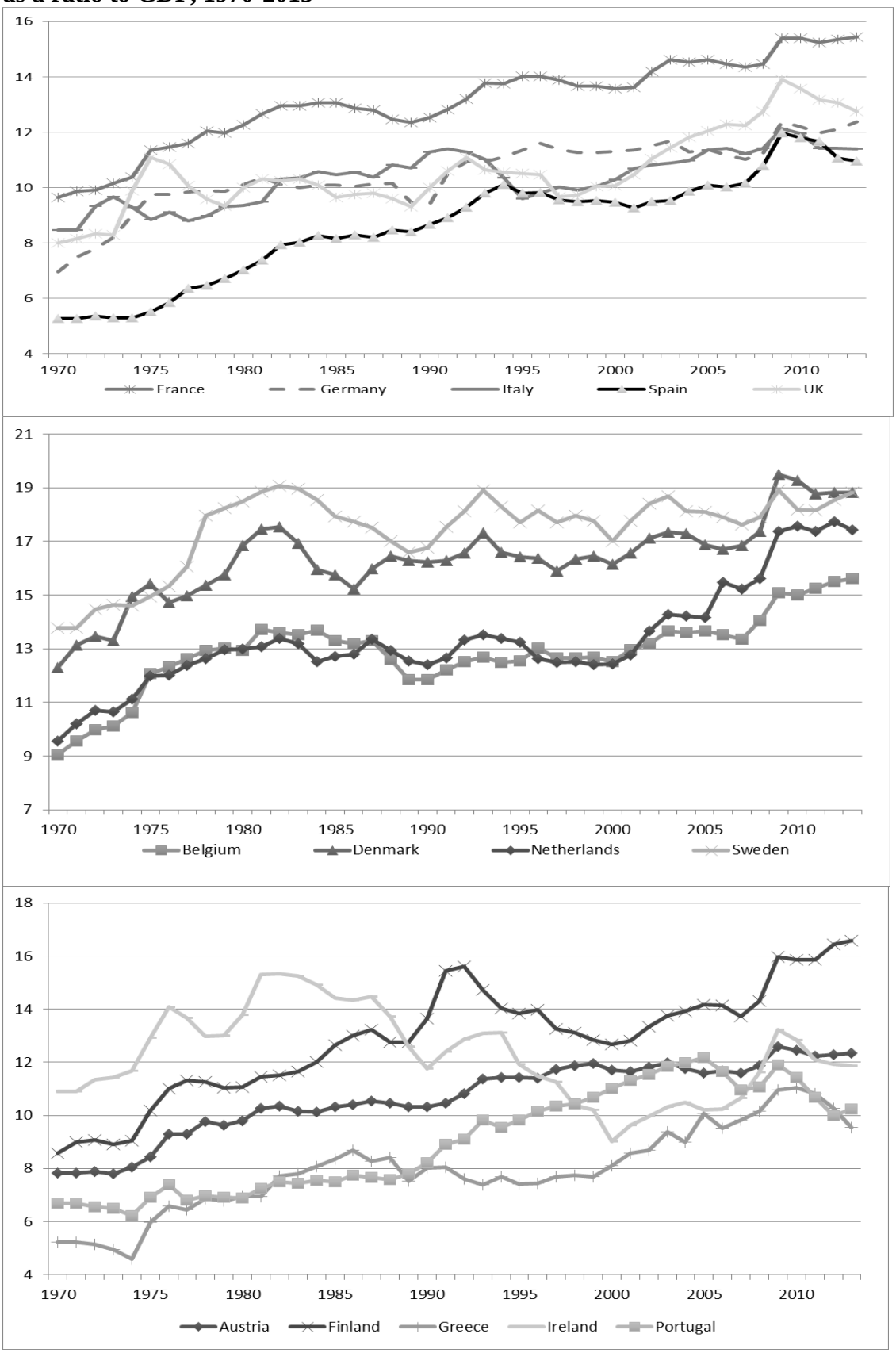
Figure C5: Government collective consumption expenditure in the EU14 countries, as a ratio to GDP, 1970-2013



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.

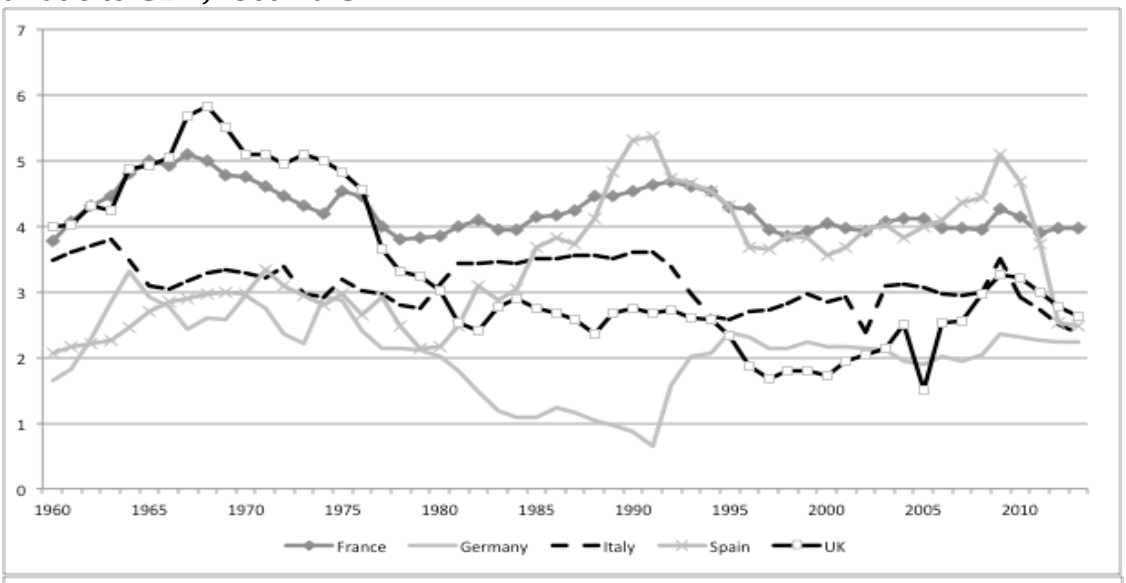
Figure C6: Government individual consumption expenditure in the EU14 countries, as a ratio to GDP, 1970-2013

