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A Structuralist Analysis of Income Distribution and its Influence on the Macroeconomy

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Abstract

This study undertakes a comprehensive structuralist analysis of income distribution and its macroeconomic implications, framed through three distinct but interrelated essays. These three essays aim to generate novel, theoretical modelling contributions to macroeconomic literature, prior to testing these contributions empirically for 7 countries.

The first essay investigates the role of income distribution in maximising real GDP and evaluating cycles in the labour share around some GDP-optimising value, proposing a novel, parsimonious single-equation model to estimate the GDP-optimal labour share without reliance on Cobb-Douglas production functions. Employing Nonlinear Least Squares (NLS) and Dynamic Ordinary Least Squares (DOLS) techniques, the essay demonstrates that the relationship between the labour share and output is non-linear and time-dependent, with substantial variations across the seven countries analysed.

The second essay explores the dynamic interplay between output, household debt, and the labour share (using the abovementioned novel specification to identify labour share cycles suggested in the first essay) positing that deviations between the actual and GDP-maximising labour share influence both business and financial cycles. Generating a two-equation structuralist framework, the study finds (through employment of a Structural Vector Autoregression - SVAR - approach) that income distribution shocks have asymmetric effects on debt accumulation and output, with wage-led economies in the sample under analysis (Australia, France, Germany, Italy, South Africa, the United Kingdom and the United States of America) exhibiting larger increases in household debt volatility and accummulation, than profit-led economies.

The final essay extends the structuralist model found in Flaschel and Krolzig (2003) to an open macroeconomy, integrating wage and price Phillips Curves, monetary policy, and exchange rate dynamics. Employing a large SVAR approach, prior to conducting a stability analysis and utilising a novel, income distribution-sensitive monetary policy rule, the study establishes that shifts in income distribution can exacerbate macroeconomic stability. The findings suggest that structuralist-informed monetary policy frameworks can serve as effective tools for stabilising economies exposed to income distribution shocks. The study concludes by highlighting the policy implications of the findings, advocating for income distribution-sensitive approaches to macroeconomic management.

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Acronyms and Expansions

CF Filter	Christiano-Fitzgerald Filter
CPI	Consumer Price Index
DOLS	Dynamic Ordinary Least Squares
FRED	Federal Reserve Economic Data
GDP	Gross Domestic Product
HP Filter	Hodrick-Prescott Filter
IS-(P)PC-MR	Investment and Savings - (Price) Phillips Curve - Monetary Rule
NLS	Non-Linear Least Squares
OECD	Organisation for Economic Cooperation and Development
SARB	South African Reserve Bank
SVAR	Structural Vector Autoregression
UIP	Uncovered Interest Parity
VAR	Vector Autoregression
WPC	Wage Phillips Curve

1 Chapter 1: Introduction

1.1 Context of the study

Structuralist Macroeconomics is a blend of Marxian and Keynesian economic fundamentals, which is used most frequently to analyse income distribution dynamics in a macroeconomic setting. The core assumption regarding income distribution in this analysis is that national income is split between two classes- the working class (who earns the majority of their income through wage-labour), and the capitalist class (who earns the majority of their income through the ownership of productive assets) (Marx, 1867). Against this backdrop, the current study attempts to make use of Structuralist "macro-fundamentals" aimed at developing macroeconomic models meant to assess changes in income distribution, while also shaping the potential direction that macroeconomic policy can take to redress income distribution imbalances.

Broadly, the topics covered in this thesis include papers written on assessing an optimal level of income distribution (in the GDP-maximising sense), the manner in which deviations from that optimal level of income distribution influence household credit, and the way in which one such functional distribution change destabilises an economy's broader macroeconomy. Further, the thesis provides an analysis as to how such instability can be mitigated through the use of monetary policy mechanisms.

1.2 Motivation for the Study

At its core, this analysis is motivated by a general under-utilisation of the Structuralist lens through which to view and model the impact of shifting income distribution dynamics on macroeconomic health in some contexts. Given pervasive income inequality in South Africa, and because the Structuralist motief casts macroeconomic relationships in a distribution-sensitive light (Leibbrandt, et al., 2012), the South African research case is a clear one which has seen some exploration along the Structuralist vein (see, for example, early post-1994 works done by Gibson and Van Seventer (2000a); Gibson and Van Seventer (2000b) and Nell (2004), or more contemporary pieces of research done by Onaran and Galanis, 2012, Malikane, 2017 and Geda, 2018, inter alia, that are in fact Structuralist analyses), but which warrants further analysis.

Income inequality is, however, not a solely South African (or developing world) problem. Many countries the world over (even the most developed of nations), experience structural challenges which tend to undermine the equality of economic outcomes between classes. Beyond South Africa, the

study provides empirical evidence related to the macroeconomic impacts of income inequality for Australia, France, Germany, Italy, the United Kingdom, and the United States, where income inequality is particularly problematic at the tails of the income distribution (for example, between the bottom 80 percent relative to the top 20 percent) (University of New South Wales, 2020; Anirudh, 2018; The Borgen Project, 2018; Drechsel-Grau, et al., 2022; Generation Maastricht, 2021; Sologon, et al., 2018; Dorling, 2015).

In particular,:

- In Australia, income inequality has worsened since the start of the millennium. In addition, the upper 10 percent of households (by income) earn seven times the lowest 20 percent of households, with this inequality driven by a lack of access to employment and wages (Australia Bureau for Statistics, 2024; University of New South Wales, 2024).
- In France, income inequality is on the rise, with some 9 million individuals living below the poverty line from a net incomes perspective (SDG Watch Europe, 2019)
- In Germany, according to Drechsel-Grau, et al., 2022, total inequality has worsened since the beginning of the twenty-first century, especially given the concentration of wealth (there is a high likelihood for retained, intergenerational wealth, with the likelihood of the top 1 percent falling out of that cluster at close to zero)
- In Italy, there has also been a persistent rise in income concentrations since the 2000s, with the top 1 percent of earners earning over ten percent of overall national income in Italy as of 2021 (Guzzardi and Morelli, 2024).
- In the United Kingdom, income inequality has grown substantially (notably, post-Brexit), with a Gini coefficient of between 0.35 and 0.4 as of the latest available data (Francis-Devine, 2025).
- In the United States, income inequality is also of growing concern, with the share of national income earned by the top 1 percent having increasing markedly since the turn of the century (United States Census Bureau, 2024).

Resultantly, these countries have been included in the study for a handful of reasons:

- Considering potentially widespread income inequality that is often not the prime focus because of a country's high degree of development, these 6 countries are also included in the analysis of the relationship between income inequality and other key macroeconomic factors. Including such countries will provide a global context which echoes what is already common knowledge

at this stage- income inequality is detrimental to socioeconomic progress. Analysis for these countries, we believe, will also provide incisive evidence to suggest that, not only does the truism "income distribution matters" still hold true across development contexts, but also that income distribution can be seen as a macroeconomic lever that, once abused, will develop sub-optimal macroeconomic outcomes.

- Considering the most income-inequitable of countries in the world by multiple measures (South Africa), it is also useful to evaluate South Africa's outcomes relative to a set of developed peers.

- Granular, robust and timely data on income shares is also difficult to source from the developing world perspective. While future studies could, for example, evaluate more emerging market contexts, at the time of writing, quarterly data that appeared reasonable was difficult to source.

A blend of these sub-optimal macroeconomic outcomes experienced historically across the country group, coupled with policy and contextual relevance associated with improving income inequality, creates a direct motivation for one such Structuralist study as proposed in this current analysis.

1.3 Research Problem

At the core of this research is work done by Goodwin (1967). In his seminal work,"A Growth Cycle", Goodwin develops a theoretical model that describes the way in which cycles in employment (and, through Okun's Law- the positive relationship between GDP and employment (Okun, 1963)) are affected by the labour share. As Palley (2017, pp 1) confirms, "Since the distribution of wages impacts personal income distribution, that explains why income inequality can also impact regime character. Increases in workers' wage share always increase growth and capacity utilisation regardless of the economy's character. Furthermore, an increase in workers' wage share can flip an economy from being profit-led to wage-led." As a base, our main research problem is therefore:

Income distribution dynamics are cyclical (Goodwin, 1967; Palley, 2017). How can such a cycle be estimated empirically, and how does such a cycle influence the stability of the macroeconomy at large and the prospects of economic expansion?

This problem is unpacked by first developing a novel method to empirically assess cycles in income distribution, as Goodwin postulates exist. Once obtained empirically, the subsequent analyses relate to assessing how the cycle in the labour share influences the financial cycle (arguably one of the

most important macrofundamental theories to be researched in the wake of the 2008 financial crisis, with roots in research going as far back as Minsky (1975)), and assessing how this newly, empirically defined income distribution cycle might influence other macro-aggregates (inflation, unemployment, and so forth), paying particular focus to the destabilising effects that labour share movements have on such macroaggregates (Flaschel and Krolzig, 2003; Franke, Flaschel and Proano, 2006; Origazzi, 2008).

The authors further note that there exists a large body of literature surrounding cycles in economic indicators- predominantly, those related to business cycles and financial cycles (see, for example, a summary of such works on cycles by Romer (2008), or Carlin and Soskice (2015)) . Under this Structuralist school of thought, the general focus of the analysis tends to be the labour share, and the cycles within that share generally are often relatively underexplored (Barbosa-Filho and Taylor, 2006; Kabaca, 2014; Grasselli and Maheshwari, 2018). Therefore, the sequencing of the technical chapters relates first to understanding the existence of the labour share cycle and subsequently extracting information regarding the cycle, before applying that extracted information to understand how fluctuations in that cycle first relate to other major econo-financial cycles, and then separately, how fluctuations in the labour share cycle require the need of policy course correction to bring about stability within a macroeconomic structure.

1.4 Research Questions and Hypotheses

In order to make clear the goals of the current thesis, it is important to outline the question that each chapter attempts to answer. As such, each chapter's research question(s) are as follows:

- Chapter 3: Is there an optimal income distribution level (proxied for by the labour share) which maximises real Gross Domestic Product? If so, what level of the labour share will maximise real GDP for a subset of countries, and how does the labour share cycle around that optimal?

- Chapter 4: How would deviations between real-GDP-maximising labour share and actual labour share levels influence the business and financial cycle (the former, proxied for by changes in GDP, the latter proxied for by changes in household debt over time) within an economy?

- Chapter 5: How does maximising output through changes in income distribution influence an (open) macroeconomy at large? Is there any relationship between this realization of a maximised real GDP and price or wage inflation, short term interest rates and/or exchange rate volatility? If so, is there a reaction needed by monetary policy to stabilise these potentially destabilising macroeconomic impacts?

We accordingly hypothesize:

- Chapter 3: In most, if not all countries, a labour share cycle exists (as per Goodwin, 1967) and redistributing more income towards workers (increasing the labour share) will increase output from the demand side (as Kalecki (1971) hypothesizes).
- Chapter 4: Changes in income distribution beyond real-GDP maximising levels influence both the business and financial cycle in a non-negligible way. An increase in the labour share to above its real-GDP maximising level will increase both nominal output and nominal household debt stocks (as Minsky (1975) suggests).
- Chapter 5: A change in income distribution has the ability to influence key macroeconomic variables within an economy in a non-negligible way; a change in income distribution is also able to influence whether an economy will be equilibrium-tending or not (as pointed to by analyses done by Flaschel and Krolzig (2003), and Franke, Flaschel, and Proano (2006)). Furthermore, changing the interest rate with respect to changes in the labour share in targeted policies is able to steer the economy towards a more stable equilibrium across the general macroeconomic framework (Taylor, 2009).

1.5 Contribution of the Study

The specific contribution (and identified gap in the literature) for each chapter is provided below:

- Chapter 3: Income Distribution and its Role in Maximising Real Output
  - Gap in Literature- Analyses done in the literature to assess the optimal labour share rely on Cobb-Douglas functions which, as Fisher (1971), Shaikh (1974) and Shaikh (1979) point out, breed inaccuracy and are unrealistic to rely on, with such analysis developing labour share estimates at the mean (i.e., static estimates). In particular, relying on such Cobb-Douglas functions in general (and therefore, when estimating optimal labour shares) generate an aggregation problem (while an economy's micro-firms might follow some Cobb-Douglas production function, these might not be the same across all firms), and an identity problem (where the presupposition that an economy follows a specific production function of a well-defined nature is called into question- especially considering that such a functional classification works well with fake, randomly generated- so-called "Humbug"- data). (Shaikh, 1974; Shaikh, 1979)
  - Contribution- The analysis mathematises, and subsequently quantifies through econometric analysis, a single-equation method based on

Structuralist economic theory to estimate an optimal labour share that maximises real GDP, which does not rely on Cobb-Douglas functions, which steers the analysis away from falling into either the aggregation or identity pitfalls by instead relying on concrete macroeconomic theories of aggregation and aggregate demand (i.e., classical Keynesian macroeconomic aggregation), and is employable to estimate such an optimal for every time period for which data is available (and not at the mean). Further, the study confirms cycles in the labour share as Goodwin (1967) postulates, and analyses this labour share cycle for all 7 countries previously identified. This information is able to feed directly into policy debates regarding the need for accumulating profit, vis-a-vis improvements in labour earnings or the timing of labour market policy interventions (skills development programmes, minimum wage legislation changes, and so forth) as they pertain to impacting the wage bill (either the number of people employed, or their aggregate wage).