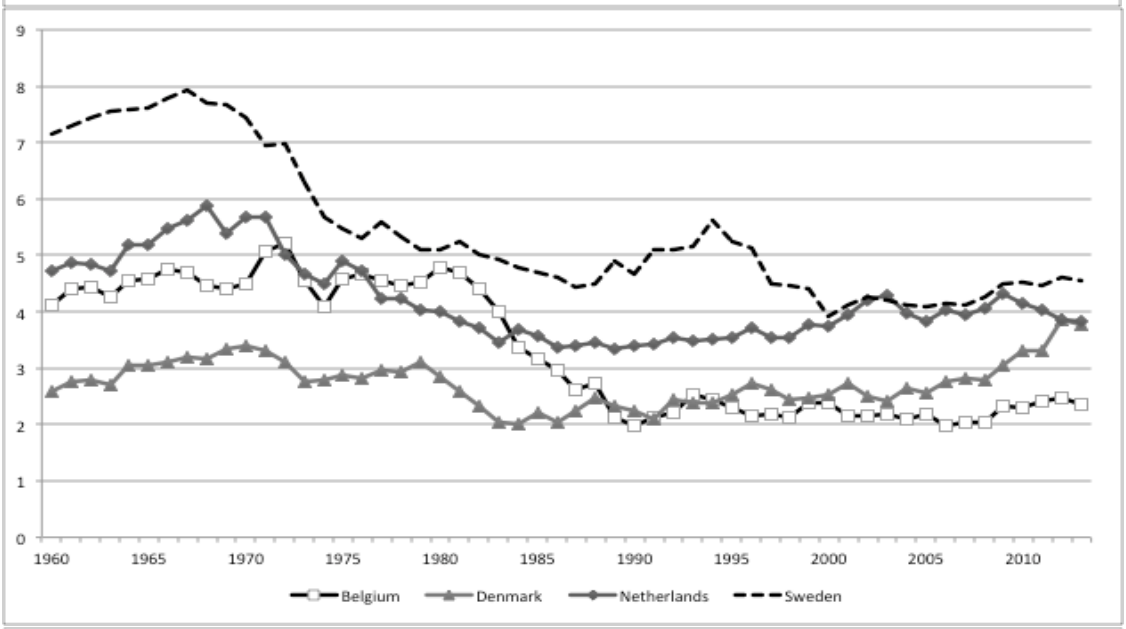


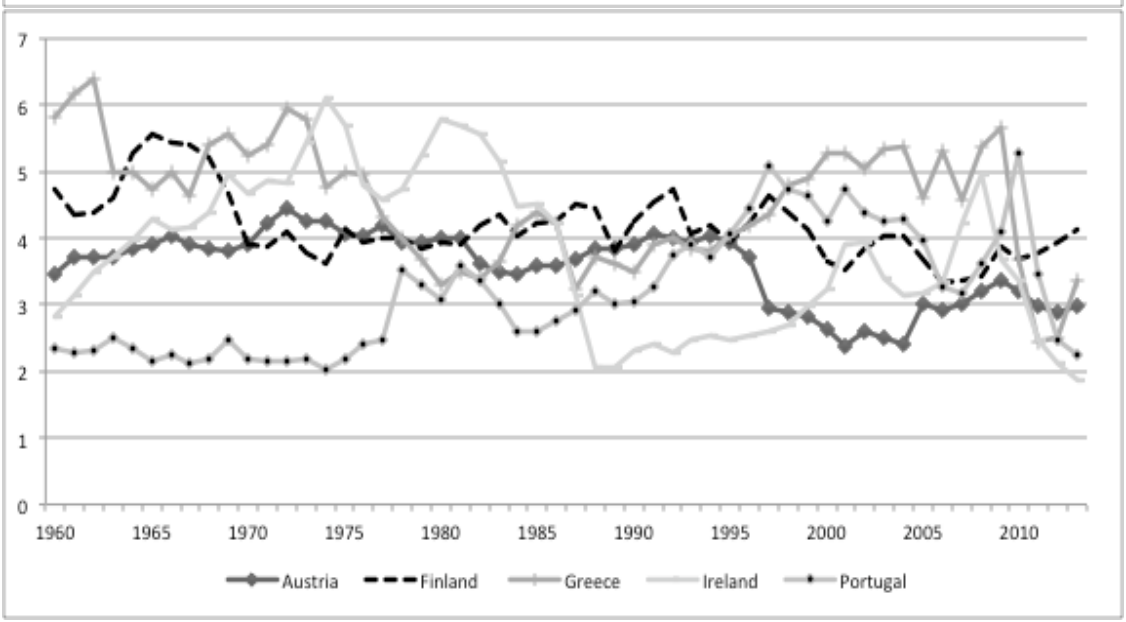
Source: OECD National Accounts (2016).

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 C7: General government gross capital formation in the EU14 countries, as a ratio to GDP, 1960-2013







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

Appendix D

Table D1. Unit root test results for all countries (Augmented-Dickey-Fuller-Tests).

Stage	Included in test equation	Countries and Variables													
	Consumption	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.887	-0.811	-1.399	-0.084	-1.095	-1.546	-1.207	-0.241	-2.224	-1.690	-1.040	-1.390	0.861	0.254
	Intercept and trend	-1.829	-1.407	-3.002	-2.809	-2.433	-1.359	-5.198	-2.021	2.962	-2.101	-1.372	-2.602	-1.040	-2.052
First Difference	Constant	-7.634	-6.126	-6.098	-4.211	-4.354	-3.876	-4.220	-3.367	-3.359	-2.443	-3.968	-2.490	-4.779	-3.274
	None	-1.580	-1.081	-4.447	-2.866	-1.907	-2.152	-3.536	-2.759	-2.628	-1.957	-3.122	-2.128	-2.942	-2.141
	Adjusted After-Tax Profits	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	0.020	-0.508	-1.430	-0.997	-1.064	-0.474	0.636	0.233	-1.701	-0.035	-1.438	0.220	-0.980	-0.042
	Intercept and trend	-2.701	-2.668	-2.285	-2.119	-0.474	-2.734	-3.267	-1.859	1.287	-2.833	-2.862	-3.051	-3.921	-4.096
First Difference	Constant	-7.049	-4.676	-5.519	-5.961	-4.520	-6.792	-5.957	-4.482	-6.874	-5.269	-3.767	-4.956	-8.649	-5.707
	None	-5.877	-4.539	-5.457	-5.600	-1.892	-6.389	-1.867	-3.630	-6.583	-4.979	-5.637	-3.965	-8.390	-4.818
	Adjusted After-Tax Wages	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.647	-0.445	0.375	-0.139	-0.427	-1.032	-1.859	-0.788	-2.984	-0.208	-1.275	-1.605	3.448	0.216
	Intercept and trend	-3.028	-1.900	-1.448	-1.917	-1.800	-3.271	-3.139	-2.211	-2.618	-2.153	0.189	-2.337	0.497	-2.057
First Difference	Constant	-4.072	-5.467	-5.092	-4.543	-3.644	-4.500	-2.092	-3.082	-4.706	-5.159	-2.639	-1.720	-3.693	-3.507
	None	-3.095	-4.151	-3.953	-3.986	-2.804	-3.360	-2.150	-2.765	-4.716	-2.247	-2.723	-1.738	-3.039	-2.532
	Private Investment	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**

Level	Intercept	-0.934	-0.343	-1.277	-1.655	-1.063	-0.365	-2.301	-1.464	-1.795	-1.310	-1.543	-1.535	-0.945	-0.585
	Intercept and trend	-2.130	-2.459	-2.958	-3.862	-2.930	-2.614	-1.838	-2.920	-0.707	-2.415	-1.369	-2.529	-3.248	-2.698
First Difference	Constant	-6.522	-5.392	-5.148	-5.129	-5.169	-5.740	-5.519	-3.564	-5.322	-5.051	-4.639	-3.860	-4.984	-5.761
	None	-5.780	-4.903	-4.973	-4.378	-4.526	-5.199	-5.573	-3.506	-5.193	-4.810	-4.603	-3.787	-4.753	-5.339
	GDP	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.214	-0.479	-1.462	-0.470	-1.253	-0.810	-1.747	-0.121	-2.968	-0.707	-1.348	-0.971	0.584	0.540
	Intercept and trend	-2.256	-2.043	-1.903	-2.792	-2.448	-2.650	-3.479	-2.128	1.879	-2.093	-1.189	-2.472	-1.332	-1.828
First Difference	Constant	-6.143	-6.864	-5.592	-5.111	-5.357	-6.967	-2.991	-3.063	-4.911	-4.273	-3.690	-2.822	-6.131	-4.559
	None	-0.668	-1.487	-3.860	-4.005	-2.628	-4.145	-2.859	-2.429	-1.711	-2.691	-2.766	-2.139	-4.013	-2.862
	Adjusted After-Tax Profit Share	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-1.130	-2.157	-3.455	-2.189	-1.825	-1.090	-4.046	-0.630	-1.785	-1.269	-2.408	-3.215	-3.322	-3.539
	Intercept and trend	-2.858	-2.605	-3.563	-4.267	-1.696	-2.145	-3.296	-3.334	-1.483	-3.038	-2.598	-3.945	-3.454	-4.400
First Difference	Constant	-8.559	-4.561	-5.581	-6.780	-4.875	-6.346	-7.516	-6.233	-8.715	-6.987	-5.224	-5.842	-7.514	-6.213
	None	-8.538	-4.419	-5.616	-6.846	-4.909	-6.391	-7.484	-6.089	-8.810	-7.049	-5.280	-5.899	-7.563	-6.278
	Domestic Prices	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.387	-0.104	-0.492	-0.059	-1.415	-0.759	-2.874	-0.642	-0.604	-0.915	-0.205	-1.179	-0.385	-0.026
	Intercept and trend	-2.167	-2.534	-2.897	-1.924	-2.473	-1.823	-2.226	-3.096	-2.646	-2.409	-2.562	-2.718	-2.091	-2.876
First Difference	Constant	-2.836	-3.231	-2.198	-3.513	-1.778	-3.041	-0.564	-2.639	-1.979	-3.147	-1.942	-1.704	-2.862	-2.671

	None	-0.963	-1.113	-0.533	-1.603	-0.926	-1.288	-0.765	-1.790	-0.794	-1.444	-0.920	-0.800	-1.517	-1.231
	Unit Labour Costs	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.509	-0.089	-0.098	-0.606	-0.998	-1.126	-2.360	-0.393	0.145	-0.987	-0.102	-0.810	0.120	0.168
	Intercept and trend	-1.545	-2.274	-2.344	-2.159	-2.321	-1.394	-1.850	-3.039	-2.542	-1.903	-2.147	-2.495	-2.407	-3.131
First Difference	Constant	-4.505	-4.109	-4.055	-2.594	-2.256	-4.528	-2.939	-4.310	-3.356	-4.023	-2.933	-2.400	-4.667	-3.617
	None	-1.070	-2.111	-2.284	-1.466	-1.362	-3.026	-2.534	-2.749	-1.912	-2.481	-1.970	-1.633	-3.072	-2.194
	Import Prices	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.088	-0.608	-0.792	-0.640	-1.314	-1.159	2.510	-0.682	0.346	-1.001	-0.298	-0.721	-0.626	-0.215
	Intercept and trend	-1.532	-1.816	-1.076	-1.119	-1.343	-1.244	-2.723	-1.726	-2.676	-1.218	-1.296	-2.310	-0.935	-1.631
First Difference	Constant	-6.045	-5.323	-5.253	-5.358	-4.634	-5.502	-4.019	-4.618	-6.269	-5.599	-5.173	-4.805	-5.263	-5.064
	None	-4.264	-4.686	-4.601	-4.365	-4.297	-5.216	-2.781	-3.671	-5.080	-5.241	-4.483	-4.307	-4.220	-4.073
	Export Prices	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.934	-0.693	-0.346	-1.506	-1.439	-1.845	0.821	-1.068	0.595	-1.020	-0.347	0.024	-0.993	0.167
	Intercept and trend	-0.813	-1.585	-1.428	0.043	-1.342	-0.131	-2.831	-1.200	-2.100	-1.725	-1.755	-2.307	-0.129	-1.365
First Difference	Constant	-5.022	-5.104	-6.954	-4.718	-3.330	-4.430	-3.583	-4.657	-4.778	-5.240	-4.002	-4.433	-4.515	-5.095
	None	-3.287	-4.243	-2.945	-3.897	-2.953	-3.332	-0.347	-1.460	-1.977	-4.860	-3.046	-2.793	-3.696	-2.415
	Exports	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	1.628	2.148	1.532	0.517	1.425	0.602	0.239	-2.779	0.017	2.786	2.792	1.255	1.421	1.601
	Intercept and trend	-1.327	-0.974	-3.453	-1.708	-1.724	-2.908	-1.988	-3.624	-2.588	-0.869	-1.097	-1.313	-1.288	-1.497