- Chapter 4: The Interplay between Output, Household Debt and the Labour Share
  - Gap in Literature- Although much research has been done to assess the determinants of real business cycles and financial cycles, relatively few parsimonious models have been developed to assess the relationship between these cycles and their relationship to changes in income distribution levels (i.e., the labour share cycle). This interplay between business, financial, and labour share cycles is particularly critical given the relationship between such cycles and the cost of borrowing. Each position in each cycle corresponds to a given market interest rate, a key macroeconomic policy lever which, once changed, shifts nominal positions in each cycle in a self-resonant fashion (Kabaca, 2014). Further, it is very rare that such studies conduct an analysis of inequality with respect to household debt (in fact, studies focus rather on overall macroeconomic debt and the income share of the top 1, 5 or 10 percent vis-a-vis the bottom percentiles - Perugini, et al (2013); Tuomas (2014); Holscher, et al., (2015); Behringer, et al., (2017))
  - Contribution- This analysis mathematises a novel, parsimonious, two-equation model that is usable to assess the relationship between household credit cycles, output growth cycles, and cycles in the labour share before estimating this model using an SVAR approach. This model is then applied to real world data for 7 countries, the results from which can be used to further understand the linkage between each indicator's (GDP, household debt, and the labour share) position along their respective cycle, and how shocks to any of those positions may influence one another over time.

- Chapter 5: A Dynamic "Distribution-Sensitive" Model of an Open Macroeconomy with stabilising Monetary Policy
  - Gap in Literature- Seminal works done by Flashcel and Krolzig (2003) and Flaschel, et al. (2006) provide a classical closed-economy Keynesian framework to assess the macroeconomic stability impacts of changes in the labour share. However, these models are estimated for the United States, and are not augmented to include labour share cycle dynamics, or an open-economy perspective.
  - Contribution- This study adds to the theoretical framework developed by Flashcel and Krolzig (2003) and Flaschel, et al. (2006) by augmenting their theoretical model to include labour share cycle dynamics and an open-economy model parameterisation. Thereafter, we estimate the theoretical framework through an SVAR approach for the 7 countries within the sample of analysis. This stability analysis feeds directly into the development of optimal monetary policy responses given shocks to the labour share, which can either be driven by fiscal policy, labour market policy, or the nature of market forces. Such evidence is critical in ensuring that policy decisions are ultimately evidence-based, and considering the employment of such a model, is extremely useful to policymakers as and when shocks to income distribution occur, and in general.

1.6 Data Description

1.6.1 Data Sources and Methods of Calculation

Before outlining the study and its general undertakings, it is perhaps important to discuss the various data sources drawn upon in order to obtain these results. Not only this, it is important to realize that the use of different data sources may have implications on the results set out in this study. Nevertheless, for the most part, we realize that the data used is from robust sources. This is discussed in the following table:

Table 1: Data Sources and Time Periods per Country

	Australia	France	Germany	Italy	SA	UK	USA
Compensation of Employees	FRED	FRED	FRED	FRED	SARB	FRED	FRED
Consumer Price Index	OECD	OECD	OECD	OECD	SARB	OECD	OECD
Employment Rate	OECD	OECD	OECD	OECD	SARB	OECD	OECD
Gross Domestic Product	FRED	FRED	FRED	FRED	SARB	FRED	FRED
Household Credit	FRED	FRED	FRED	FRED	SARB	FRED	FRED
Nominal Exchange Rate	FRED	FRED	FRED	FRED	SARB	FRED	FRED
Nominal Interest Rate	OECD	OECD	OECD	OECD	SARB	OECD	OECD
Real Exchange Rate	FRED	FRED	FRED	FRED	SARB	FRED	FRED
Market Share Price Index	OECD	OECD	OECD	OECD	OECD	OECD	OECD
Unemployment Rate	OECD	OECD	OECD	OECD	SARB	OECD	OECD
Start of Time Period	1994Q1	1994Q1	1994Q1	1995Q1	1994Q1	1994Q1	1994Q3
End of Time Period	2017Q1	2017Q2	2017Q2	2017Q2	2017Q4	2017Q1	2017Q2

As can be gleaned from the table, data either stems from the OECD, FRED or SARB (in the case of South Africa) databases. In most instances (save for the French employment data), the data is filled from between the start (1994) to the end time period (2017). In the case of the French employment level, however, unemployment statistics are only available from the beginning of 2002, onwards.

In terms of data construction, it is also important to be consistent. As such, a few broad statements can be made here:

1. In general, growth rates are calculated as 4-quarter (year-on-year) percentage changes through the use of natural logarithms.

2. In order to obtain the labour share, the analysis divided employee compensation by price-normalized national income. This is common practice, but may understate the value of the labour share by the income earned by the self-employed portion of the economy. Inherently, this is a difficult task which itself requires modelling (and can become an individual research paper all on its own). Nevertheless, it is important to admit to the fact that this may influence the results as set out in this current thesis. This may be room for future analyses.

3. A proxy for Tobin's Q has been used- instead of calculating Tobin's Q in a manual fashion for the economy, a weak proxy identified in the literature is the general market share value index for a particular country (see work done by Taylor (2009), inter alia). This itself tentatively shows a market capitalisation value for the economy as a whole, and forms a large part of Tobin's original idea of what the variable should/could measure at firm-level.

1.6.2 Data Stationarity

To this point, nothing has been said regarding whether all variables (either collected or generated mathematically) are stationary or not. The discussion of stationarity is one which divides macroeconometricians the world over. Some, like Johansen, might argue that the notion of stationarity is sacrosanct and should be corrected for in all econometric analyses worth their salt. There is, arguably, an element of truth to this, given the inobvious linkages that some variables experience over time- falling into a spurious regression trap would thus definitively bias one's results and impending inference.

A growing body of literature also admits to the fact that- in some instances- theoretical relationships, in a way, supersede the need for analysing data through a cointegrating lens. In line with this, if a relationship is derived from solid theoretical underpinnings which are well-founded in literature, it might not be necessary to estimate regressions using cointegrating analysis (either of the uni- or multivariate form).

It is, however, best practice to point to the fact that we have assessed whether each variable is explained by an underlying unit root process or not. Generally, across all countries, we find that all level variables (output, unemployment, credit etc.) tend to have a unit root. Unsurprisingly, differencing these variables yields a stationary process. This analysis was done through the use of Augmented Dickey-Fuller, Phillips-Peron, and KPSS tests, whose results have not been included here due to the number of variables and countries upon which these analyses were done (approximately 30 variables for 7 countries).

So as to correct for this, we estimate the results for the first chapter of the thesis using both regular (i.e., non-cointegrating) and cointegrating methods alike. This, more than anything, ensures robustness and wider acceptance of the results found in the chapter

Importantly, we do not utilise the cointegrating analysis framework for the remainder of the thesis. This is for two main reasons:

1. Papers referenced in the theoretical analysis make use of SVARs, and our methodologies follow theirs closely where feasible. But, more importantly

2. The main output of this research is theoretical, and not empirical. While strong empirics are extremely integral for the robust analysis of economic problems, the focus of our analysis is primarily to create a theoretical output which is both novel (to varying degrees per chapter) and useful. Given this truth, it is important to stress that our empirical analysis is limited by not using using multivariate cointegrating techniques where feasible in chapters

four and five (although vast amounts of literature referenced does suggest that each variable of interest is related as expected).

1.7 Structure

This thesis is broken down into a handful of distinct chapters. The first of which, the current introduction, provides the study's objectives, contributions, hypotheses and motivations. The introduction is followed by a literature review touching on aspects of literature pertinent to all methodological chapters, before presenting a further three technical chapters that guide the development of novel income-distribution-sensitive macroeconomic models, aimed at assessing key macroeconomic drivers and their dependence on functional income distribution changes. These chapters are then followed by a broad concluding chapter spanning across all evidence collected and analysed. This review of literature is provided in the ensuing chapter.

2 Chapter 2: Literature Synopsis

As mentioned before, an economy can be disaggregated into two broad classes; those economic agents whose majority of disposable income comes from wage-labour- henceforth the labourer/working class- and those agents whose majority of disposable income comes from the investing in and accumulation of capital- the capitalist class (Marx, 1867). These classes interact within a mode of production in order to create a nation's output. There is, therefore, a fundamental and intimate link between classes and production. Given the structural features of various countries, a nation can either be classified as "wage-led" (where a surge in wages leads to demand growth) or "profit-led" (where a surge in profits improves economic growth through the investment channel) (Goodwin, 1967; Boddy and Crotty, 1975; Bhaduri and Marglin, 1991; Taylor, 2009; Onaran and Galanis, 2012).

Generally, this regime is determined through the augmentation or decomposition of Keynes' classical effective demand equation. The components within Keynes' (1936) seminal aggregate effective demand equation are all- at least somewhat- driven by income distribution across classes. For instance, an increase in the share of income earned by labourers may increase consumption (considering that the working class is the majority of a nation's labour force) but simultaneously decrease profits such that private investment/gross fixed capital formation worsen over time (Taylor, 2009).

Thus, although consumption in this instance would have increased, investment would act as an opposing force to this increase. The magnitude of each change, in turn, determines the influence that an increase in the labourer's share of income has on output. If, for example, the expected consumption increase from this increased labour share was larger than the expected drop in investment, an increase in the labourer's share would yield a net increase in output (while, of course, the inverse also holds true) (Boddy and Crotty, 1975).

Where an increase in the labourer's share influenced an increase in output within a country, this would imply that the economy is led into growth by an improvement in working class standing- in this case, wage-led economic growth. If, however, the inverse was to hold true, an economy would be deemed profit-led (where an increased labour share bid down profits by a large enough margin to decrease output more so than the expected increase in consumption set forth by the improvement in labour share) (Bhaduri and Marglin, 1991).

This so-called "output regime" (either wage- or profit-led) differs across countries, and is dependent on the inherent nature and structure of the

economy under scrutiny. The seminal work of Goodwin (1967), for instance, finds that- due to cyclicality inherent to the capitalist mode of production- a nation may cycle between having a negative or positive relationship between the labour share and output (implying a movement from a profit-led to wage-led regime or vice versa).

Furthermore, there exists a large base of literature linking nations to being specifically wage- or profit-led at particular points in time (for a synthesis of these results across a wide array of research, see work done by Onaran and Galanis (2012) or Malikane (2017)).

Although nations are classified as either being under profit- or wage-led regimes, there are relatively few studies that look to develop a non-econometric model to estimate such regimes over time that do not rely on Cobb-Douglas production capabilities (for a summary of research related to Cobb-Douglas optimisations, see for example Blumle and Sell, 1998; Palley, 2017; Growiec, McAdam and Muck 2018).

Relying heavily on such a function relates to two major theoretical issues which decrease the reliability of the information obtained when developing methods along similar veins. In particular, relying on Cobb-Douglas functions generates an aggregation problem. The first of these is an inaccuracy arising where an economy's micro-firms admittedly might follow some Cobb-Douglas production function, but where such production functions may not be the same across firms, and so aggregation thereof is increasingly not representative of real economic activity, especially as the number of firms (and their heterogeneity) increases). The second of these is an identity problem, where the presupposition that an economy follows a specific production function of a well-defined nature is called into question- especially considering that such a functional classification works well with fake, randomly generated- so-called "Humbug"- data, making such analyses easy to manipulate by pre-defining favourable mathematical relationships of the macroeconomy a priori and obtaining synthetic correlations between indicators passed through this pre-defined mathematical relationship, especially when using log transformations as a means for regression (Shaikh, 1974; Shaikh, 1979).

Under the current approach provided by the literature, the research also implicitly allows an ever-increasing profit share to yield continuously positive economic growth if an economy is profit-led (i.e., an economy is identified as wage- or profit-led at the mean). However, should a nation be deemed profit-led, it is unlikely that profit increases ad infinitum would yield economic growth considering that such increased profit is at the expense of real wage growth, and therefore, real consumption growth. As a result, the labour

share hovers between 0 and 1, and not at the extremes- if the regime were determined at the mean, and an economy was deemed wage-led, a labour share of 1 (or 100 percent) would maximise real economic outcomes, which is not the case in reality (Boddy and Crotty, 1975; Onaran and Galanis, 2012)

The output regime is, however, not the only core relationship found in the Structuralist literature. In fact, each key macroeconomic variable relates to income distribution in a particular way based on the inherent structure of the economy within which that relationship is being assessed.

For example, it is common knowledge at this stage that oscillations in output exist; in times of prosperity, output is seen to rise, whereas- when a nation is in dire straits- output is seen to decline. The reasons for these oscillations are dependent on ideology- some argue that these cycles (in fact, the business cycle relating to upswings and downswings of a nation's income) stem from changes in investment levels (Hayek, 1931), while others argue that this cyclicality in output is dependent on the impact that technological advancements have on productivity and employability (for instance, Schumpeter in 1947). Others still believe that these oscillations stem from class struggle and changes in consumption, where -in times of prosperity- the capitalist class may not mind to employ workers, but during more lean periods, may instead retrench those workers, bidding down consumption and, ipso facto, both national income and output (Goodwin, 1967).

While post-2008 saw a resurgence in financial cycle research, such analyses into either credit (public or private) or housing prices saw prominence throughout the 1900s, before fading out of popularity in the early 2000s until the financial crisis (see works done by Carlin and Soskice 2015; Flaschel and Semmler 2003; Kindleberger, 2000; Goodhart and De Largy, 1999; Balino, 1987; Diaz-Alejandro, 1985; Minsky, 1982; Minsky 1975; and Mises, 1912). As Borio (2012, pp 50) points out, these cycles in financial market indicators relate to "self-reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing constraints".

In very rare instances, as Taylor (2009) points out, these analyses extend themselves to including proxies for income distribution. In these rare cases, however, movements in the labour share have a destabilising impact on financial variables. Origazzi (2007), for example, points out that an increase in the labour share cuts into profit- a decline in profits, in turn, puts capital loan repayments from businesses at risk, cutting into banking margins, and so forth. Kabaca (2014) notes the simultaneous relationship between the labour share and the market interest rate- the latter, a lever to influence an economy's nominal position in the business, and financial cycles, which

are ultimately once more impacted by the labour share and shocks thereto. Ryoo and Kim (2014) further suggest that lower labour shares may feed into over-borrowing, either due to emulation (i.e., the working class wanting to emulate consumption patterns of the more wealthy that they cannot afford) or due simply to the need to obtain finance in light of worsened incomes.

However, as Minsky (1975) alludes to and as Taylor (2009) reflects on, financial market variables reflecting the financial cycle (like household debt, or housing prices) can be driven by the labour share either positively or negatively. Of particular interest to this current thesis is the relationship between household debt and the labour share. In general, Taylor (2009) suggests that household debt could conceivably increase due to an increase in the labour share (i.e., collateralisation considering improved earnings), or decrease due to an increase in the labour share (i.e., debt-payoff). This relationship remains, however, relatively underexplored for the countries under analysis, and warrants further analysis.

Since financial and business cycle literature has existed, there has also been a move towards understanding the relationship or interplay between the two cycles. As Claessens, et al. (2011) suggest- financial cycle busts, depending on their nature, have very different impacts on business cycles (as Claessens, et al. (2011) point out, household debt crises relate to stronger economic recovery than financial cycle recessions related to housing prices or equity price busts). In turn, business cycle positions may exacerbate the length of financial cycles (a business cycle bust will likely create unemployment, which might exacerbate a household debt crisis). While the literature base in this regard is wide, and further while the labour share features in some of this analysis, very little attention is paid to the interplay between the labour share cycle (i.e., whether an economy is profit- or wage-led), and the financial cycle. This provides a gap in the literature that will be leveraged in Chapter 4.

Beyond output- and financial-indicator-labour-share regimes, other key macroeconomic variables are also related to the labour share in a ubiquitous system of equations. Without the labour share and in their most basic forms, models of an open macroeconomy contain the following components (Keynes (1936); Franke, Flaschel and Proano (2006); Taylor (2009); Romer (2012); (Blanchard and Johnson (2014); Gali (2015); Carlin and Soskice (2015)):

1. An Investment-Savings (IS) relationship which governs the negative relationship between interest rates and an economy's output,

2. A Monetary Policy Rule (MR) which takes into account the relationship between the central bank of a nation and its stance on things like output growth, exchange rate volatility and inflation,

3. Some relationship which governs the impact that monetary policy changes have on the exchange rate within the economy (for instance, either Covered or Uncovered Interest Parity- CIP or UIP), and finally

4. An idea of the relationship between output growth and inflation (usually through estimating a Phillips Curve- PC- of some form).

This form of economic model is sufficient to provide a snapshot into the macroeconomy of a particular country. However, in this "simplest" form, these factors are insufficient in themselves to shed light on the complexities associated with ever-evolving macroeconomic systems. Although much work has already been done in expanding on these economy-wide models, there is yet room to improve further - specifically, in relation to the inclusion of other relationships and factors which make for a more holistic picture of an economy.

In particular, this basic model does not take into account wage pressure or unemployment levels (if utilising output-based Phillips relations). However, while this has been corrected for over time, information regarding a crucial driver of both unemployment and wage pressure is still yet to be widely leveraged. Namely, these economy-wide models very rarely focus on the impact of changes in income distribution and the impact that those changes might have on, inter alia, whether monetary policy is stabilising in nature or not. It is often the case that, without controlling for such income distribution dynamics, monetary policy decisions in a particular country might be seen as sufficient to be construed as economically stabilising, when in fact they are not (Taylor (1991); Chiarella and Flaschel (2000); Chiarella, Flaschel and Franke (2005); Flaschel, Franke and Proano (2006) Taylor (2009)) .

Given a confluence of regimes related to the labour share, it is clear that any and all future research seeking to shed light on such regimes is invaluable. As will be discussed from hereon, this research seeks to shed light on such regimes by developing theoretical models along the Structuralist line of thought. While parsimonious and arguably simplistic, these models provide straightforward means to assessing the relationship that changes in the functional distribution of income have on a host macroeconomic indicators.

3 Chapter 3: Income Distribution and its Role in Maximising Real Output

3.1 Introduction

A large volume of Structuralist macroeconomic research deals with evaluating whether an economy is wage-led or profit-led in growth. While this sort of analysis has been done often, there are three major gaps in the literature (see Bowles and Boyer, 1995; Naastepad and Storm, 2007; Ederer and Stockhammer, 2007; Hein and Vogel, 2007; Stockhammer and Stehrer, 2011; Onaran and Galanis, 2011 and 2012; Piketty 2014; Growiec, et al., 2019.) which, when closed, will improve the robustness of the analysis and ensuing results therefrom. The literature, up until this point usually:

1. Assumes that relationship between income/production and the labour share is static over time,
2. Does not provide for a parsimonious approach with which to determine output regimes, and
3. Assumes that the relationship between the labour share and production/income is linear, usually relying on a Cobb-Douglas function which is often refuted as being too tenuous a link to reality to be utilised without major simplifying assumptions (Fisher, 1971; Shaikh, 1974).

This set of gaps creates a foothold that this research attempts to fill. Because, while knowing whether output is positively or negatively related to the labour share is intrinsically important for policy-making, it is only when an analysis attempts to assess whether this positive or negative relationship changes over time that will assist in the creation of more informed policy. It is only with this more nuanced picture of the relationship between output and the labour share that the timing and scale of changes to minimum wages, the optimal time to target employment interventions, and the timing of investment decisions among other things, that the optimal economic impact can be teased out from the expected policy change.

In order to fill these gaps, this research contributes an approach to modelling the output regime of any country within a real-GDP maximising framework. In so doing, the analysis develops a dynamic framework that assists to distil the output regime of a country over time. This is done by first outlining the theoretical framework under consideration.

3.2 Theoretical Framework

Instead of the commonplace (and static) treatment of the relationship between the labour share and output (Onaran and Galanis, 2011 and 2012; Piketty 2014; Growiec, et al., 2019.), one could suggest that- when considering labour demand of a particular type- the labourer's share may end up being non-linearly related to real output without the need to rely on Cobb-Douglas Production Function patterns. With this, it may be that- instead of being profit- or wage-led indefinitely, an economy may cycle between these regimes.

Keeping this non-linear relationship in mind, we propose a labour demand schedule which is a synthesis of theories found in Keynes (1936) and Varian (1992), in equation 1 below:

$$3.1. \quad L_t = (\frac{P_t Y_t}{W_t})^{\beta}$$

Here, labour demand (L_t) is directly related to a firm's total revenue (Varian, 1992) or, indeed, the Gross Domestic Product of a country at current prices when scaling up to the Macroeconomic level -$P_t Y_t$- and inversely related to the money wage -W_t (Keynes, 1936).

In the first instance, it is argued that an increase in the total revenue of a firm should relate to an increase in its capabilities to produce, and- ipso facto- its necessity to employ more labourers (Varian, 1992). An increase in wage demands, on the other hand, increases the cost of employing a prospective worker, decreasing labour demand (a direct, although nonlinear, take on Keynes' (1936) classical postulate linking the marginal product of labour negatively to wages).

Further, Keynes' (1936) seminal outlook on aggregate demand is inherently useful as well. However, in its most ubiquitous form, the classical aggregate demand relation is not cast in terms of income distribution. Following the method outlined by Taylor (2009),the classical Keynesian view of aggregate demand can be cast in a Structuralist light.

$$3.2. \quad Y_t = C_t + I_t + G_t + (X_t - M_t)$$

Where real domestic output (Y_t) is the summation of private consumption (C_t), firm-driven investment (I_t), government expenditure (G_t), and net exports ($X_t - M_t$).

Naturally, Taylor (2009) puts forward that all the elements of effective demand can be affected by labourers and by capitalists, given that these are the only two classes we have assumed to act in the model. It is by breaking down aggregate effective demand into functions of income distribution between classes that the posited labour demand function will be made workable as a means to non-linearly relate national output to the labour share, making this an extremely crucial set of steps.

As such, "Structuralist Consumption" can be disaggregated below:

$$3.3a. \quad C_t = (1 - s_l)(1 - \tau_l)\frac{W_t L_t}{P_t} + (1 - s_c)(1 - \tau_c)\frac{\Pi_t}{P_t}$$

In equation 3a, labourer and capitalist consumption relate to class-specific tax rates (τ_l and τ_c) , their propensities to save in accordance with their own savings rates (s_l and s_c), as well as their own incomes (the real wage bill- $\frac{W_t L_t}{P_t}$ - and real capitalist profit- $\frac{\Pi_t}{P_t}$ respectively). It is assumed that savings and taxation both cut into class-consumption, while income earned by each respective class positively relates to consumption (Taylor, 2009).

Work by Kalecki (1942), and then Taylor (2009), provide the relevant investment function:

$$3.3b. \quad I_t = s_l\frac{W_t L_t}{P_t} + s_c\frac{\Pi_t}{P_t} + \alpha_y Y_t$$

Because labourers save in our current model specification, it is likely that their savings (s_l) will be transformed into credit, and used in order to boost capital investment. As such, we assume that the savings of labourers from their real wages relate positively to investment (Taylor, 2009). Similarly, as profit increases, investment (and, thus, capital accumulation) is expected to increase by a factor of s_c. Due to a capitalist's increased profit, the ability of the capitalist to obtain a loan which could fund large capital projects improves, bolstering investment (Kalecki, 1942). Put differently, as capitalists save their share of profits, so too are they more able to invest in capital.

In a similar vein, it is suggested that economic expansion is related to improved investment and capital accumulation within the capitalist mode, bidding up investment- hence α_y is positive as well (Kalecki, 1971).

Penultimately, considering government spending of the Taylor (2009) type, equation 3c speaks to G_t in Keynes' effective demand equation:

$$3.3c. \quad G_t = \tau_l\frac{W_t L_t}{P_t} + \tau_c\frac{\Pi_t}{P_t}$$

It is simply argued that, as revenues increase (for either the working or capitalist class), tax revenues increase from the perspective of the state. This yields an ability to expend more on public goods and implies a positive relationship between these tax rates (as well as the relative income of each class) and government expenditure (Taylor, 2009).

It must be said that the steady-state primary balance (i.e., government spending less taxes at economic steady-state) also has a potential impact on government spending. However, given the nature of our economic modelling, this, and other omitted factors, all form part of the error term in the final equation. This, we believe, is room for improvement in the model. Nevertheless, it is possible that this steady-state primary balance is also a function of the various levels of income distribution, given a fiscus' mandate to maintain income equality (Taylor 2009). As such, for the time being, we have assumed that primary-balance effects on government spending have been encapsulated in the real wages and/or real profits terms.

$$3.3d. \quad X_t = \pm\sigma_l \frac{W_t L_t}{P_t} \pm \sigma_c \frac{\Pi_t}{P_t}$$

$$3.3e. \quad M_t = \theta_y Y_t \pm \theta_l \frac{W_t L_t}{P_t} \pm \theta_c \frac{\Pi_t}{P_t}$$

In line with Structuralist literature, the inclusion of workers' and capitalists' real compensation can be argued for from two different positions- either from the perspective of production costs or of strict consumption when looking at the export function. In the first instance, it is argued that the inclusion of real wages and profits acts as a proxy for production cost- if this compensation had to increase (if, for instance, wages had to rise), per-unit labour cost would increase, increasing the price of domestically produced goods, and decreasing export demand in conjunction. The same can be said for real profits (as profits increase, it is possible that mark-up on goods might increase, increasing export cost accordingly (Lavoie 2014). This makes the case for negativity in σ_l and σ_c) (Stockhammer, et al., 2008).

If, however, one had to look at consumption as the opportunity cost of exporting domestically produced goods, it stands to reason that an increase in real wages or profits improves the ability of the working and capitalist classes to consume that which was meant to be exported, at the cost of consumption of the other class.

If the profiteer's decrease in consuming otherwise-exportable goods exceeds the increase of the working class consumption of these goods, it stands to reason that an increase in the labourer's share of income may increase the

actual amount of exportable goods in this way, making a case for positivity in σ_l, whilst σ_c would retain negativity. Instead, if the inverse is to hold true (and an increase in labourer income pushes up net consumption of exportables vis-a-vis the decrease in profiteer's consumption of those exportables), σ_1 could also be negative, whilst σ_c could be positive.

Moving to the import function; as domestic income increases, so too should a country's ability to trade (and thus, import), making a clear case for positivity in θ_l (Appleyard, et al., 2008). Furthermore (and as is synonymous with Structuralist macroeconomic relationships), ambiguity exists regarding the relationship between imports and real workers' compensation. If the labourer's share increases, and economic growth in a domestic economy is wage-led (put differently, an increase in the labourer's share increases economic activity more so than the depression of profits decreases economic activity (Bhaduri and Marglin, 1991)), there exists a case for positivity in θ_l, and negativity in θ_c. This suggests that the lion's share of imports are purchased from those who are labourers within the economy. If the inverse is to hold, an increase in the labourer's share may in fact depress import demand, making the case for negativity in θ_l and positivity in θ_c.

Substituting equations 3a-3e into the seminal Keynesian aggregate demand function may be viewed from the Structuralist perspective as equation 4:

$$3.4. \quad Y_t = (1-s_l)(1-\tau_l)\frac{W_tL_t}{P_t}+(1-s_c)(1-\tau_c)\frac{\Pi_t}{P_t}+s_l\frac{W_tL_t}{P_t}+s_c\frac{\Pi_t}{P_t}+\alpha_y Y_t+\tau_l\frac{W_tL_t}{P_t}$$
$$+\tau_c\frac{\Pi_t}{P_t} \pm \sigma_l\frac{W_tL_t}{P_t} \pm \sigma_c\frac{\Pi_t}{P_t} - (\theta_y Y_t \pm \theta_l\frac{W_tL_t}{P_t} \pm \theta_c\frac{\Pi_t}{P_t})$$

In order, however, to cast this relationship in terms of labour demand as set out in equation 1, and ultimately income distribution, one should first be aware of two structural relationships governing the labourer's share and output as discussed in Taylor (2009):

$$3.5. \quad S_t = \frac{W_tL_t}{P_tY_t}$$

$$3.6. \quad \frac{\Pi_t}{P_t} = Y_t - \frac{W_tL_t}{P_t}$$

With the former simply governing the structural manner in which the labourer's share in income is formulated, while the latter simply posits the notion that all income in the economy can be shared between the working class and the capitalist class (as governed by the real income of profiteers- $\frac{\Pi_t}{P_t}$). These, in conjunction with the labour demand schedule postulated above, can be useful tools made to redefine output dynamics in a Structuralist way.