First Difference	Constant	-7.256	-7.278	-1.655	-6.948	-6.577	-0.983	-6.405	-3.478	-1.261	-5.933	-5.794	-2.450	-6.761	-6.405
	None	-0.427	0.254	-1.124	-1.636	-4.814	0.100	-5.807	-2.680	-0.754	0.361	0.007	-1.232	-5.451	-0.972
	Imports	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	1.288	2.006	1.349	0.857	1.614	2.420	-1.833	-1.766	-0.463	2.479	-1.034	-0.306	1.212	1.538
	Intercept and trend	-1.687	-1.006	-1.159	-1.476	-1.398	-0.687	-3.726	-3.111	-1.982	-0.917	-3.475	-1.874	-1.289	-1.504
First Difference	Constant	-6.481	-0.684	-5.957	-7.055	-6.608	-6.424	-2.605	-4.195	-7.117	-5.583	-1.471	-5.035	-7.318	-5.682
	None	-0.568	0.609	-4.875	-6.019	-4.833	0.261	-0.943	-1.596	-6.194	-0.345	-1.032	-4.617	-5.964	-1.461
	Real Unit Labour Costs	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.921	-2.344	-1.511	-1.125	-1.131	-0.782	-3.992	-0.698	-0.765	-1.274	-1.223	-0.892	-1.255	-2.560
	Intercept and trend	-2.304	-2.083	-3.006	-2.205	-1.521	-2.346	-3.671	-1.750	-1.638	-3.056	-2.676	-3.410	-2.688	-3.542
First Difference	Constant	-7.431	-5.146	-7.291	-6.519	-5.670	-5.988	-7.873	-6.499	-6.726	-6.671	-5.009	-4.603	-5.754	-5.908
	None	-7.331	-5.112	-7.346	-6.447	-5.638	-6.009	-7.631	-6.248	-6.670	-6.740	-5.051	-4.597	-5.797	-5.899
	Debt to (nominal) GDP ratio	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-1.520	-2.009	-2.456	-0.977	0.373	-0.116	1.373	-2.781	-0.506	-1.924	0.236	-0.702	-2.442	-1.675
	Intercept and trend	-2.258	-1.673	-2.208	-2.814	-2.809	-3.915	-1.367	-2.744	-2.085	-1.859	-1.077	-4.177	-2.334	-1.144
First Difference	Constant	-5.225	-2.646	-2.780	-3.903	-3.635	-4.696	-6.171	-2.355	-4.055	-3.445	-3.644	-2.511	-3.038	-2.767
	None	-3.750	-2.576	-2.776	-3.642	-2.620	-3.794	-4.972	-2.304	-3.285	-3.363	-2.917	-2.228	-3.061	-2.776
	Foreign GDP	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**

Level	Intercept	3.466	3.478	3.481	3.477	3.656	3.804	3.504	3.451	3.825	3.510	3.475	3.565	3.478	3.591
	Intercept and trend	-0.473	-0.470	-0.466	-0.466	-0.379	-0.319	-0.449	-0.467	-0.260	-0.442	-0.459	-0.407	-0.481	-0.367
First Difference	Constant	-5.342	-5.335	-5.336	-5.341	-5.274	-5.075	-5.346	-5.366	-5.167	-5.330	-5.337	-5.349	-5.336	-5.361
	None	1.291	1.297	1.297	1.289	1.415	1.428	1.325	1.295	1.440	1.325	1.297	1.409	1.297	1.510
	Relative Prices Imports	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-1.943	-1.133	-1.280	-1.389	-0.883	-1.341	-0.855	-1.256	-1.460	-1.432	-0.021	-0.869	-1.520	-0.812
	Intercept and trend	-2.186	-1.852	-2.553	-1.985	-2.077	-2.191	-1.407	-2.458	-1.714	-1.866	-1.526	-2.219	-2.013	-2.463
First Difference	Constant	-6.557	-6.052	-6.496	-6.132	-7.420	-6.168	-5.272	-5.791	-5.895	-6.369	-6.192	-5.773	-6.318	-5.706
	None	-6.611	-6.003	-5.889	-6.106	-7.101	-5.968	-5.024	-5.670	-5.875	-5.953	-5.651	-5.505	-6.294	-5.564
	Relative Prices Exports	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.405	-1.740	-1.471	-0.402	-1.971	-2.103	-1.617	-0.574	-1.632	-1.859	-1.302	-1.498	-1.451	-1.610
	Intercept and trend	-3.368	-1.791	-2.473	-2.001	-2.439	-2.918	-1.714	-3.774	-1.708	-1.912	-2.078	-2.551	-2.414	-2.846
First Difference	Constant	-8.645	-6.206	-8.198	-5.815	-8.186	-5.807	-7.388	-7.405	-5.877	-6.895	-5.373	-5.188	-7.892	-6.047
	None	-8.212	-6.258	-7.965	-5.710	-8.194	-5.825	-7.461	-7.223	-5.904	-6.960	-5.373	-5.071	-7.427	-6.096
	Exchange rate	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-1.562	-2.367	-3.091	-1.960	-2.515	-2.216	-0.711	-1.749	-1.052	-1.510	-1.081	-1.399	-1.212	-1.528
	Intercept and trend	-1.574	-3.696	-3.205	-3.320	-2.600	-1.332	-1.554	-1.496	-0.968	-2.097	-1.348	-2.233	-1.904	-2.810
First Difference	Constant	-4.642	-4.319	-4.775	-6.331	-4.976	-4.666	-3.768	-5.212	-5.372	-4.860	-4.026	-4.470	-6.156	-5.221

	None	-4.304	-4.299	-4.819	-6.266	-5.021	-4.310	-3.387	-5.133	-5.193	-4.633	-3.788	-4.375	-6.169	-5.072
	Gross Capital formation Government	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-1.420	-2.037	0.931	-0.310	-1.735	-1.002	-1.802	-1.864	-1.857	-0.700	-1.438	-1.845	-0.177	-1.547
	Intercept and trend	-2.166	-1.901	-0.575	-3.672	-2.203	-1.629	-1.762	-4.057	-1.077	-1.268	-1.244	-3.997	-1.187	-1.815
First Difference	Constant	-6.491	-5.696	-7.459	-5.880	-5.855	-5.597	-6.132	-5.133	-7.163	-5.595	-6.264	-3.740	-7.395	-8.923
	None	-6.136	-5.647	-6.530	-6.521	-4.648	-5.470	-6.173	-5.164	-7.115	-5.093	-6.294	-3.310	-6.675	-8.854
	Final Consumption Expenditure Government	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.290	-2.393	-1.618	-1.351	-1.198	-1.324	-1.966	-0.808	-2.016	1.550	-0.941	1.051	-3.097	0.284
	Intercept and trend	-3.130	-1.664	-2.224	-0.799	-0.649	-2.114	-2.197	-4.827	-0.607	-1.996	-1.321	-2.049	-1.317	-1.543
First Difference	Constant	-4.717	-6.160	-4.435	-4.789	-5.708	-4.986	-1.729	-2.894	-3.207	-5.097	-3.379	-3.077	-4.715	-4.278
	None	-2.152	-1.599	-1.947	-1.586	-0.569	-2.735	-1.774	-2.391	-2.367	-3.147	-2.588	-2.193	-1.651	-2.719
	Total Government Expenditure (capital + current spending)	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**
Level	Intercept	-0.262	-2.100	-1.232	-1.082	-1.584	-0.993	-1.685	-0.704	-2.031	3.200	0.510	-1.091	1.616	-2.669
	Intercept and trend	-4.699	-2.340	-2.171	-2.103	-0.782	-3.048	-1.916	-4.783	-0.208	-0.991	-1.900	-1.368	-3.393	-2.220
First Difference	Constant	-5.379	-4.661	-5.141	-4.454	-6.119	-4.781	-4.088	-4.100	-3.910	-6.036	-4.982	-4.011	-3.380	-5.759
	None	-1.365	-2.632	-1.983	-2.612	-0.829	-3.162	-3.891	-3.071	-2.023	-1.186	-3.212	-3.503	-1.661	-1.720
	Government Individual Consumption spending	**A**	**B**	**DK**	**FIN**	**FR**	**D**	**GR**	**IRL**	**I**	**NL**	**P**	**E**	**S**	**UK**

Level	Intercept	-0.177	0.833	-0.899	0.007	-0.345	-0.529	-2.108	-0.062	-1.876	1.165	-2.150	0.459	0.922	-0.159
	Intercept and trend	-2.171	-0.355	-2.501	-2.777	-1.976	-2.955	-2.821	-3.731	-1.619	-0.814	-1.904	-2.789	-0.811	-1.782
First Difference	Constant	-4.520	-4.294	-5.308	-3.574	-4.522	-5.663	-1.253	-4.240	-4.297	-4.376	-0.539	-3.640	-4.995	-3.364
	None	-1.921	-1.128	-1.010	-2.139	-1.703	-1.597	-1.440	-3.236	-3.615	-1.353	-0.815	-2.399	-2.450	-2.475
	Government Collective Consumption spending	A	B	DK	FIN	FR	D	GR	IRL	I	NL	P	E	S	UK
Level	Intercept	-0.912	-0.853	-1.821	-0.159	-2.356	-4.159	-1.824	-0.914	-2.598	0.362	-0.792	-0.673	0.133	-1.115
	Intercept and trend	-3.848	-1.993	-1.811	-3.486	-2.062	-3.422	-1.515	-5.519	-0.197	-3.171	-2.111	-3.783	-1.266	-2.234
First Difference	Constant	-5.862	-5.633	-5.652	-5.827	-5.547	-6.143	-6.598	-4.219	-3.366	-5.020	-4.875	-3.194	-5.466	-2.373
	None	-4.023	-3.838	-4.537	-3.204	-1.286	-5.755	-6.326	-3.974	-2.713	-3.478	-4.057	-2.169	-3.357	-2.198

Appendix E. 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:

$$\frac{dY}{d\pi} = \frac{dC}{d\pi} + \frac{dI}{d\pi} + \frac{dNX}{d\pi} + \frac{dG}{d\pi} \tag{E1}$$

where:

$$\frac{dC}{d\pi} = \frac{\partial C}{\partial \pi} + \frac{\partial C}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{E2}$$

$$\frac{dI}{d\pi} = \frac{\partial I}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{E3}$$

$$\frac{dNX}{d\pi} = \frac{\partial NX}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{E4}$$

$$\frac{dG}{d\pi} = \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial \pi} \tag{E5}$$

Therefore (E1) becomes:

$$\frac{dY^*/Y}{d\pi} = \frac{\frac{\partial C/Y}{\partial \pi} + \frac{\partial I/Y}{\partial \pi} + \frac{\partial NX/Y}{\partial \pi}}{1 - \partial C/\partial Y - \partial I/\partial Y - \partial NX/\partial Y - \partial G/\partial Y} \tag{E6}$$

The marginal effects are given by:

$$\frac{\partial C}{\partial R} = \frac{\partial C/Y}{\partial \pi} = c_r \frac{C}{R} - c_w \frac{C}{W} \tag{E7}$$

$$\frac{\partial I}{\partial R} = \frac{\partial I/Y}{\partial \pi} = i_r \frac{I}{R} \tag{E8}$$

$$\frac{\partial X}{\partial R} = \frac{\partial X/Y}{\partial \pi} = \left(-e_{XPx}, e_{Pxulc}, \frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\right)\frac{X/Y}{rulc} \tag{E9}$$

$$\frac{\partial M}{\partial R} = \frac{\partial M/Y}{\partial ws} = \left(-e_{MP}, e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\right)\frac{M/Y}{rulc} \tag{E10}$$

$$\frac{\partial I}{\partial G} = \frac{\partial I/Y}{\partial K_g} = i_g \frac{I}{G} \tag{E11}$$

$$\frac{\partial G}{\partial G} = \frac{\partial G/Y}{\partial K_g} = 1 \tag{E12}$$

$$\frac{\partial NX}{\partial G} = \frac{\partial NX/Y}{\partial K_g} = -\frac{\partial M}{\partial G} = -m_g \frac{M}{G} \tag{E13}$$

$$\frac{I}{Y_p} = i_y \frac{I}{Y_p} \tag{E14}$$

$$\frac{\partial I/Y}{\partial D/Y} = i_d \frac{I/Y}{D/Y} = i_d \frac{I}{D} \tag{E15}$$

$$\frac{\partial D/Y}{\partial Y} = \frac{\frac{\partial D}{\partial Y}Y + \frac{\partial Y}{\partial Y}D}{Y^2} = \frac{\partial D}{\partial Y}\frac{1}{Y} - \frac{D}{Y^2} = \left(\frac{\partial D}{\partial Y} - \frac{D}{Y}\right)\frac{1}{Y} = \left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)\frac{1}{Y} \tag{E16}$$

$$\frac{\partial D}{\partial Y} = \frac{\partial (D_{-1} + G - T + rD_{-1})}{\partial Y} = \frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} \tag{E17}$$

$$\frac{\partial T}{\partial Y} = \frac{\partial (t_w W + t_r R + t_c C)}{\partial Y} = t_w \frac{\partial W}{\partial Y} + t_r \frac{\partial R}{\partial Y} + t_c \frac{\partial C}{\partial Y} \tag{E17}$$

$$\frac{\partial R}{\partial Y} = \frac{\partial \pi Y}{\partial Y} = \pi \tag{E18}$$

$$\frac{\partial W}{\partial Y} = \frac{\partial (1-\pi)Y}{\partial Y} = 1 - \pi \tag{E19}$$

$$\frac{\partial Y_p}{\partial Y} = \frac{\partial (Y - G)}{\partial Y} = \frac{\partial (Y - \kappa_g Y)}{\partial Y} = 1 - \kappa_g \tag{E20}$$

$$\frac{\partial R/Y}{\partial Y} = \frac{\partial \pi}{\partial Y} = 0 \tag{E21}$$

$$\frac{\partial C}{\partial Y} = \frac{\partial C}{\partial R}\frac{\partial R}{\partial Y} + \frac{\partial C}{\partial W}\frac{\partial W}{\partial Y} = c_r \frac{C}{R}\pi + c_w \frac{C}{W}(1-\pi) = (c_r + c_w)\frac{C}{Y} \tag{E22}$$

$$\frac{\partial C}{\partial Y} = \frac{\partial C}{\partial R}\frac{\partial R}{\partial Y} + \frac{\partial C}{\partial W}\frac{\partial W}{\partial Y} = c_r \frac{C}{R}\pi + c_w \frac{C}{W}(1-\pi) = (c_r + c_w)\frac{C}{Y} \tag{E23}$$

$$\frac{\partial NX}{\partial Y} = -\frac{\partial M}{\partial Y} = -\left(\frac{\partial M}{\partial Y_p}\frac{\partial Y_p}{\partial Y} + \frac{\partial M}{\partial G}\frac{\partial G}{\partial Y}\right) = -\left(m_y \frac{M}{Y_p}(1-\kappa_g) + m_g \frac{M}{G}\kappa_g\right) = -(m_y + m_g)\frac{M}{Y} \qquad \text{(E24)}$$

$$\frac{\partial G}{\partial Y} = \frac{\partial \kappa_g Y}{\partial Y} = \kappa_g \qquad \text{(E25)}$$

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

or

$$\frac{\partial I}{\partial Y} = i_y \frac{I}{Y_p}(1-\kappa_g) + i_g \frac{I}{G}\kappa_g + i_d \frac{I}{D/Y}\frac{\partial D/Y}{\partial Y} = (i_y + i_g)\frac{I}{Y} + i_d \frac{I/Y}{D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right) \qquad \text{(E26)}$$

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 (5.16).The details of each matrix are given by:

The diagonal elements of *E* are calculated as:

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

H' reflects the national multiplier:

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

W is:

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

P is:

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

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

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

$$\frac{dY^*}{dG} = \frac{dC}{dG} + \frac{dNX}{dG} + \frac{dG}{dG} + \frac{dI}{dG} \tag{E27}$$

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 (E28) becomes:

$$\frac{dY^*}{dG} = \frac{\frac{\partial I}{\partial G} + \frac{\partial NX}{\partial G} + \frac{\partial G}{\partial G} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial G}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{E28}$$

Dividing (E29) by Y we get:

$$\frac{dY^*/Y}{d\kappa_g} = \frac{\frac{\partial I/Y}{\partial \kappa_g} + \frac{\partial NX/Y}{\partial \kappa_g} + \frac{\partial G/Y}{\partial \kappa_g} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial G}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{E29}$$