Firstly, utilising the labour demand schedule found in equation 1 and substituting this into the relationship governing real labour compensation ($\frac{W_t L_t}{P_t}$) portion of the aggregate demand relation yields:

$$3.7a. \quad \frac{W_t L_t}{P_t} = \frac{W_t(\frac{P_t Y_t}{W_t})^{\beta}}{P_t}$$

This simplifies to equation 7b:

$$3.7b. \quad \frac{W_t L_t}{P_t} = (\frac{W_t}{P_t})^{1-\beta} Y_t^{\beta}$$

Then solving equation 5 for the real wage (i.e., $\frac{W_t}{P_t}$) yields:

$$3.7c. \quad \frac{W_t}{P_t} = \frac{S_t Y_t}{L_t}$$

This result from 7c is then substituted into equation 7b, and the resultant equation simplified in order to obtain equation 7d:

$$3.7d. \quad \frac{W_t L_t}{P_t} = (\frac{S_t}{L_t})^{1-\beta} Y_t$$

In order to further simplify, we then plug equation 6 into the aggregate effective demand equation (equation 4) which yields:

$$3.7e. \quad Y_t = (1-s_l)(1-\tau_l)\frac{W_t L_t}{P_t} + (1-s_c)(1-\tau_c)(Y_t - \frac{W_t L_t}{P_t}) + s_l \frac{W_t L_t}{P_t} + s_c(Y_t - \frac{W_t L_t}{P_t}) + \alpha_y Y_t$$

$$+\tau_l \frac{W_t L_t}{P_t} + \tau_c(Y_t - \frac{W_t L_t}{P_t}) \pm \sigma_l \frac{W_t L_t}{P_t} \pm \sigma_c(Y_t - \frac{W_t L_t}{P_t}) - [\theta_y Y_t \pm \theta_l \frac{W_t L_t}{P_t} \pm \theta_c(Y_t - \frac{W_t L_t}{P_t})]$$

This, when simplified, shows that Y_t on the left-hand-side of the equation is simply a function of $\frac{W_t L_t}{P_t}$ and Y_t on the right-hand-side of the equation. For simplicity, all coefficients relating to $\frac{W_t L_t}{P_t}$ on the right-hand-side of the equation will be reduced down to a potentially positive or negative ϕ_1, whilst all coefficients on the right-hand-side of equation 7c relating to Y_t will subsequently be reduced to ϕ_2, as seen below:

$$3.7f. \quad Y_t = \pm\phi_1 \frac{W_t L_t}{P_t} \pm \phi_2 Y_t$$

In order to make this a function of the labour share, equation 5 is then substituted into equation 7f as is. This yields:

$$3.7g. \quad Y_t = \pm\phi_1 (\frac{S_t}{L_t})^{1-\beta} Y_t \pm \phi_2 Y_t$$

Dividing this by Y_t on both sides and multiplying by $L_t^{1-\beta}$ yields:

$$3.7h. \quad L_t^{1-\beta} = \pm\phi_1 S_t^{1-\beta} \pm \phi_2 L_t^{1-\beta}$$

Solving for labour demand, and substituting equation 1 into this then provides the following:

$$3.7i. \quad (1 \pm \phi_2)(\frac{P_t^{\beta} Y_t^{\beta}}{W_t^{\beta}})^{1-\beta} = \pm\phi_1 S_t^{1-\beta}$$

Solving for Y_t then provides equation 8 below:

$$3.8. \quad Y_t = (\frac{\pm\phi_1}{1 \pm \phi_2})^{\frac{1}{(1-\beta)\beta}} S_t^{\frac{1}{\beta}} \frac{W_t}{P_t}$$

Importantly, in order to make this relationship workable in the schema of an income-maximising labourer's share, it is integral to rely on a discrete-time function linking output, unemployment and the labourer's share found in Franke, Flaschel and Proano (2006). As such, one could look at a possible variation of the Goodwin-augmented Okun's law relation of the form:

$$3.9. \quad U_t = -\delta_Y (Y_t - Y_{t-1}) \pm \delta_S S_{t-1}$$

Simply, an increase in Gross Domestic Product above its previous level allows for an expansion of employment in the economy, ensuring negativity in δ_Y (Okun, 1963). From the standpoint of the inclusion of the previous labour share, Goodwin's adaptation of the Predator-Prey model may allow for ambiguity in δ_S. If, for instance, the economy is in a boom, an increase in bargaining power may in fact yield an increased employment rate- hence δ_S may be negative. If, however, the economy is facing recessionary pressure, unemployment may still increase in the event that bargaining power is improved (where the wage of workers increases and the demand for labour decreases in step). In this instance, δ_S may be positive (Goodwin, 1967). Importantly, the inclusion of the lagged labour share necessarily shows that changes in bargaining power do not have contemporaneous power to bid up employment, but rather filter through any labour market rigidities over time.

In light of the above, and in order to stay true to obtaining a growth maximising level of the labourer's share of income, one could follow two steps; firstly, one could push the relationship between output, the real wage and the labourer's share (equation 8) back by one period to obtain 10a:

$$3.10a. \quad Y_{t-1} = (\frac{\pm\phi_1}{1 \pm \phi_2})^{\frac{1}{(1-\beta)\beta}} S_{t-1}^{\frac{1}{\beta}} \frac{W_{t-1}}{P_{t-1}}$$

Secondly, one could solve for the previous level of output in the augmented Okun's law equation (equation 9) to obtain 10b:

$$3.10b. \quad Y_{t-1} = \frac{1}{\delta_Y} U_t \pm \frac{\delta_S}{\delta_Y} S_{t-1} + Y_t$$

Plugging the result from 10b into 10a, and solving for Y_t yields equation 11, which is the central thesis for the current analysis:

$$3.11. \quad Y_t = \left(\frac{\pm\phi_1}{1 \pm \phi_2}\right)^{\frac{1}{(1-\beta)\beta}} S_{t-1}^{\frac{1}{\beta}} \frac{W_{t-1}}{P_{t-1}} \pm \frac{\delta_S}{\delta_Y} S_{t-1} - \frac{1}{\delta_Y} U_t$$

In reduced form, this yields:

$$3.11, \textit{reduced}. \quad Y_t = \pm\zeta_1 S_{t-1}^{\frac{1}{\beta}} \frac{W_{t-1}}{P_{t-1}} \pm \zeta_2 S_{t-1} - \zeta_3 U_t$$

Considering the above, it is argued (as is generally the case) that unemployment negatively impacts output from the perspective of a depression in both production and consumption, making $\frac{1}{\delta_Y}$ negative (Okun, 1963).

What is, however, ambiguously related to output, is the inclusion of both labour share terms. This comes about due to the confluence of signs in each coefficient attached to both labour share terms.

Inherently, this paper does not suggest that- from the above equation- one is able to gauge whether a particular economy is profit- or wage-led in its growth path, but rather that, after optimising the above equation, one could come up with an idea regarding the regime of the economy in question around a particular labour share level. Thus, this makes the expected sign of each labour share term of slightly less importance to our current study. Instead, and in order for real output (Y_t) to be at a local (and possibly global) maximum, ζ_1 should be positive, while ζ_2 should be negative when running regressions.

In line with this maximisation, we optimise the reduced form of equation 11 with respect to S_{t-1}. This yields:

$$3.12. \quad \frac{\partial Y_t}{\partial S_{t-1}} = 0 = \frac{1}{\beta}(\pm\zeta_1 S_{t-1})^{\frac{1-\beta}{\beta}} \frac{W_{t-1}}{P_{t-1}} \pm \zeta_2$$

As an aside, taking the second derivative of output with respect to the labour share yields $\frac{1-\beta}{\beta^2}(\pm\zeta_1) S_{t-1}^{\frac{1-2\beta}{\beta}}$. Given that β is constrained to be positive and below 1, $\frac{1-\beta}{\beta^2}$ is always positive. ζ_1 should then be negative in order to at least suggest that a particular labour share maximises GDP locally (the inverse also holds true).

Simplifying equation 12 to make the labour share the subject of the formula yields the thrust of the research:

$$3.13. \quad S^*_{t-1} = (\beta \frac{\pm\zeta_2}{(\pm\zeta_1)} \frac{P_{t-1}}{W_{t-1}})^{\frac{\beta}{1-\beta}}$$

As per equation 13, the optimal (i.e., the real GDP maximising) labour share is a function of the inverse real wage, a multiplier dependent on the coefficients found in the equation governing output and the level of β. Comparing the realised real GDP level in time "t-1" with the optimal derived from the above provides a sense of whether an economy is profit- or wage-led. Suppose the actual labour share was above its real-GDP-maximising level; in this case, a decrease in the actual labour share towards the real-GDP-maximising level of the labour share would increase output by definition.

Thus, if the difference between actual and "optimised" labour shares is positive, it stands to reason that an economy is profit-led in real GDP for a particular period. If the inverse is to hold true, and an increase in the actual labour share is needed to reach its real-GDP maximising level (and, in so doing, increase real GDP), an economy is wage-led. This information can be plotted over time to assess the output regime of any country over any period of time for which data is available, providing a sense of when output regimes switch (if they do), and providing policy makers with a baseline to assess why such a shift might occur.

Intrinsically, this result also has large policy implications. Due to the fact that the previous labour-share level maximises current output, the optimal labour share equation acts as a policy tool which is forward looking by its very nature.Because this equation is also time-dependent, the optimal can be measured at any point in time without relying on econometric filters. As Yilmaz (2015) points out, a single-equation means to assess the output regime of an economy, is often preferred given its parsimony over most other approaches to assessing output regimes (see, for example, extensions of works by Bhaduri and Marglin, 1991, which provide a VAR structure to assess output regimes). This single equation is estimated using both Non-Linear Least Squares (NLS) and Dynamic Ordinary Least Squares (DOLS). While the NLS approach corrects for any non-linear paramaterisations (Gujarati and Porter, 2009), the DOLS model is used to correct for differing orders of integration between left- and right-hand-side-of-the-equation variables. Further, the performance of DOLS estimates is widely considered robust, especially when taking into account the potential long-run relationship between variables (Stock and Watson, 1993).

As opposed to other standard techniques like typical OLS or Fully Modified OLS, DOLS also exhibits the following advantages (as per Montalvo, 1995; Khan, et al., 2019 and Neto, 2023):

- DOLS can correct for endogeneity and serial correlation - something that the NLS estimates in the ensuing analysis highlight as potential hindrances to model outcomes.
- DOLS corrects for non-stationarity when implemented correctly. As mentioned in the introduction, most of the macroeconomic variables included are integrated of order 1.
- DOLS has improved finite-sample properties in contrast to other approaches; given a limited time series of some 80-90 quarters on average, this advantage enables robust inference.

The development of this parsimonious means to extract labour share cycle and regime information one period ahead without the reliance on a Cobb-Douglas production function, and the application of this method to data for the 7 countries within the sample, are the key contributions of the ensuing analysis.

3.3 Estimation and Interpretation

3.3.1 Labour Demand

Importantly, each economy's labour demand is measured so as to gauge the optimal β by taking the natural logarithm of the terms on the left- and right-hand-sides of equation 1. This is done on aggregate first, and the value of this β is then calculated by splitting the sample in half so as to ascertain whether this aggregated measurement is reasonable or time-dependent. Given the analysis overleaf, it is clear that taking the overall value of β is relatively robust, given that it sits in the middle of each regression split by time period as well:

Table 1: Labour Demand (Equation 3.1)

	Australia	France	Germany	Italy	SA	UK	USA
β (Full Sample)	0.788^{***}	0.838^{***}	0.858^{***}	0.834^{***}	0.776^{***}	0.868^{***}	0.783^{***}
	(0.0004)	(0.0007)	(0.0009)	(0.0008)	(0.003)	(0.0001)	(0.001)
β (First Half of Sample)	0.791^{***}	0.842^{***}	0.865^{***}	0.849^{***}	0.798^{***}	0.878^{***}	0.793^{***}
	(0.0005)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0001)	(0.001)
β (Second Half of Sample)	0.785^{***}	0.834^{***}	0.851^{***}	0.8438^{***}	0.757^{***}	0.859^{***}	0.773^{***}
	(0.0003)	(0.0003)	(0.0006)	(0.0003)	(0.001)	(0.0001)	(0.001)
SE (Full-Sample)	0.04	0.06	0.10	0.08	0.29	0.13	0.18
DW Stats (Full-Sample)	0.02	0.01	0.01	0.01	0.05	0.01	0.00

HAC standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent.
All statistics are presented for the full sample regression although statistics are sufficiently similar in the full- and split-sample regressions

Prior to assessing each coefficient, it is important to discuss general statistical robustness in the estimation. Generally, standard errors for every regression were exceptionally low relative to the sizes of the various coefficients, implying that each model specification was robust (according to typical measures of econometric robustness found in Gujarati and Porter (2009)). However, each model did suffer from positive autocorrelation, which may have the impact of falsely generating the statistical significance of each β. As such, we have also corrected the standard errors for both heteroskedasticity and autocorrelation using the method outlined by Newey and West (1987), in order to ensure that standard errors are not inflated or that inference is not poorly drawn. This is the case for all standard errors henceforth, and will only be commented on briefly in the following sections

Moving forward and considering coefficients of interest, it stands to reason that β be positive. This, as a priori expected, suggests that employment (a proxy for the portion of labour demand which is fulfilled) increases when total revenue within firms increases, relative to their cost. Furthermore, this value being lower than unity indicates a less than one-for-one increase in employment with a surge in total revenue.

In all instances, the relationship between employment and the revenue-cost ratio is highly significant, and there exists no marked differences between the labour-share-weight when splitting each sample in half. Thus, each estimate of β used in the following analysis is not done through a time-varying lens, although this may be room for future research. Nevertheless, the full-sample labour-share-weight will be utilised in order to optimise output for the purposes of this analysis. This is simply due to the small diferences between split- and full-sample estimates of the coefficient, and the similarity of coming regression results when using either the full- or split-sample value of β.

3.3.2 Effective Demand and its maximisation

From this labour demand backdrop, one could start by analysing the framework using Non-Linear Least Squares (NLS) due to the inherent non-linearity in parameters found in the effective demand equation This is shown in Table 2 overleaf:

Table 2: Effective Demand (NLS- Equation 3.11, reduced)

	Australia	France	Germany	Italy	SA	UK	USA
ζ_1	-564357.4^{***}	-846903.8^{***}	-704387.4^{***}	-600571.4^{***}	-1888436^{***}	-682970.6^{***}	-13651221^{***}
	(190450.2)	(23940.71)	(21590.98)	(11231.06)	(180170.2)	(40191.72)	(701512.8)
ζ_2	1417533^{***}	2259355^{***}	2087450^{***}	1573675^{***}	4996534^{***}	1845193^{***}	46044488^{***}
	(399091.5)	(63096.28)	(61459.16)	(26541.25)	(499717.4)	(102453.8)	(2307673)
ζ_3	-5492.721^{***}	-1655.74^{***}	-4629.646^{***}	-1724.983^{***}	-9977.97^{***}	-2910.378^{***}	-79661.73^{***}
	(574.0647)	(563.9931)	(789.6298)	(165.8700)	(2049.6300)	(833.7713)	(21530.33)
R Squared	0.721	0.964	0.918	0.959	0.793	0.726	0.949
SE of Regression	6210.23	3171.18	5329.57	1591.15	29069.3	6989.75	151288
DW Statistic	0.06	0.32	0.07	0.26	0.55	0.07	0.11

HAC standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Concerning the goodness of fit, it appears that all models across countries have high R Squared values (where between 72 and 96 percent of all the variation in real output is explained by the model across the seven countries in question). To add to this, each regression standard error is still low relative to coefficient sizes (which are high, given that real GDP is measured in millions of the local currency). While positive autocorrelation is still an issue, this has been somewhat curbed through the estimation of HAC errors. Further, it appears that all variables are extremely statistically significant at the 1 percent level, and all signs are as a priori laid out in the previous section.

Foremost, it appears that- due to the presence of the previous price level found in the real wage component of effective demand- the interaction term between real wages and labour share, and real output is negatively related . Considering all β values to be below one, it stands to reason that $\frac{1}{\beta}$ is above unity but below 2. Thus, when taking the second derivative of the function in question with respect to the previous labour share value, this is unambiguously negative across the board, satisfying the condition for a locally maximised value of real output. Further, all ζ_2 are large and positive (as Malikane (2017) points out can happen, causing a so-called "labour share puzzle"); with this, and the fact that all ζ_1 are negative, it will be that all optimal labour share values will be positive unambiguously. Thus, the structural integrity of the above-posited methodology is maintained.

Concerning unemployment (and ζ_3), it stands to reason that Okun's (1963) empirical law holds- an increase in unemployment relates to a concomitant decrease in real GDP across all countries. In terms of percentage changes, this relationship is explored across all countries in recent works by Ball, Furceri, Leigh and Loungani (2019), although this sort of study has seen a wide array of analysis across all countries within our sample.

Continuing on; if one is to believe that any one (or, in fact, all) of these variables has a unit root, it stands to reason that a cointegrating relationship between each variable may be useful in gauging the long run relationship between each variable before understanding whether coefficients are not biased in any way. As such, Table 3 deals with estimating a cointegrating regression using equation 11 for robustness sake through Dynamic Ordinary Least Squares (DOLS).

Table 3: Effective Demand (DOLS- Equation 3.11, reduced)

	Australia	France	Germany	Italy	SA	UK	USA
ζ_1	-495869.5^{***}	-878964.8^{***}	-703235.6^{***}	-592842.5^{***}	-2378198^{***}	-832508.1^{***}	-13890096^{***}
	(173083.2)	(16463.56)	(16945.11)	(13246.43)	(257610.0)	(44503.17)	(528989.9)
ζ_2	1301537^{***}	2353876^{***}	2086659^{***}	1562886^{***}	2259723^{***}	1845193^{***}	46930317^{***}
	(364922.2)	(42866.52)	(51229.12)	(29590.38)	(715732.5)	(111033.1)	(1768267)
ζ_3	-7012.205^{***}	-2464.137^{***}	-4478.104^{***}	-1833.169^{***}	-14474.13^{***}	-7263.586^{***}	-63967.83^{***}
	(581.9934)	(503.6202)	(707.6744)	(128.4557)	(2836.242)	(1637.887)	(19218.84)
R Squared	0.860	0.986	0.916	0.984	0.908	0.901	0.983
SE of Regression	4680.26	2106.56	4437.71	929.45	21709.87	4581.00	92664.63
DW Statistic	0.26	0.32	0.21	0.43	0.12	0.41	0.40

HAC standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Integrally, each estimation is estimated under the lag-lead (p;q) DOLS structure (6;0). This is chosen by paying attention to Akaike information criterion values. This lag-lead selection is not prescribed per se, but rather done on a post hoc basis; changing lag-lead structure will also influence results, and this is subject for further research.

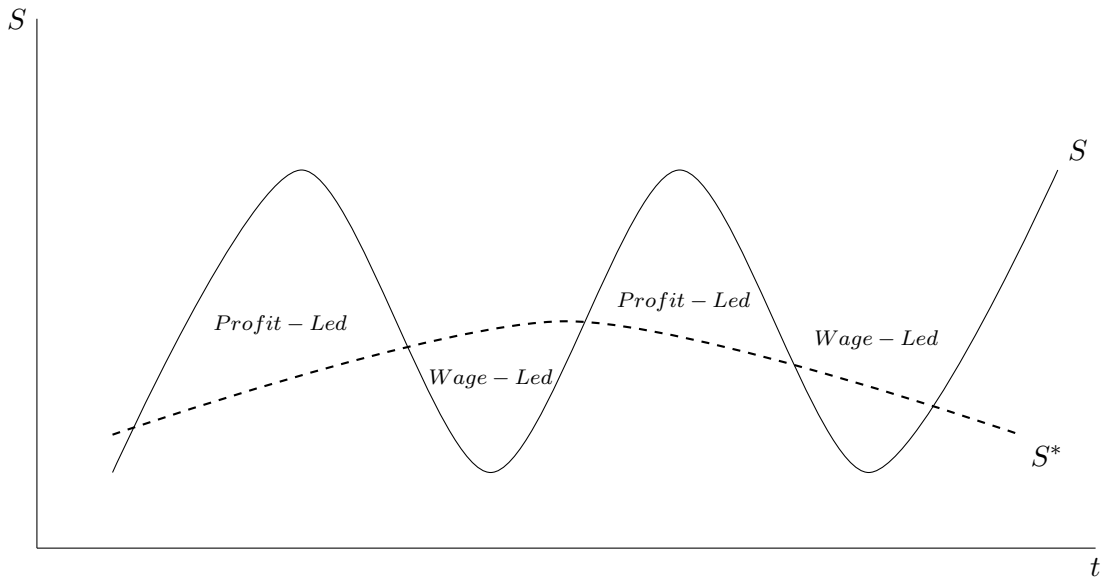
Nevertheless, concerning the cointegrated analysis, general goodness of fit has been improved. Across the board, between 86 and 98 percent of the variation in real GDP is explained by the model. Once more, all coefficients estimated are extremely significantly related to real output at between the 1 and 5 percent levels, and relate to real output as expected (similar to the regular NLS estimation as well). All regression coefficient magnitudes are relatively similar between NLS and DOLS estimate as well, and as such, yield relatively similar optimal labour share values (which will be explored further on). This is true for all cases save for the Australian estimation, who sees great divergence between both methodological approaches.

Each estimation, however, is a means to an end. These estimations do not describe whether an economy is wage- or profit-led, but rather are part of the process in identifying the real output regime of the economy in question. As such, it may be pertinent to understand the nature of each optimal labour share derived from the above equations. From the perspective of interpretation, this qualitative look into the nature of the "labour share cycle" will shed light on whether a particular nation is in the profit- or wage-led portion of their own cycle, and may be as informative (if not, more so) than estimations relating to the identification of regimes within a particular economy. Thus, the next section deals with understanding the optimal labour share in a more descriptive sense.

3.4 The Labour Share through Time

As touched on before, the commonplace interpretation of similar regression results as were found in Tables 2 and 3 (whether an economy be profit- or wage-led) is static- where an economy's regime is assumed to be the same for the underlying time period- and done at the mean (i.e., an economy's output regime is dictated by regression coefficients attached to the labour share). Given this researches' deviation from the aforementioned commonplace assessments, from a qualitative perspective initially, our analysis suggests that an economy's output regime is not in stasis, but rather a moving entity, changing based on the inherent structure of the economy in which it abides.

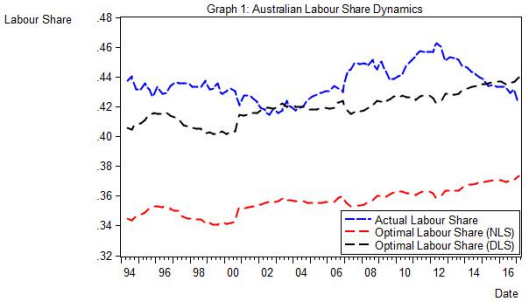
Generally, this labour share cycle can be described through the use of the following illustration:

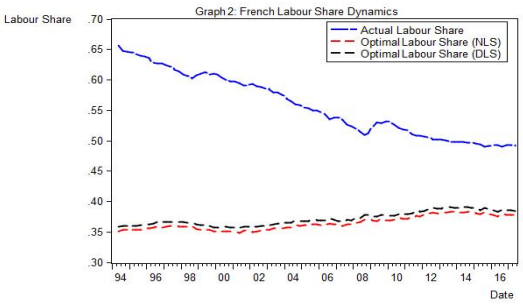


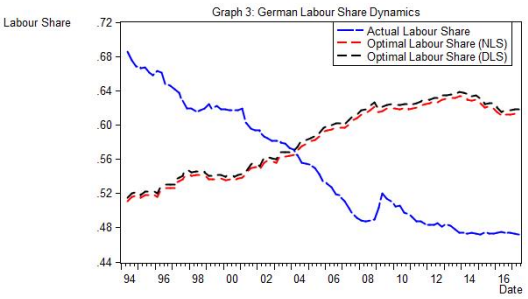
Where an increase in the labour share cycles between leading real output, and depressing it. Bearing cognisance of the above, it is apparent that, if the labour share is above its real-GDP-maximising level, a decrease in the actual labour share towards that real-GDP-maximising level would end up increasing real GDP by definition. Thus, if the difference between actual and "optimised" labour shares is positive, an economy is profit-led in real GDP.

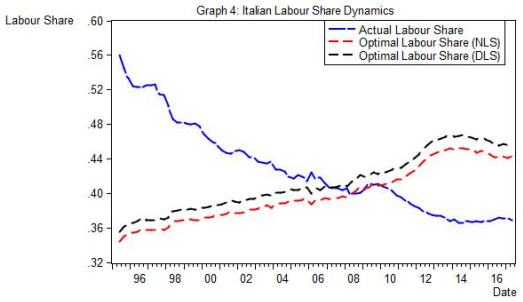
If the inverse is to hold true, and an increase in the actual labour share is needed in order to reach its real-GDP maximising level (and, in so doing, increase real GDP), it stands to reason that an economy is wage-led.

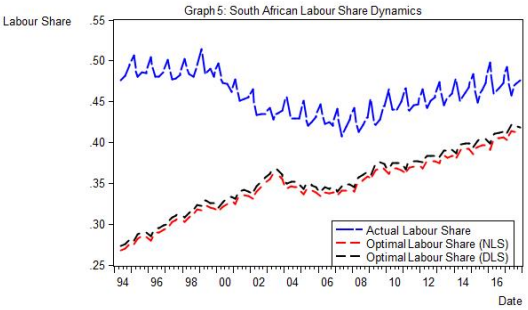
These so-called "cycles" in the labour share (defined as cycles between being profit- or wage-led) are summarised graphically below and overleaf based on the aforementioned regression results:

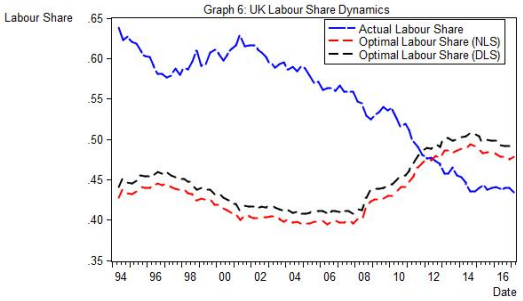

Graph 1: Australian Labour Share Dynamics
Labour Share
.48
.46
.44
.42
.40
.38
.36
.34
.32
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)

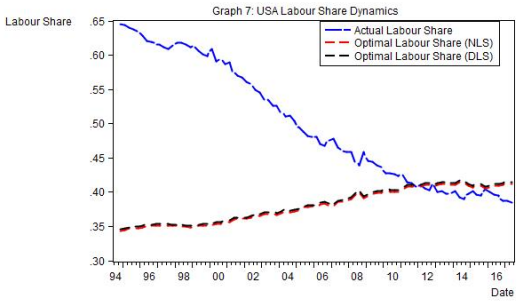

Graph 2: French Labour Share Dynamics
Labour Share
.70
.65
.60
.55
.50
.45
.40
.35
.30
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)


Graph 3: German Labour Share Dynamics
Labour Share
.72
.68
.64
.60
.56
.52
.48
.44
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)


Graph 4: Italian Labour Share Dynamics
Labour Share
.60
.56
.52
.48
.44
.40
.36
.32
96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)


Graph 5: South African Labour Share Dynamics
Labour Share
.55
.50
.45
.40
.35
.30
.25
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)


Graph 6: UK Labour Share Dynamics
Labour Share
.65
.60
.55
.50
.45
.40
.35
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)


Graph 7: USA Labour Share Dynamics
Labour Share
.65
.60
.55
.50
.45
.40
.35
.30
94 96 98 00 02 04 06 08 10 12 14 16
Date
Actual Labour Share
Optimal Labour Share (NLS)
Optimal Labour Share (DLS)

In five of the seven countries analysed (namely Germany, Italy, The United Kingdom, The United States of America and, to an extent, Australia), it appears as though during the early stages of the respective time series, each economy was profit-led. These regimes (in the context of this paper), however, altered to being wage-led in a cyclical nature.