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 (5.17) and (5.18). The details of each matrix are given by:

The diagonal elements of the E matrix are:

$$Eg_{15\times15}=\begin{bmatrix}\frac{\partial I_1/Y_1}{\partial \kappa_{g1}}+\frac{\partial NX_1/Y_1}{\partial \kappa_{g1}}+\frac{\partial G_1/Y_1}{\partial \kappa_{g1}}+\frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial G}{\partial G} & 0 & . & 0\\ 0 & . & . & .\\ . & . & . & .\\ 0 & 0 & . & \frac{\partial I_{15}/Y_{15}}{\partial \kappa_{g15}}+\frac{\partial NX_{15}/Y_{15}}{\partial \kappa_{g15}}+\frac{\partial G_{15}/Y_{15}}{\partial \kappa_{g15}}+\frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial G}{\partial G}\end{bmatrix}$$

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

$$Hg_{15\times15}=\begin{bmatrix}\frac{\partial C_1}{\partial Y_1}+\frac{\partial I_1}{\partial Y_1}+\frac{\partial NX_1}{\partial Y_1}+\frac{\partial G_1}{\partial Y_1}-\frac{\partial I_1/Y_1}{\partial D_1/Y_1}\left(\frac{\partial T_1}{\partial Y_1}+\frac{D_1}{Y_1}\right) & 0 & . & 0\\ 0 & . & . & .\\ . & . & . & .\\ 0 & 0 & . & \frac{\partial C_{15}}{\partial Y_{15}}+\frac{\partial I_{15}}{\partial Y_{15}}+\frac{\partial NX_{15}}{\partial Y_{15}}+\frac{\partial G_{15}}{\partial Y_{15}}-\frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\left(\frac{\partial T_{15}}{\partial Y_{15}}+\frac{D_{15}}{Y_{15}}\right)\end{bmatrix}$$

Total effects of a **change in gross fixed capital formation of general government**[289] on equilibrium aggregate demand:

$$\frac{dY^*}{dI_g}=\frac{dC}{dI_g}+\frac{dNX}{dI_g}+\frac{dG}{dI_g}+\frac{dI}{dI_g} \tag{E30}$$

where:

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

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

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

$$\frac{dI}{dI_g}=\frac{\partial I}{\partial I_g}+\frac{\partial I}{\partial Y}\frac{\partial Y}{\partial I_g}+\frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial I_g}$$

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

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

Therefore (E31) becomes:

$$\frac{dY^*}{dI_g}=\frac{\frac{\partial I}{\partial I_g}+\frac{\partial NX}{\partial I_g}+\frac{\partial G}{\partial I_g}+\frac{\partial I/Y}{\partial D/Y}\frac{\partial G}{\partial I_g}}{1-\frac{\partial C}{\partial Y}-\frac{\partial I}{\partial Y}-\frac{\partial NX}{\partial Y}-\frac{\partial G}{\partial Y}+\frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y}+\frac{D}{Y}\right)} \tag{E31}$$

where:

$$\frac{\partial I}{\partial I_g}=\frac{\partial I/Y}{\partial I_g/Y}=i_i\frac{I}{I_g}$$

$$\frac{\partial NX}{\partial I_g}=\frac{\partial NX/Y}{\partial I_g/Y}=-m_i\frac{M}{I_g}$$

$$\frac{\partial G}{\partial I_g}=\frac{\partial G/Y}{\partial I_g/Y}=\frac{\partial\left(I_g+G_{gc}+G_{gi}\right)}{\partial I_g}=1$$

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

Dividing (E32) by Y we get:

$$\frac{dY^*/Y}{d\kappa_{ig}} = \frac{\frac{\partial I/Y}{\partial \kappa_{ig}} + \frac{\partial NX/Y}{\partial \kappa_{ig}} + \frac{\partial G/Y}{\partial \kappa_{ig}} + \frac{\partial I/Y}{\partial D/Y}\frac{\partial G/Y}{\partial \kappa_{ig}}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} + \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial T}{\partial Y} + \frac{D}{Y}\right)} \tag{E32}$$

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:

$$\left[\frac{dY}{Y}\right]_{15\times 1} = \begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} = Eig_{15\times 15}\begin{bmatrix} d\kappa_{ig1} \\ \cdot \\ \cdot \\ d\kappa_{ig15} \end{bmatrix} + Hg_{15\times 15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} + W_{15\times 15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ \cdot \\ \cdot \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} \tag{E33}$$

$$\left[\frac{dY}{Y}\right]_{15\times 1} = \left(I_{15\times 15} - Hg_{15\times 15} - W_{15\times 15}\right)^{-1} Eig_{15\times 15}\begin{bmatrix} d\kappa_{ig1} \\ \cdot \\ \cdot \\ d\kappa_{ig15} \end{bmatrix} \tag{E34}$$

where

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

Total effects of a **change in ITR on capital income** on equilibrium aggregate demand:

$$\frac{dY^*}{dt_r} = \frac{dC}{dt_r} + \frac{dNX}{dt_r} + \frac{dG}{dt_r} + \frac{dI}{dt_r} \tag{E35}$$

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 (E36) becomes:

$$\frac{dY^*}{dt_r} = \frac{\frac{\partial C}{\partial t_r} + \frac{\partial I}{\partial t_r} - \frac{\partial I/Y}{\partial D/Y}\frac{\partial T}{\partial t_r}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} - \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)} \tag{E36}$$

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 (E37) by Y we get:

$$\frac{dY^*/Y}{dt_r} = \frac{\frac{\partial C/Y}{\partial t_r} + \frac{\partial I/Y}{\partial t_r} - \frac{\partial I/Y}{\partial D/Y}\frac{\partial T/Y}{\partial t_r}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} - \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)} \tag{E37}$$

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 ITR on capital income in all countries** on equilibrium aggregate demand of each national economy are estimated in equation (5.19) and (5.20). The details of each matrix are given by:

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

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

Total effects of a **change in ITR on labour income** on equilibrium aggregate demand:

$$\frac{dY^*}{dt_w} = \frac{dC}{dt_w} + \frac{dNX}{dt_w} + \frac{dG}{dt_w} + \frac{dI}{dt_w} \tag{E38}$$

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 (E39) becomes:

$$\frac{dY^*}{dt_w} = \frac{\frac{\partial C}{\partial t_w} - \frac{\partial I/Y}{\partial D/Y}\frac{\partial T}{\partial t_w}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} - \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)} \tag{E39}$$

where:

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

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

$$\frac{\partial W'}{\partial t_w} = \frac{\partial(1-t_w)W}{\partial t_w} = -W$$

Dividing (E40) by Y we get:

$$\frac{dY^*/Y}{dt_w} = \frac{\frac{\partial C/Y}{\partial t_w} - \frac{\partial I/Y}{\partial D/Y}\frac{\partial T/Y}{\partial t_w}}{1 - \frac{\partial C}{\partial Y} - \frac{\partial I}{\partial Y} - \frac{\partial NX}{\partial Y} - \frac{\partial G}{\partial Y} - \frac{\partial I/Y}{\partial D/Y}\left(\frac{\partial G}{\partial Y} - \frac{\partial T}{\partial Y} - \frac{D}{Y}\right)} \tag{E40}$$

where:

$$\frac{\partial C/Y}{\partial t_w} = -c_w\frac{C/Y}{(1-t_w)}$$

$$\frac{\partial T}{\partial t_w} = \frac{\partial(t_wW + t_rR + t_cC)}{\partial t_w} = W \text{ or } \frac{\partial T/Y}{\partial t_w} = \frac{W}{Y}$$

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

$$\left[\frac{dY}{Y}\right]_{15\times1} = \begin{bmatrix} \frac{dY_1}{Y_1} \\ . \\ . \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} = Etw_{15\times15}\begin{bmatrix} dt_{w1} \\ . \\ . \\ dt_{w15} \end{bmatrix} + Ht_{15\times15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ . \\ . \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} + W_{15\times15}\begin{bmatrix} \frac{dY_1}{Y_1} \\ . \\ . \\ \frac{dY_{15}}{Y_{15}} \end{bmatrix} \tag{E41}$$

$$\left[\frac{dY}{Y}\right]_{15\times1} = \left(I_{15\times15} - Ht_{15\times15} - W_{15\times15}\right)^{-1} Etw_{15\times15}\begin{bmatrix} dt_{w1} \\ . \\ . \\ dt_{w15} \end{bmatrix} \tag{E42}$$

where

$$Etw_{15\times15} = \begin{bmatrix} \frac{\partial C_1/Y_1}{\partial t_{w1}} - \frac{\partial I_1/Y_1}{\partial D_1/Y_1}\frac{\partial T_1/Y_1}{\partial t_{w1}} & 0 & . & 0 \\ 0 & . & . & . \\ . & . & . & . \\ 0 & 0 & . & \frac{\partial C_{15}/Y_{15}}{\partial t_{w15}} - \frac{\partial I_{15}/Y_{15}}{\partial D_{15}/Y_{15}}\frac{\partial T_{15}/Y_{15}}{\partial t_{w15}} \end{bmatrix}$$