What of French or South African labour share dynamics (which suggest that both nations are profit-led)? Qualitatively analysing the trend of each series, it appears as though- after a longer time horizon- there may be convergence across actual and real-GDP maximising labour shares.

According to Goodwin's 1967 theory, an economy cycles through being wage- or profit-led on a relatively regular basis as follows:

1. In the first phase of the Goodwin cycle, employment levels and an economy's real output are both relatively high. This phase translates directly to a boom in the business cycle. In this phase, the marginal product of labour is larger than the wage that the capitalist pays the labourer, and the bargaining power of workers is potentially quite high (given assumedly low structural unemployment levels coupled with a sufficiently skilled labour force). If this is the case, labourers/unions caucus for higher wages and/or for increased employment. There is room for the capitalist to absorb increased wages and employ more workers, as long as productivity is higher than the wage level within the economy. For a time, this boost in wages across the economy increases consumption (which itself is predominatly driven by labourers), and economic growth continues for a period.

2. This trend of increased wages and/or employment continues to the point where the productivity (per unit of labour output) slows down relative to wage growth. This downturn in relative productivity decreases the profit of the capitalist whose total cost of conducting business is increasing relative to the productive capacity of the workers employed. This process continues until the profits of the capitalist worsen substantially, and investment in gross fixed capital decreases with the decrease in profits, which worsens economic growth once the investment downturn overtakes the concomitant consumption uptick due to labourers improved wages. This sows the seeds for an impending downswing in the business cycle.

3. If (and when) investment and profits decrease sufficiently, it is then that the capitalist begins retrenching workers. An increased unemployment level depresses consumption, worsening output growth yet further. This has the added effect of worsening labourers bargaining power, given that the reserve army within a nation increases therefrom.

4. Growth and employment continue to be severely depressed. It is then that the capitalist is able to employ labour for relatively cheaply (although, potentially, a lower quantum of workers than before the collapse, given improvements in technology over that time- see Schumpeter (1942)). This hiring increase sets the Goodwin cycle into motion once more- higher labour productivity relative to cost bolsters further hiring, further profits, until ultimately bargaining power for workers increases to a sufficient extent for wages to be hiked, once again, decreasing profits until such point as layoffs begin.

It is, among other things, whether an economy is growing due to labour-related or capital-related reasons, and whether wages or labour productivity outstrip one another that act as signals for the switch in regimes between wage- and profit-led or vice versa.

Given an analysis of structural features identified from the literature which may have influenced a change in the output regime from profit- to wage-led for the 5 countries in question, it is possible to pre-empt future cyclical changes. As such, country-level characteristics which might speak to this regime switch are discussed next:

- Australia- According to the dynamic analysis done before, estimates suggest that Australia has historically been profit-led. DOLS analysis does, however, suggest that the Autralian regime could have moved from profit- to wage-led from between 2001 and 2002, and then again from 2015 onwards. Whether this is the case or not can be elucidated with an analysis of productivity and wages within the country. A potential source of information to consider would be work done by Diewert and Fox (2017) who aim to analyse productivity and its suspected slowdown across various countries. In this work based on the Australian context, it is clear that factor productivity, which was perceived to be growing slowly, was in fact, at relative maxima between 2001-2002, and from 2015 onwards, after correcting for productivity measurement issues. While this study does not compare this productivity growth to wage growth within the time period, per se, it does offer tentative confirmation that the Australian economy could have moved from profit- to wage-led economic growth in the highlighted periods due to a relative increase in factor productivity. Thus, while some studies might show that the Australian economy is profit-led (see, for instance, examples set out in Onaran and Galanis (2012)), it is only because the analysis is done at the mean, and not over time. In fact, when conducting the analysis over time, there is cause to believe that the Australian economy was profit-led for the majority of time before 2015, but then experienced periods of wage-led economic growth between 2001-2002, and again from 2015 onwards.

- Germany- The dynamic analysis done before suggests that Germany tran-

sitioned from profit- to wage-led in approximately 2003/2004. From De Santis and Ferroni (2019), it is clear that labour productivity within the country has far outstripped real compensation per employee from as early as 1995. This signals that the economy is either in the 4th or the 1st phase of the Goodwin cycle (both when labour productivity outstrips real wages, with the 4th cycle being characterised by declining employment, and the first being characterised by increasing employment). Given relatively low employment rates in Germany during the late 1990s and early 2000s (see, for instance, statistics on German employment rates from the OECD), it is clear that up until 2004, the German economy was in the last phase of the Goodwin cycle (with relatively low employment rates as compared to now). From 2004, onwards, however, the economy experienced a rapid expansion of employment prospects, ensuring the transition from the 4th to the 1st phase of the Goodwin cycle (i.e., moving from profit led economic growth driven mostly by profit accumulation and investment, to wage-led economic growth which depends more heavily on the expansion of employment and consumption).

- Italy- Given the dynamic analysis done before, Italy has remained wage-led from approximately 2009/2010 onwards. Based on work from De Santis and Ferroni (2019), it is clear that real compensation per employee has been outstripped by labour productivity. This, coupled with relatively strong bargaining power along with more egalitarian economic policies (proxied for by improving income inequality), suggests that the Italian economy has entered into the first phase of the Goodwin cycle, and economic growth is being propped up by increases in consumption more so than by rising profits (as shown by the decline in the labour share).

- The United Kingdom- As per the previous analysis, the United Kingdom transitioned from profit- to wage-led by 2011/2012. According to data from the OECD, this comes after the recessionary impact of the 2008 crisis loosened its grip on the employment landscape within the economy. However, and irrespective of the productivity slowdown that the economy has been in since the beginning of the 2000s (see work done by Craft, and Mills (2020)), real compensation has sufficiently decoupled from productivity in the same time period (Pessoa and Van Reenen, 2013). It is this decoupling, along with an increase in employment from 2011/2012 onwards which has seen the UK move towards the first phase of the Goodwin cycle- a phase in which, due to decreasing investments, growth is now bolstered by consumption (again, see Pessoa and Van Reenen (2013))

- The United States of America- As per our prior analysis, the American economy moved from being profit- to wage-led from as early as 2011/2012. Again, because America has seen an incredible increase in employment post-financial-crisis, and since America's productivity and real wage decoupling

has been well documented (Pessoa and Van Reenen (2013)), it is clear that the United States has begun the 1st phase of its Goodwin cycle, and as such, wages draw economic growth more so than the tentative investment growth which has also spurred on some economic growth in the country.

From this analysis, our findings suggest that two conditions should hold in the event that a nation were to transition from profit- to wage-led economic growth. The necessary condition for the transition between regimes is that an economy should be experiencing some sort of productivity and wage decoupling. That is, productivity in the economy should be higher than real earnings within that economy. The sufficient condition for this transition, though, is that there should also be an increase in employment within the economy in question. This increase might not be sufficient to increase the labour share given the slowdown in real wages (as is often the case in these economies), but should be sufficient to spur on consumption within that economy more so than investment.

3.5 An Aside; Profit- or Wage-Led Real Output

Importantly, most analysis of whether an economy is profit- or wage-led looks at relating the labourer's share to the output-capital ratio or, in Structuralist terms, capacity utilisation (Taylor, 2009). The current paper, however, looks to understand the relationship between the labour share and real GDP. This is for a number of theoretical reasons- most profoundly, there is much debate on how to estimate quarterly capital stock levels in a non-contentious manner. Thus, when an economy is deemed either wage- or profit-led in the current paper, it is to the extent that the labour share positively or negatively relates to real output.

This analysis (as well as the more fundamentally Structuralist analyses briefly discussed above), however, has the ability to conflate whether nominal GDP alone is profit- or wage-led. For instance, it might be that an increase in the labour share decreases nominal output, but also decreases the price level within an economy substantively (Taylor, 1991). This could lead to an increase in real output in the event that the labour share were to rise (hence, real GDP may be seen as being wage-led), but nominal GDP levels would be seen to decrease (and thus be profit-led).

In the first instance, it is argued that- with an increase in labour share- comes a concomitant improvement in worker bargaining power. This increase in bargaining power allows for labourers to caucus for higher wages, which inevitably bids up the price of goods and services. Thus, if an increased labour share yields increased price levels, it is found that the labour force

is sufficiently militant such that an increase in bargaining power creates inflationary pressure (Taylor, 1991).

If the inverse is to hold true, an increased labour share which does not sufficiently bolster bargaining power (especially in nations with a large reserve army) may create a situation in which employers- paying high wages in light of an increased labour share- may end up retrenching workers in the event that those same workers caucus for further wage-hikes. As such, that may allow for downward pressure to be exerted on price levels- given the negative relationship between unemployment and inflation (Phillips, 1958). In this instance, workers whose increased labour share links to a decreased price level within an economy are deemed sufficiently reformist in nature (Taylor, 1991).

Thus, dependent on both the mixture of nominal output and price- and wage-inflation regimes as well as the intensity of said regimes, real output may vary accordingly, given a change in the labour share. This may be simpler to relay using Table 4, but can, however, only be done after simplifying the concepts of various different regimes slightly.

In mathematical terms, real GDP is structurally defined as nominal GDP (y) divided by the price level (P) within an economy. Taking the growth rate of this structural relationship, as per Solow's (1954) growth accounting methodology yields:

$$3.14. \hat{Y} = \hat{y} - \hat{P}$$

Put differently, the growth rate of real GDP ($\hat{Y}$) is equal to the difference between the growth rate of nominal GDP ($\hat{y}$) and price inflation (π^p, or equivalently, the growth rate of prices- $\hat{P}$)

Assuming, of course that the labour share (or, more specifically, the difference between actual and real-GDP maximising labour shares) is given by s, a nominal output regime (i.e when an increase in the labour share changes nominal output) in the world of the Marginalist can simply be seen as $\frac{\partial \hat{y}}{\partial s}$. A price-inflation regime (linking price changes to an increase in bargaining power, as proxied for by an increase in income distribution towards the working class) on the other hand can be relayed as $\frac{\partial \pi^p}{\partial s}$, considering that both nominal output and price inflation are both functions of functional income distribution (Taylor, 2009).

This is important because, from a structurally defined perspective, the labour share ($S = \frac{WL}{PY}$) grows based on the difference between Nominal Unit Labour

Costs (NULC- $\frac{WL}{Y}$) and prices (P). Thus:

$$3.15a. \hat{S} = \hat{NULC} - \hat{P}$$

Or, more succinctly:

$$3.15b. \hat{S} = \pi^w - \pi^p$$

Where growth in the labour share $\hat{S}$ is approximately given by the difference between wage/unit labour cost inflation (π^w) and price inflation.

As Taylor (1991) points out, both wage and price inflation are functions of the labour share themselves, and thus, the interplay between whether a nation's inflation regime is reformist or militant depends heavily on whether the derivative of $\hat{S}$ with respect to s is negative or positive respectively (i.e., $\frac{\partial \hat{S}}{\partial s} = [\frac{\partial \pi^w}{\partial s} - \frac{\partial \pi^p}{\partial s}]$)

Solving for $\frac{\partial \pi^p}{\partial s}$ then yields:

$$3.16. \frac{\partial \pi^p}{\partial s} = \frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}$$

Thus, a change in real output, given a change in the labour share is decomposed into its organic parts such that:

$$3.17. \frac{\partial \hat{Y}}{\partial s} = (\frac{\partial \hat{y}}{\partial s} - [\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}])$$

At this, real output (Y in the chapter) can be wage-led/increased when the labour share increases if, and only if $\frac{\partial \hat{y}}{\partial s} > [\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}]$. With this information, Table 4 reads:

Table 4: The Real GDP Regime Given a Confluence of Nominal GDP and Inflation Regimes

	$\frac{\partial y}{\partial s} > 0 (Large)$	$\frac{\partial y}{\partial s} > 0 (Small)$	$\frac{\partial y}{\partial s} < 0 (Large)$	$\frac{\partial y}{\partial s} < 0 (Small)$
$[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}] > 0$ (Large)	$W or P$	P	P	P
$[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}] > 0$ (Small)	W	$W or P$	P	P
$[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}] < 0$ (Large)	W	W	$W or P$	P
$[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}] < 0$ (Small)	W	W	W	$W or P$

"Large" and "Small" indicate the absolute size of each partial derivative

Focusing on the table, it is important to be drawn to the notion that- even though a nation's nominal output may be profit-led, an increase in the labour share can still lead to real output growth if $[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}]$ is "negative enough" to the extent that it offsets one such decrease in nominal output. On the other hand, a nation's nominal output may be wage-led, but, due to sufficiently large net wage-inflation pressure (i.e., $[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}]$) that comes about due to an increase in the labour share, may in fact be profit-led in the real output sense.

In the case where both magnitudes (the derivative of nominal output and the difference between wage inflation and labour share growth partials) is "Large" or "Small", simultaneously, this leads to further ambiguity in regime which policy makers should be intimately aware of. Put differently, the difference between a large $\frac{\partial y}{\partial s}$ and large $[\frac{\partial \pi^w}{\partial s} - \frac{\partial \hat{S}}{\partial s}]$ could either be negative or positive, and as such may influence real output regimes accordingly (if the difference is positive, real output is wage-led, and if the difference is negative, real output will be profit-led).