Appendix F 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:

$$\left[\frac{dY}{Y}\right]_{15\times1} = E_{15\times15}\left[d\pi\right]_{15\times1} + P_{15\times15}\left[d\pi\right]_{15\times1} + \\ + Eg_{15\times15}\left[d\kappa_g\right]_{15\times1} + Hg_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad \text{(E43)}$$

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

$$\left[\frac{dY}{Y}\right]_{15\times1} = Etr_{15\times15}\left[dt_r\right]_{15\times1} + Etw_{15\times15}\left[dt_w\right]_{15\times1} \\ + Ht_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad \text{(E44)}$$

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

$$\left[\frac{dY}{Y}\right]_{15\times1} = E_{15\times15}\left[d\pi\right]_{15\times1} + P_{15\times15}\left[d\pi\right]_{15\times1} \\ + E_{g15x15}\left[dk_g\right]_{15x1} + Etr_{15x15}[dt_r]_{15x1} + Etw_{15x15}[dt_w]_{15x1} \\ + Ht_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} + W_{15\times15}\left[\frac{dY}{Y}\right]_{15\times1} \quad \text{(E45)}$$

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

$$\frac{dI}{d\pi} = \frac{\partial I}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \pi} \\ \frac{dI/Y}{d\pi} = \frac{\partial I/Y}{\partial \pi} + \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial \pi} \quad \text{(E46)}$$

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

$$\frac{dI}{d\kappa_g} = \frac{\partial I}{\partial \kappa_g} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial \kappa_g} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial \kappa_g} \\ \frac{d\,I/Y}{d\kappa_g} = \frac{\partial\, I/Y}{\partial \kappa_g} + \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial \kappa_g} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial D/Y}{\partial \kappa_g} \quad \text{(E47)}$$

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 ITR on capital income on investment** as follows:

$$\frac{dI}{dt_r} = \frac{\partial I}{\partial t_r} + \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_r} + \frac{\partial I}{\partial D/Y}\frac{\partial D/Y}{\partial t_r}$$
$$\frac{d\,I/Y}{dt_r} = \frac{\partial\, I/Y}{\partial t_r} + \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial t_r} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial\, D/Y}{\partial t_r} \quad \text{(E48)}$$

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

$$\frac{dI}{dt_w} = \frac{\partial I}{\partial Y}\frac{\partial Y}{\partial t_w} + \frac{\partial I}{\partial\, D/Y}\frac{\partial\, D/Y}{\partial t_w}$$
$$\frac{d\,I/Y}{dt_w} = \frac{\partial I}{\partial Y}\frac{\partial Y*/Y}{\partial t_w} + \frac{\partial\, I/Y}{\partial\, D/Y}\frac{\partial\, D/Y}{\partial t_w} \quad \text{(E49)}$$

We calculate the **total effects of a change in income distributions, government expenditures, and ITR on capital income and ITR on labour income on investment** as in equation (5.24) in the main text.

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

$$\frac{dNX}{d\pi} = \frac{\partial NX}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \pi}$$
$$\frac{dNX/Y}{d\pi} = \frac{\partial NX/Y}{\partial \pi} + \frac{\partial NX}{\partial Y}\frac{\partial Y*/Y}{\partial \pi} \quad \text{(E50)}$$

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

$$\frac{dNX}{d\kappa_g} = \frac{\partial NX}{\partial \kappa_g} + \frac{\partial NX}{\partial Y}\frac{\partial Y}{\partial \kappa_g}$$
$$\frac{d\,NX/Y}{d\kappa_g} = \frac{\partial\, NX/Y}{\partial \kappa_g} + \frac{\partial NX}{\partial Y}\frac{\partial Y*/Y}{\partial \kappa_g} \quad \text{(E51)}$$

Following the approach in chapter 3 we calculate the post-multiplier net export effects as

$$\begin{bmatrix} \frac{\Delta NX/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta NX/Y_n}{\Delta \pi_n} \end{bmatrix} = (NX_{nxn} + P_{nxn}) \begin{bmatrix} \Delta\pi_1 \\ \vdots \\ \Delta\pi_n \end{bmatrix} + (W_{nxn} - M_{nxn}) \begin{bmatrix} \frac{\Delta Y/Y_1}{\Delta \pi_1} \\ \vdots \\ \frac{\Delta Y/Y_n}{\Delta \pi_n} \end{bmatrix} \quad \text{(E52)}$$

where

$$NX_{nxn} = \begin{bmatrix} \frac{\frac{\Delta NX}{Y_1}}{\Delta \pi_1} & 0 & \cdots & 0 \\ 0 & \ddots & \vdots & \vdots \\ \vdots & \ddots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\frac{\Delta NX}{Y_n}}{\Delta \pi_n} \end{bmatrix} \quad \text{(E53)}$$

and

$$M_{nxn} = \begin{bmatrix} \frac{\Delta M_1}{\Delta Y_1} & 0 & \cdots & 0 \\ 0 & \ddots & \cdots & \vdots \\ \vdots & \ldots & \ddots & \vdots \\ 0 & \cdots & \cdots & \frac{\Delta M_n}{\Delta Y_n} \end{bmatrix} \quad \text{(E54)}$$

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 (5.13) and (5.14) 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:

$$\frac{dBAL}{d\pi} = \frac{dT}{d\pi} - \frac{dG}{d\pi} = \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial \pi} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial \pi}$$
$$\frac{d\,BAL/Y}{d\pi} = \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} \quad \text{(E55)}$$

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

$$\frac{dBAL}{dk_g} = \frac{dT}{dk_g} - \frac{dG}{dk_g} = \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial k_g} - \frac{\partial G}{\partial k_g} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial k_g}$$
$$\frac{d\,BAL/Y}{d\kappa_g} = \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} - \frac{\partial G/Y}{\partial k_g} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} \quad \text{(E56)}$$

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

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

$$\frac{d\,BAL/Y}{dt_r} = \frac{\partial T/Y}{\partial t_r} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} \quad \text{(E57)}$$

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

$$\frac{dBAL}{dt_w} = \frac{dT}{dt_w} - \frac{dG}{dt_w} = \frac{\partial T}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y}{\partial t_w}$$
$$\frac{d\,BAL/Y}{dt_w} = \frac{\partial T/Y}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} \quad \text{(E58)}$$

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 (5.25) or as follows:

$$\frac{d\,BAL/Y}{d\pi} + \frac{d\,BAL/Y}{d\kappa_g} + \frac{d\,BAL/Y}{dt_r} + \frac{d\,BAL/Y}{dt_w} = \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \pi} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} - \frac{\partial G/Y}{\partial k_g}$$
$$- \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial \kappa_g} + \frac{\partial T/Y}{\partial t_r} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_r} + \frac{\partial T/Y}{\partial t_w} + \frac{\partial T}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} - \frac{\partial G}{\partial Y}\frac{\partial Y^*/Y}{\partial t_w} \quad \text{(E59)}$$

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

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

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

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

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

$$\frac{d\log P}{d\pi}=-e_{Pulc}\frac{1}{1-e_{Pulc}}\frac{Y_f}{Y}\frac{1}{rulc} \qquad \text{(E60)}$$

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 the approach in chapter 3 we calculate the price effects of a simultaneous change in each country as:

$$\begin{bmatrix}\frac{\Delta logP}{\Delta\pi_1}\\ \vdots \\ \frac{\Delta logP}{\Delta\pi_n}\end{bmatrix}=\left(DP_{nxn}\begin{bmatrix}\Delta\pi_1\\ \vdots\\ \Delta\pi_n\end{bmatrix}+PM_{nxn}\begin{bmatrix}0 & \Delta\pi_2 & \cdots & \Delta\pi_n\\ \Delta\pi_1 & \ddots & \cdots & \vdots\\ \vdots & \vdots & \ddots & \vdots\\ \Delta\pi_1 & \Delta\pi_2 & \cdots & 0\end{bmatrix}\begin{bmatrix}p_{m1}\\ \vdots\\ p_{mn}\end{bmatrix}\right) \qquad \text{(E61)}$$

where

$$DP_{nxn}=\begin{bmatrix}\frac{\Delta logP}{\Delta\pi_1} & 0 & \cdots & 0\\ 0 & \ddots & \cdots & \vdots\\ \vdots & \vdots & \ddots & \vdots\\ 0 & \cdots & \cdots & \frac{\Delta logP}{\Delta\pi_n}\end{bmatrix} \qquad \text{(E62)}$$

and

$$PM_{nxn}=\begin{bmatrix}0 & \frac{\Delta log(P_x)_2}{\Delta\pi_2}\frac{M_{21}}{M_1} & \cdots & \frac{\Delta log(P_x)_n}{\Delta\pi_n}\frac{M_{n1}}{M_1}\\ \frac{\Delta log(P_x)_1}{\Delta\pi_1}\frac{M_{12}}{M_2} & 0 & \cdots & \vdots\\ \vdots & \vdots & \ddots & \vdots\\ \frac{\Delta log(P_x)_1}{\Delta\pi_1}\frac{M_{1n}}{M_n} & \frac{\Delta log(P_x)_2}{\Delta\pi_2}\frac{M_{2n}}{M_n} & \cdots & 0\end{bmatrix} \qquad \text{(E63)}$$

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

$$PM_{ij}=\frac{\Delta log(P_x)_j}{\Delta\pi_j}\frac{M_{ji}}{M_i}=-(e_{Pxj}\frac{1}{1-e_{pj}}\frac{Yf_j}{Y_j}\frac{1}{rulc_j})\frac{M_{ji}}{M_i} \qquad \text{(E64)}$$

Appendix G

Table G1. 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 H. Robustness Checks for Investment

Table H1. 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 H2. 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 H3. 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 H4. 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 I

Table I1. 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 I2. 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 I3. 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 I4. The effect of a 1% point increase in the WS on annual inflation and nominal ULC

	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 I5. 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 chapter 3. 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 E for details.