4 Chapter 4: The Interplay Between Output, Household Debt and the Labour Share

4.1 Introduction

A fundamental part of macroeconomic analysis relates to the topic of cyclicality. A wide berth of evidence suggests that the real economy cycles between peaks and troughs, as measured by a period within which real economic output declines or grows and then cycles back to a period of decline (Marx, 1867; Hayek, 1931; Schumpeter, 1947; Goowdin, 1967; Romer, 2012). While the reasons for this cycle and the position of an economy along this cycle are often debated , what is an inalienable fact is that such cycles exist. It comes as no surprise, then, that cycles in other macroeconomic indicators exist. Arguably, the focus in literature since the mid 2000s (although extending much before then) is the so-called "financial cycle" in financial indicators (housing prices, equity prices, household debt, and even government debt) (Borio, 2012).

While both have been explored extensively in their own right, and as they interact, very little has been done to assess this interaction when casting income distribution dynamics in the same cyclical light (Taylor, 2009; Ryoo and Kim, 2014). Considering that the first chapter has provided a means to assess the labour share cycle, incorporating this cycle into models that weave financial and business cycles is, therefore, of utmost importance going forward to understand whether the labour share cycle does, in fact, have any baring of the position of an economy and the drivers of either output or financial indicators.

As Holscher, et al., (2015, pp 1) point out, "evidence on the inequality-[financial] fragility relationship is limited", yet it is this relationship that inevitably drives a large portion of financial crises (Perugini, et al (2013); Tuomas (2014); Holscher, et al., (2015); Behringer, et al., (2017)). Once a relationship between the labour share (an indicator not used often to assess income inequality) and household debt is established, the mainstream view that inequality is not relevant to macroeconomic stability is challenged. Further, given information regarding such a relationship, policies associated with ensuring financial sector stability can be made more robust (Holscher, et al., 2015).

Bearing this gap in mind, the current chapter looks to develop a novel theoretical model along Structuralist lines linking the three concepts (the business cycle, the financial cycle pertaining to household credit, and the labour share cycle) in a parsimonious system of equations, as outlined next.

4.2 Theoretical Framework

Understanding a facet of the impact that labour share dynamics/cycles have on output and household credit (i.e., major components of the business and financial cycles) requires the development of a system of equations which intimately link all variables of interest. This system is developed in the ensuing discussion.

4.2.1 Output Dynamics

Output is dependent on a simplistic manipulation of the classical Keynesian Effective Demand equation as was highlighted in Chapter 3. However, the investment function is now augmented.

Consumption is disaggregated into labourer and capitalist consumption as before, who each pay taxes (τ_l and τ_c respectively) , and save (in relation to the different classes respective savings rates s_l and s_c), based on their own incomes, adjusting for current prices (the wage bill- $\frac{WL}{P}$ - and capitalist profit share- $\frac{\Pi}{P}$ respectively):

$$4.1a. \quad C = (1 - s_l)(1 - \tau_l)\frac{WL}{P} + (1 - s_c)(1 - \tau_c)\frac{\Pi}{P}$$

Explicitly, it is assumed that savings and taxation both cut into class-consumption, while income earned by each respective class positively relates to consumption (Taylor, 2009).

Considering investment, it is expected that- above and beyond current output and capitalist profit- a capitalist's repayment cost on loans and the valuation of her/his portfolio also influence gross fixed capital formation such that:

$$4.1b. \quad I = \alpha_1\frac{\Pi}{P} + \alpha_2 Y \pm \alpha_3\Lambda + \alpha_4 Q$$

Where, as profit increases, investment (and, thus, capital accumulation) is expected to increase by a factor of α_1; due to a capitalist's increased profit, obtaining a loan which could fund large capital projects increases, bolstering investment (Kalecki, 1942). In a similar vein, it is suggested that economic expansion in an economy is related to the ability for improved profitability in that same time period, bidding up investment capabilities- hence positivity in α_2(Kalecki, 1971). Further, the stock of credit from households (Λ) remains ambiguously related to investment until estimated (hence, theoretical ambiguity of α_3) . If, for instance, debt stocks were to increase and this led to a concomitant increase in gross fixed capital formation, it stands to reason that the economy on aggregate is gearing upwards and

attempting to accumulate debt as a means to increase investment (Hoffman and Reisen, 1991). If the inverse holds, this gearing up of the economy might put strain on investment projects due to the volume of debt repayment, ultimately decreasing investment (Krugman, 1988). This particular inclusion is nuanced, but encapsulates the small portion of households that influence Gross Fixed Capital Formation- slightly relaxing the assumptions of Kalecki, Kaldor and the like.

Furthermore (stemming originally from Kaldor (1966), but more seminally from Tobin, Lovell and Von Fursternberg (1977)), it is argued that- when including the ratio of a firm's market value to asset replacement cost- investment should positively relate to Tobin's Q by a factor of α_4. In the "scaled-up" macroeconomy, this still rings out as a truth. If, for instance, market value of all firms assets were to increase in an economy relative to replacement costs, capital inflows from prospective investors are expected, bolstering the ability of firms to invest (Tobin, Lovell and Von Fursternberg (1977)).

Focusing on government spending:

$$4.1c. \quad G = \tau_l \frac{WL}{P} + \tau_c \frac{\Pi}{P}$$

Where, as revenues increase (for either the working or capitalist class), tax revenues increase from the perspective of the state, which bolsters public spending. Thus, there is expectedly a positive relationship between these class-based tax revenues and government expenditure (Taylor, 2009).

Finally, considering net exports, one could follow the model posited by Stockhammer, et al. (2008), where:

$$4.1d. \quad X = \pm\sigma_1 \frac{WL}{P} \pm \sigma_2 R$$

$$4.1e. \quad M = \theta_1 Y \pm \theta_2 \frac{WL}{P} - \theta_3 R$$

As with the household debt variable in equation 1b, a case for positive or negative coefficient signs associated with the labour share and real exchange rate (the latter in the export function only) exist. In the former case, it is argued that the inclusion of the labour share acts as a signal relating to production cost- if the labourer's share had to increase (if, for instance, wages had to rise), per-unit labour cost would increase, increasing the price of domestically produced goods, and decreasing export demand in conjunction (making the case for negativity in σ_1) (Stockhammer, et al., 2008). If, however, the labour share increases such that it may incentivize increased productivity

sufficiently to offset price rises, such a case might induce positivity in σ_1 (Deshmukh and Pyne, 2013). Additionally, including the real exchange rate (R)- either, a depreciation in the real exchange rate may improve export quantities more so than decreasing their value (in which case a depreciation or increase in the real exchange rate yields a concomitant increase in exports), making the case for positivity in σ_2; or, that same depreciation would yield a larger value than quantity effect, making the case for negativity in σ_2 as well (Appleyard, et al., 2008).

Looking now at the import function; as domestic income increases, so too should a country's ability to import, making a clear case for positivity in θ_1 (Appleyard, et al., 2008). Ambiguity exists regarding the relationship between imports and the labourer's share of income. If the labourer's share increases, and economic growth in a domestic economy is wage-led (where an increase in the labourer's share increases economic activity more so than the depression of profits decreases economic activity, decreasing imports and implying negativity in θ_2. However, a wage-led economy might see an increase in economic activity (and the consumption of imports) should the labour share increase, making the case for positivity in θ_2 as well (Bhaduri and Marglin, 1991). Considering the inclusion of the real exchange rate, it stands to reason that a real depreciation should make imports more costly in comparison to domestic goods, making the case for an unambiguously negative θ_3.

Thus, output is of the reduced form:

$$4.2. \quad Y = \pm\rho_1 \frac{WL}{P} \pm \rho_2 \frac{\Pi}{P} \pm \rho_3 \Lambda + \rho_4 Q \pm \rho_5 R$$

Importantly, the above can be simplified further by looking at structural relationships from Taylor (2009) governing the labour share and profit share:

$$4.3. \quad S = \frac{WL}{PY}$$

$$4.4. \quad (1 - S) = \frac{\Pi}{PY}$$

Rearranging each structural relation by making SY and $(1-S)Y$ the subject of equations 4 and 5 respectively, before substituting this result into the equation governing output (equation 3), yields:

$$4.5. \quad Y = \pm\rho_1 SY \pm \rho_2 (1 - S)Y \pm \rho_3 \Lambda + \rho_4 Q \pm \rho_5 R$$

Solving with respect to output then yields equation 7:

$$4.6. \quad Y = \frac{\pm\rho_3 \lambda + \rho_4 Q \pm \rho_5 R}{\pm\rho_2 + (\pm\rho_1 \pm \rho_2)S}$$

Obtaining growth rates through the use of a Taylor Expansion provides equation 8 in further reduced form:

$$4.7. \quad \hat{Y} = \pm\omega_1\hat{\Lambda} \pm \omega_2\hat{S} \pm \omega_3\hat{Q} \pm \omega_4\hat{R}$$

The above mathematical manipulation suggests that the deviation of nominal output can be related to growth in household credit (which may either improve output growth in the event that incurring debt builds productive capacity- such that the economy is debt-led- or worsen economic outcomes through exorbitant repayments- such that the economy is debt-burdened (Taylor, 2009)) or deviations in the labourer's share of income from its optimal level signals either a profit- or wage-led regime. This is portrayed by ambiguity in both ω_1 and ω_2 respectively.

Above and beyond this, output deviations can also relate to financial flows from the perspective of Tobin's Q; where, as market value increases (relative to replacement costs), so too should net investment within an economy. If that investment is productive, and if indeed that firm's value does not react to the market with recessionary pressures stemming from asset bubbles (as in the 2007-2008 financial crisis), then ω_3 is expectedly positive (Kaldor, 1966). If, however, a market value increase (signalled by an increasing Tobin's Q) decreases output growth, it is expected to do so through the expansion of market value through subprime assets whose ability to force recessionary pressure allows for ω_3 to be negative.

Finally, considering the real exchange rate, Thirlwall (1979) suggests that this variable negatively relates to economic growth so as to maintain the Marshall-Lerner Condition (governing the trade-improvement effect that a real depreciation will have in the long run only). This is indicative of contractual rigidities in the foreign trade sector, which will see a depreciation in the real exchange decrease output growth. If such trade rigidities do not exist, there is also room (although it may be unlikely) for positivity in ω_4, suggesting a real exchange rate depreciation to contemporaneously improve output through a large improvement in the trade balance (Appleyard, et. al., 2008).

4.2.2 Household Debt Dynamics

Previously, the analysis has been painted to reflect output. As equation 8 points out, output variability is determined by changes in the financial space of an economy- in particular, the state of an economy's household credit in particular (although this analysis could easily be extended to other forms of debt or housing market prices, household credit is a major driver of financial collapse). Knowing this, one could first focus on Kaldor's (1940) macrobalance, equating savings (SV) and investment (I) in order to ascertain

a dynamical equation governing the motion in household credit as well. Similar undertakings to use this macrobalance equation by Ryoo and Kim (2014) yield favourable results.

Importantly, investment has already been defined. Considering savings, then, it stands to reason that (in an augmented version of Taylor's 2009 view):

$$4.8. \quad SV = s_l(1-\tau_l)\frac{WL}{P} + s_c(1-\tau_c)\frac{\Pi}{P} - \phi\Lambda$$

Where savings relates positively to class-based income, negatively to class-based taxation and negatively to debt accrued (for, if debt were to increase, it is expected that savings be decreased so as to pay off said debt (Taylor, 2009)). In this way, equating both savings and investment (while also substituting for each prospective income share) yields:

$$4.9. \quad s_l(1-\tau_l)SY + s_c(1-\tau_c)(1-S)Y - \phi\Lambda = \alpha_1(1-S)Y + \alpha_2 Y \pm \alpha_3\lambda + \alpha_4 Q$$

Solving for the level of household debt and obtaining deviations through a first degree Taylor approximation yields a reduced form relationship as shown in equation 11:

$$4.10. \quad \hat{\Lambda} = \pm\kappa_1\hat{Y} \pm \kappa_2\hat{S} \pm \kappa_3\hat{Q}$$

Shifting focus to output growth and its relation to the stock of debt, it stands to reason that an increase in output may in fact lead to decreased debt stock; in this instance, debt dynamics are deemed to be non-explosive (where κ_1 is negative). If, however, an increase in output allows for the expansion of debt, it can be argued that the dynamics of the system are explosive (where κ_1 is positive). In the latter case, household debt dynamics are Minsky-unstable, while the former case sees household credit being stable (Minsky, 1975).

Shifting focus to an increase in the labour share, one could argue that repayments on debt may be able to increase in-step with improvements in labour-based income, decreasing the level of debt repayable- making the case for negativity in κ_2. If, however, an increase in the labour share bolsters the amount of loans taken out by labourers, it may be that κ_2 be positive and, in fact, inflate the stock of debt.

Focusing on Tobin's Q, a market value increase of a set of assets may allow firms within the macroeconomy to accrue more debt (and in so doing, leverage themselves more so as to bolster investment outcomes). making the case for positivity in κ_3. As a counter to this, an increase in the market value of particular firms may see an ability to more adequately pay for debt, decreasing

debt stocks (in which case, it is expected that κ_3 be negatively related to growth in the debt stock.)- in this instance, Tobin's Q is a signal of a firm's total value.

Hence, in continuous time, the system can be rewritten as follows:

$$\hat{Y} = \pm\omega_1\hat{\Lambda} \pm \omega_2\hat{S} \pm \omega_3\hat{Q} \pm \omega_4\hat{R} \tag{4.7.}$$

$$\hat{\Lambda} = \pm\kappa_1\hat{Y} \pm \kappa_2\hat{S} \pm \kappa_3\hat{Q} \tag{4.10.}$$

Estimating these equations enables the estimation of the impact that the labour share cycle has on both an economy's position in the output cycle and financial cycle alike (as well as the interplay between these two cycles). This system is estimated using a Structural VAR as found in Sims (1986) and Bernanke (1986). This was done, as opposed to a VECM analysis, in order to ascertain all coefficients in as agnostic a manner as feasible, while also correcting for different orders of integration between variables. Although SVARs may uncover structural relationships between variables- these relationships are based on restrictions placed on the model, however. Changing restrictions implies a change in both the size and (possibly) sign of each reported coefficient within the estimation framework which should be cautioned (Uhlig, 2005). In comparison to most rigid SVAR studies who impose restrictions on coefficient signs and coefficient sizes themselves, however, the former restrictions are not implemented given the feature of Structuralist regression coefficients to be explained by both their positivity or negativity, depending on the Structure and context of the economy within which they are estimated. This, as per Sims (1980) or more recently, Arias, Rubio-Ramirez, Juan and Waggoner (2014), feeds into the inherent "Agnosticism" of the analysis, and as such, may be more robust than generic SVAR analysis which are not permissive of sign ambiguity.