CONCLUSION

This thesis has analysed the interaction of income distribution, demand and growth in the context of European imbalances. It attempted to illuminate the key question whether it is possible to promote higher growth with a more equitable distribution of income. In this context, we have focused on the effects of an exogenous change in functional income distribution on AD and growth. We have analysed the distributional effects of a change in functional income distribution on AD and hence economic growth through the lens of macroeconomic models in a PK/PKA tradition.

In chapter 2 we have reviewed the literature on the effects of income distribution on growth comparing the neoclassical and PK paradigm. We have outlined old and new neoclassical growth theory, followed by a brief illustration on recent research that incorporates political economy in the mainstream literature. Moreover, the chapter introduced PK distribution and growth theory with a focus on its PKA variant. We have argued why the PKA model was chosen as the suitable 'work-horse' model in this thesis and shown several extensions to the basic model, as well as reviewed the empirical research triggered by this literature. Finally, we have contrasted and critically reviewed the theoretical framework of both paradigms in relation to growth theory.

In chapter 3 this thesis presented and estimated a multi-country demand-led growth model for the EU15. We have analysed the effect of a pro-capital redistribution of income on growth in a highly integrated region such as the EU15 MS. The empirical analysis was conducted to highlight whether there is an empirical basis for wage policy coordination and avoid beggar thy neighbour policies. We developed a consistent estimation strategy to provide new econometric estimates for all EU15 MS individually, including those countries not covered in the previous literature, and extended the analysis by estimating the impact of a simultaneous fall in the WS on growth as well as on investment, net exports, and prices. Finally, we presented a wage-led recovery scenario to discuss whether coordinated wage policies can promote growth with a more equitable income distribution in the EU15.

Chapter 4 set out to review the literature on the role of government spending and taxation in macroeconomics with a focus on the integration of a government sector in PK/PKA distribution and growth models. We have briefly discussed the debate on the relative effectiveness of fiscal policy, and summarised some of the major arguments related to the discourse about crowding out and crowding in the macroeconomic literature. We have critically reviewed a series of papers that integrate the government

sector into the stagnationist as well as the PK/PKA distribution and growth model and shed light on some of the potential questions that can be addressed when government plays a role. We have focused on the macroeconomic effects of government spending and taxation on AD, and growth and analysed how this might alter the nature of a given wage-led or profit-led economic regime. The chapter has also highlighted the role of public debt theoretically analysing whether a deficit financed increase in government purchases could be sustainable, e.g. whether crowding in or crowding out effects prevail. In this context, we emphasized the link between fiscal policy and the relationship between income distribution, AD, and economic growth in the PKA framework.

Chapter 5 developed and estimated a multi-country PKA model augmented by a government sector for the EU15. We estimated econometrically country specific equations to find the effect of income distribution and fiscal policy on each component of private aggregate demand. Moreover, we calculated a Europe-wide multiplier based on the responses of each country to changes in income distribution, taxation and public spending as well as to changes in other European countries' income distribution, taxes and government expenditure. Furthermore, the research analysed the impact of a policy mix that combines pro-labour pre-distribution with more progressive tax policies and fiscal expansion on not only growth but also on investment, budget balance, trade balance and inflation. It thus developed a policy mix that can guide public spending and wage policy.

Chapter 2 has shown that in neoclassical growth models (old and new) income distribution does not play a central role in determining investment and growth. Economic growth is essentially dependent on supply-side factors and there is no possibility of effective demand failures. Interestingly, even though the neoclassical school of thought theoretically predicts an inverse relationship between a more equal income distribution and growth, more recently, 'political economy' literature has found that increasing income inequality is negatively associated with growth. In contrast to the PK literature, the unit of analysis is personal income distribution. However, an increase in the profit share should lead to an enhanced growth performance. Wages are purely viewed as a cost item in this paradigm.

The theoretical review of PK/PKA models has shown that distribution enters the picture right from the start. Moreover, underutilised resources and involuntary unemployment are assumed to be persistent features of the economy and those models take into account important behavioural and institutional features of real economies. PK

distribution and growth theory retains the principle of effective demand and income distribution, capital accumulation and economic growth are all interrelated. While there have been different demand-led growth theories we focused on the Kalecki-inspired growth theory and outlined the macroeconomic framework of both Neo-Kaleckian and PKA distribution and growth models. We have illustrated that in the basic Neo-Kaleckian growth model a change in the profit share has unambiguous effects on equilibrium output due to the paradox of costs. However, the PKA developed a slight variation of these models primarily changing the investment function but also extending the framework to an open economy context that allowed for both wage-led and profit-led demand regimes.

The chapter assessed the PKA distribution and growth model and found that it emphasizes the contradictory role of wages as a cost item as well as major source of AD thereby indicating the complex and ambiguous relationship between a change in the WS and the level of output. We have argued that it provides a flexible model that takes into account distributional conflict as a determinant of growth, while at the same time preserving the long-run validity of the principle of effective demand and excess capacity of firms. It was shown that this framework has been widely applied in empirical research and also outlined several possible extensions to the model such as savings, international trade or a government sector. We have argued, that, given the background of a race to the bottom in the WS, a further issue relates to the international interactions and responses of countries to changes in the distribution in their trade partners. Moreover, that the integration of the government sector has been relatively under-researched in the PKA models and hence present a research gap we intended to bridge. Also, we argued, that an empirical analysis of a government augmented PKA model would be needed to analyse the effects of a combined wage policy and fiscal policy at the European level.

The chapter concluded by contrasting neoclassical growth theory with PK distribution and growth models. Regarding our research question of whether there is a conflict between a more equitable distribution and economic growth the PKA model was chosen to be the suitable theoretical framework for conducting a fruitful empirical analysis on the issue of the relationship between income distribution, AD, and economic growth. We have argued that because the PKA models put functional income distribution at the heart of the analysis of AD and because they include features of the capitalist economy that, in our view, provide a more realistic analysis than growth models in the neoclassical paradigm, it would be our preferred model. Moreover, we argued that the outbreak of the Great recession in 2007 pointed to the relevance of Keynes' and Kaleckis' principle of

effective demand in determining output and employment. Furthermore, that taking into account the significant structural change in functional income distribution observed in the developed as well as developing world over the last four decades will enhance the explanatory power our analysis, e.g. explaining the poor growth performance in Europe.

The empirical analysis of chapter 3 of this thesis has shown that a simultaneous decline in the WS in a highly integrated European economy has detrimental effects on growth. A 1%-point simultaneous increase in the profit share at the European level leads to a decline of -0.42% in EU15 GDP. Reversing these effects would stimulate growth, albeit the effects are small. A cautious interpretation of the empirical results would suggest a more equal income distribution does not hamper growth in Europe.

Domestic demand is clearly wage-led in the EU15. Some small open economies may turn profit-led when the foreign sector is included due to a higher degree of the openness of the economy. In isolation, we have found 11 countries to be wage-led and 4 countries to be profit-led.

One contribution of this thesis is that we have provided new estimates for single EU15 countries (e.g. Greece or Portugal). Most previous empirical research has focused only on a subset of countries or taken the Eurozone as a hypothetical aggregate. Moreover, our analysis went beyond the nation state and estimated the impact of a simultaneous decline in the WS on demand and hence growth in the EU15 countries.

Our results are in line with previous empirical literature confirming that the negative effects a fall in the WS on domestic consumption outweigh the possible expansionary effects on investment in the vast majority of the countries. In isolation, the analysis also reaffirms the crucial role of the foreign sector, particularly in small open economies. However, a simultaneous decline in the WS eliminates most of the positive competitiveness effects among trade partners in Europe. This shows that when all EU15 countries pursue beggar thy neighbour policies, the domestic effects will dominate the competitiveness effects. The results thus illustrate a fallacy of composition at the regional level. Even though increasing the profit share seems to promote growth at the national level in some small open economies, at the European level a simultaneous change in the functional income distribution leads to European demand deficiency.

We have kept the model simple to focus on the role of income distribution in determining private demand. Possible extensions include a richer modelling of the government sector, which we have done in chapter 5 of this thesis. However, the analysis

abstracted from issues such as productivity regimes, increasing personal income inequality, and financialistation.

We have outlined the debate on the different estimation strategies that have yielded contradicting results in some cases, and argued why we have chosen the SEA. We have further indicated that even though our applied estimation approach might introduce some bias resulting from endogeneity issues and single-equation-based estimations, our result that the EU15 in aggregate is wage-led is plausible. We have also run a series of robustness checks to confirm the validity of our results.

Another contribution of this research to the policy debate is the estimation of a simultaneous fall in the WS on investment regime, the trade balance, and prices as well as presenting an alternative wage-led recovery scenario. Interestingly, an increase in the WS does not negatively impact on the investment performance in the EU15 as a whole with most countries experiencing an increase in investment. The impact on the trade balance, however, is almost always negative and hence requires future research on investment and industrial policies. We have also set out the effects of an alternative scenario of a simultaneous wage-led recovery scenario in the EU15 countries assuming a differentiated increase in the WS over the next 5 years. In this scenario, it was shown that all countries EU15 countries could grow along with an improvement of the WS leading to an increase of 2.14% in EU15 GDP as well as being consistent with annual inflation rates well below the ECB target.

The literature review on integrating the government sector into the PKA distribution and growth model in chapter 4 has first shown that there is an on-going debate among economists on the relative effectiveness of fiscal policy. The empirical fiscal multiplier literature is far from having reached a consensus on the size of the multiplier. We have outlined various conditions that help to explain that variety of results. We have highlighted the significance of the theoretical assumptions in the different model classes and emphasized that the state of the economy has not been properly accounted for and, among other factors, might have caused the underestimation of fiscal multipliers before the crisis.

Second, we have analysed the integration of the government sector into the PK/PKA distribution and growth model showing that equalising the income distribution through a progressive tax system may stimulate AD, investment and growth. The reviewed series of papers showed wide-ranging agreement on the beneficial effects on growth when tax shifting from labour to capital takes place. We also found agreement among several

authors that firms consider after-tax profits when making investment decisions and this might alter the likelihood of a profit-led regime. As a consequence, it was argued that it is necessary to take into account taxation on labour and capital and assess its implications for consumption and investment demand in the PKA model.

The chapter has crystallized several channels presented in the relevant PK literature in which an increase in government expenditure might positively affect output, e.g. crowding in private investment. It has argued that in addition to considering only public investment government spending in social and physical infrastructure can both lead to an additional positive effect on the business environment in the economy. The effect of an increase in public debt on output has been shown to be ambiguous and hence requires empirical research to evaluate whether expansionary fiscal policy is sustainable. Finally, it has highlighted some of the limitations of the models reviewed.

The empirical analysis in chapter 5 of this thesis has found that a simultaneous decline in the WS in a highly integrated European economy leads to a decline in growth. A 1% point simultaneous increase in the WS (e.g. a 1% point fall in the profit share) could lead to a 1.45% increase in EU15 GDP. The negative effects of a fall in the WS on consumption outweigh the positive effects on investment in 14 EU MS.

When considering after-tax income the difference in MPC is significantly larger in the majority of the EU15, compared to previous empirical research that applied a private sector open economy model. 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. Strikingly, the integration of the foreign sector does not lead to a regime shift and thus we find 14 countries to be profit-led and only 1 country to be profit-led.

We find evidence for both crowding in and (financial) crowding out effects of fiscal variables on private investment. However, the negative effects of public debt are small compared to the positive effects of public spending, indicating that private investment is positively affected by fiscal expansion.

The chapter also tried to disaggregate government expenditure into three parts to take into account the relative effectiveness of different types of government spending. The empirical results have largely confirmed our theoretical expectations. Public investment shows significant positive effects on private investment in 9 EU MS. Public spending in social infrastructure and other government spending also show positive effects in 5 countries. However, they also show negative effects on private investment in some

countries. These results, however, are only indicative due to data limitations and econometric issues, and require further research in the future.

Compared to the multipliers in the private sector open economy model in chapter 3, and in the previous empirical literature, integrating public spending and public debt into the model increased the multiplier (on average). Moreover, fiscal multipliers following an increase in government expenditure have also been found to be larger on average than multipliers following a change in income distribution. More importantly, multiplier effects were much stronger when policies were implemented simultaneously. We have estimated, that a combined and simultaneous change of a 1% increase in pre-tax WS and a 1%-point increase in public spending leads to a significant increase of 5.56% in EU15 GDP.

Our empirical analysis also confirmed the hypothesis that a more progressive tax system potentially stimulates demand. A redistributive policy of a 1% point fall in ITR on labour income and simultaneous increase in ITR on capital income leads to an increase of 1.43% in EU15 GDP.

We finally estimated the impact of a combined policy mix including pre-distribution, redistribution and public spending and, as expected, the combined mix of wage policy, public spending, and progressive taxation leads to much stronger growth effects with EU15 GDP increasing by 6.63%. The chapter analysed the impact of a targeted public spending policy, together with a more progressive tax policy and a pro-labour wage policy showing on the budget balance showing that it leads to an improvement in the majority of the EU15 MS. On average, the budget balance improves by 0.84% in the EU15. Hence, we have shown that extending the PKA private sector open economy model by taxes on capital and labour increase the likelihood of wage-led economic regime. Integrating public spending increases the multiplier effects and amplifies the wage-led outcome.

The research in this thesis highlights the need for a fundamental rethinking of economic policy in Europe. Whereas a more comprehensive change would include several policy areas this dissertation has focused on two in particular – wage policy and fiscal policy – and outlined the potential of progressive policies for wage-led growth and a public investment stimulus in Europe.

The EC has consistently encouraged wage moderation to increase international competitiveness of individual MS as well as for the EU as a whole. Hence, we have observed a significant decline in the share of wages in national income. In contrast to

conventional wisdom, this has been associated with a weaker and more volatile growth performance in Europe. Even though these policy recommendations have not resulted in a sustainable growth model for the EU the current crisis management still entails strict austerity measures as well as structural labour market reforms recommendations, which will lead to a continuation in wage restraint policies.

The empirical analysis of chapter 3[290] in this thesis indicates that there is room to stimulate demand in the current economic climate of deficient demand and sluggish growth. Our findings imply that increasing the wage share is not an impediment to growth. A coordinated wage policy in a highly integrated Europe, which tends to be wage-led as a whole, can improve growth. It is thus possible to decrease income inequality without harming the growth potential in a wage-led economy.

A coordinated wage stimulus does not have negative effects on investment in aggregate and induced inflation does not conflict with the ECB target. On the contrary, a coordinated wage stimulus is what is needed to keep Europe away from deflation. The analysis also challenges the argument that pro-capital policies are needed to restore competiveness in Europe in a globalised economy. Our findings show that when wage moderation policies are implemented in all countries, the positive price effects on net exports are diminished. The empirical analysis in this dissertation indicates that a wage-led recovery scenario in a globalised economy as well as an alternative to the current strategy of wage moderation in Europe is feasible, given that the coordination problem can be overcome.

Achieving convergence in the level of nominal ULC and overcoming persistent imbalances requires a more comprehensive policy mix of wage policies, investment and industrial policies. Wage-led growth might therefore not be a magic bullet to overcome the problems of the current economic model. A wage-led recovery, however, offers a valuable solution to correct imbalances via coordinated wage policy, where domestic demand plays an important role.

The empirical analysis of chapter 5 has several policy implications. First, a more progressive tax system can help to achieve a more equitable distribution of income and potentially stimulate AD and economic growth. Second, implementing a substantial public investment programme is needed in Europe. The impact of egalitarian wage

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[290] Chapter 3 has been published as a journal article: ONARAN, O. & OBST, T. 2016. Wage-led growth in the EU15 member-states: the effects of income distribution on growth, investment, trade balance and inflation. *Cambridge Journal of Economics,* Advance Access**,** 1-35.

policies are positive but small, however, when mixed with the much stronger impact of fiscal expansion, the overall stimulus is much more effective in reducing income inequality and increasing output. Third, expansionary fiscal policy is sustainable when wage and public spending policies are combined with more progressive tax policy. Fourth, the impact on growth is much stronger when policies are implemented in a coordinated fashion across Europe due to strong positive spill over effects indicating the relevance of fiscal policy coordination.

The main thrust of this thesis has been on wage policy and fiscal policy coordination bringing concerns of equality and targeted spending to the core of the analysis. Combining egalitarian labour market and tax policies with public spending policies are important for achieving higher growth, investment and sustainable debt levels. Public investment policies are key to achieving structural change and keeping the trade balance under control while managing an egalitarian growth model. The effects of progressive wage-led growth strategies and expansionary fiscal policy on growth indicate the potential as an alternative policy to the current crisis management to overcome sluggish growth and demand deficiency in Europe. The significance of these reforms is even greater when coordinated at the European level.

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