This novel two-equation model is cast within the labour share light, as opposed to the top percentile of income earners, differentiating the model from the main focus of the literature. Considering the macroeconomic instability (often glossed over in the mainstream) driven by changes in income distribution, such a model, while parsimonious, also enables improvements in financial system stability by noting income distribution cyclical dynamics, providing a clear contribution to policymakers as well.

4.3 Estimation and Analysis

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Table 1a: Equation 4.7. (NLS Labour Share Gap)

	Australia	France	Germany	Italy	SA	UK	USA
Φ_1	0.018^{***}	-0.010^{*}	0.015^{***}	0.011^{***}	0.065^{***}	0.024^{***}	0.026^{***}
	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)
Φ_2	0.141^{***}	0.202^{***}	0.298^{***}	0.168^{***}	0.188^{***}	0.358^{***}	0.202^{***}
	(0.029)	(0.050)	(0.111)	(0.057)	(0.038)	(0.059)	(0.035)
Φ_3	0.011^{**}	0.067^{***}	-0.043^{***}	0.041^{***}	0.145^{***}	-0.030^{**}	0.002
	(0.054)	(0.002)	(0.015)	(0.015)	(0.045)	(0.013)	(0.007)
Φ_4	0.029^{*}	0.033^{***}	0.035^{***}	0.032^{***}	0.033^{**}	0.067^{***}	0.074^{***}
	(0.018)	(0.006)	(0.008)	(0.008)	(0.015)	(0.011)	(0.007)
Φ_5	-0.105^{*}	-0.002	-0.100^{***}	-0.012	0.001	-0.003	–
	(0.057)	(0.027)	(0.034)	(0.037)	(0.000)	(0.006)	(-)
R Squared	0.290	0.536	0.346	0.550	0.407	0.508	0.739
DW Statistic	0.812	0.369	0.439	0.381	0.570	0.652	0.747

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Table 1b: Equation 4.10 (NLS Labour Share Gap)

	Australia	France	Germany	Italy	SA	UK	USA
Ψ_1	0.047^{***}	0.053^{***}	0.025^{***}	0.040^{***}	-0.020	-0.003	-0.024^{***}
	(0.011)	(0.010)	(0.003)	(0.006)	(0.022)	(0.006)	(0.009)
Ψ_2	1.476^{***}	1.100^{***}	0.158	0.791^{***}	1.157^{***}	0.854^{***}	1.396^{***}
	(0.327)	(0.209)	(0.110)	(0.215)	(0.239)	(0.137)	(0.244)
Ψ_3	-0.051	-0.007^{***}	0.111^{***}	0.135^{***}	0.013	0.132^{***}	0.094^{***}
	(0.190)	(0.028)	(0.010)	(0.010)	(0.117)	(0.013)	(0.014)
Ψ_4	0.095^{*}	-0.034^{**}	0.012	-0.026	0.079^{**}	-0.073^{***}	-0.082^{***}
	(0.200)	(0.015)	(0.009)	(0.018)	(0.037)	(0.018)	(0.027)
R Squared	0.251	0.243	0.592	0.546	0.341	0.692	0.641
DW Statistic	0.180	0.155	0.090	0.105	0.284	0.265	0.279

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Focusing first on goodness of fit across both tables, there is evidence for a slightly better aggregate fit for the output equation than the credit equation. The fit across tables varies greatly (with R squared values between 0.25 and 0.74 dependent on the country in question).

Paying attention in particular to Table 1a, a few facts should draw the attention of the researcher. First, all countries in the analysis experience debt-led growth dynamics (i.e., Φ_2 is positive for all countries. That is, as household debt grows, so too does output within a country. This is most pronounced in the UK case, where a 1-percent increase in household debt relates to economic growth of roughly 0.36 percent in the country.

What is, arguably, most important to the Structuralist, is Φ_3 however. First, it bears mentioning that the sign attached to Φ_3 does not reveal whether a country experiences profit-led or wage-led growth. Instead, for Germany and the UK, a negative Φ_3 indicates that, as the labour share grows above its real-GDP-maximising level, nominal GDP growth decreases.

Both countries are wage-led in terms of real GDP according to the analysis done in Chapter one of the current thesis. Therefore, when the labour share increases in these two countries, inflation would have to decrease in order to ensure wage-led economic growth. This implies that Germany and the UK experience reformist labour market structures (i.e., when bargaining power improves, inflation at its core decreases). This is the opposite for France and South Africa (where labour share growth indicates increased nominal GDP, but must necessarily imply increased inflation to ensure profit-led growth).

Moving focus to Φ_4, all countries show a significant and positive relationship between growth in Tobin's Q and nominal output. In the American context

(for, in fact, the reaction is most pronounced) a percentage increase in Tobin's Q increases nominal output by 0.074 percent. That is to say, the health of the American financial market positively influences nominal GDP in a non-negligible way through the investment channel in the economy.

Ultimately, focusing on the inclusion of the growth rate of the real exchange rate (with its attached coefficient Φ_5), one could argue its inclusion to be insignificant at driving nominal output in two cases- that of the Australian and German estimations whose coefficients abide by the Marshall-Lerner condition. In this case, a real depreciation (relative to a trade-weighted basket of other currencies) ends up depressing nominal GDP by approximately 0.1 percent in Australia and Germany in the short-term (due to the fixed short-term nature of some trade contracts).

Drawing attention to Table 1b and Ψ_2 (the elasticity of household credit with respect to output) in particular, debt dynamics are as relayed in Minsky (1975) for these particular economies save for the German estimation. That is, increased output significantly relates to increased household credit accumulation. In some cases (Italy and the UK), a 1 percent increase in GDP yields a less than 1 percent increase in credit accumulation. However, in all other cases, there is evidence to suggest household credit is Minsky-unstable (that is, as GDP grows, household credit extends at more than a one-to-one ratio).

Returning to the cornerstone of Structuralist analysis (i.e., Ψ_3), an increase in the labour share above its optimal level by 1 percent has a positive and significant impact on household credit in most instances, save for in France, Australia and South Africa (the latter two whose coefficients are statistically insignificant). In the majority of cases, an increase in the labour share beyond its real-GDP-maximising level would end up increasing household debt. This implies that wealth distributed to households is used to access credit for the most part. On the other hand, for the French estimation, if the labour-share were to overshoot it's optimal value, households are likely to pay off credit or accumulate less credit (potentially opting to save more).

Finally, focusing on the growth rate of Tobin's Q (in this instance, a proxy for financial-market based private wealth), in most instances, Ψ_4 is significant and positive in two countries, and significant and negative in three countries. In South Africa, for instance, unitary growth of Tobin's Q increases household aggregate credit by 0.08 percent. This implies that, as private wealth in the country increases, so too does credit. On the other hand, in countries like France, the UK and the USA, an increase in private wealth moves the average household away from borrowing.

This analysis, however, focuses on the optimal labour share gap estimated using NLS. When modelling this same gap using DOLS, results in tables 2a and 2b are summarized below:

Table 2a: Equation 4.7. (DOLS Labour Share Gap)

	Australia	France	Germany	Italy	SA	UK	USA
Φ_1	0.009^{***}	$-0.010^{(*)}$	0.015^{***}	0.011^{***}	0.060^{***}	0.024^{***}	0.026^{***}
	(0.003)	(0.006)	(0.004)	(0.004)	(0.006)	(0.003)	(0.002)
Φ_2	0.166^{***}	0.203^{***}	0.298^{***}	0.168^{***}	0.191^{***}	0.358^{***}	0.202^{***}
	(0.027)	(0.050)	(0.111)	(0.058)	(0.038)	(0.059)	(0.036)
Φ_3	0.137^{***}	0.067^{***}	-0.043^{***}	0.041^{***}	0.149^{***}	-0.030^{**}	0.002
	(0.029)	(0.011)	(0.015)	(0.015)	(0.047)	(0.012)	(0.007)
Φ_4	0.010	0.033^{***}	0.035^{***}	0.032^{***}	0.032^{**}	0.067^{***}	0.074^{***}
	(0.007)	(0.006)	(0.008)	(0.008)	(0.015)	(0.011)	(0.007)
Φ_5	0.010	-0.018	-0.100^{***}	-0.012	0.001	-0.034	–
	(0.026)	(0.027)	(0.034)	(0.037)	(0.000)	(0.028)	(-)
R Squared	0.407	0.536	0.347	0.553	0.403	0.508	0.739
DW Statistic	0.910	0.369	0.439	0.381	0.575	0.652	0.747

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Table 2b: Equation 4.10 (DOLS Labour Share Gap)

	Australia	France	Germany	Italy	SA	UK	USA
Ψ_1	0.052^{***}	0.053^{***}	0.026^{***}	0.039^{***}	-0.020	-0.002	-0.024^{***}
	(0.010)	(0.011)	(0.003)	(0.006)	(0.040)	(0.006)	(0.009)
Ψ_2	1.794^{***}	1.100^{***}	0.158	0.791^{***}	1.169^{***}	0.854^{***}	1.396^{***}
	(0.351)	(0.209)	(0.110)	(0.216)	(0.238)	(0.137)	(0.245)
Ψ_3	-0.363^{***}	-0.079^{***}	0.111^{***}	0.039^{***}	-0.004	0.132^{***}	0.094^{***}
	(0.017)	(0.023)	(0.010)	(0.006)	(0.122)	(0.013)	(0.015)
Ψ_4	0.036	-0.034^{**}	0.012	-0.026	0.078^{**}	-0.072^{***}	-0.082^{***}
	(0.022)	(0.022)	(0.009)	(0.018)	(0.038)	(0.018)	(0.027)
R Squared	0.340	0.244	0.591	0.554	0.431	0.692	0.641
DW Statistic	0.253	0.155	0.090	0.381	0.285	0.265	0.280

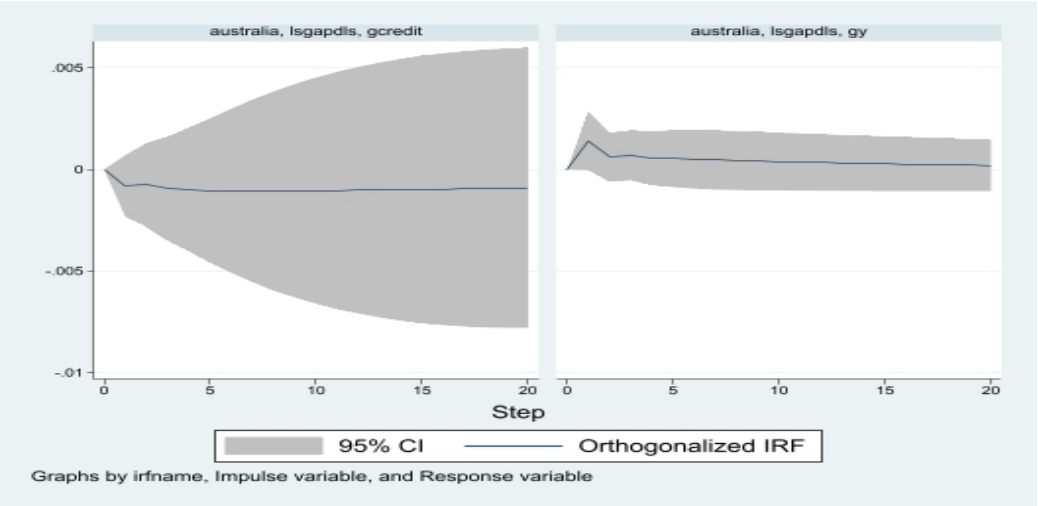
Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

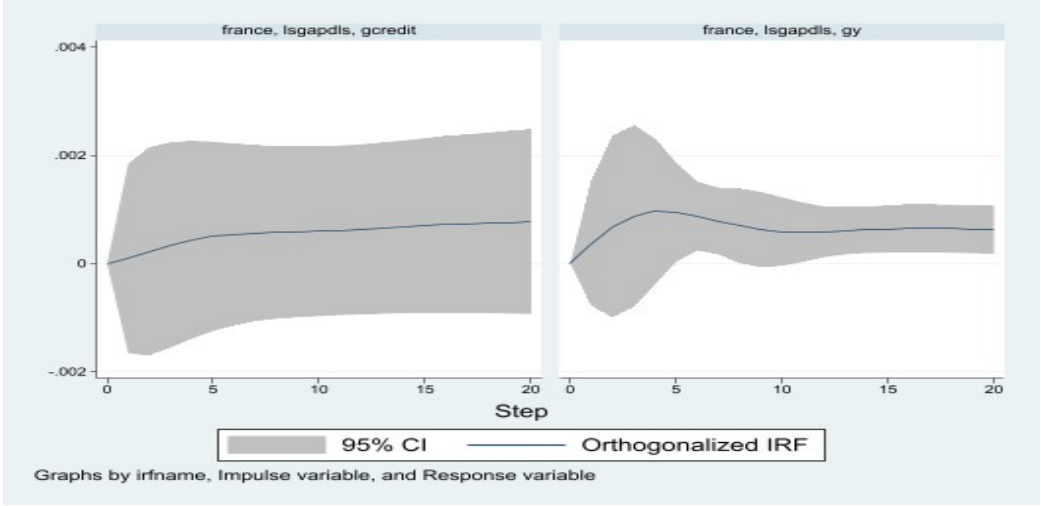
From the above, it is important to note that the sign, size and significance of most coefficients remain relatively the same when using the output-maximising NLS or DOLS estimated optimal labour share. With respect to goodness of fit, all estimations perform similarly when compared to Tables 1a and b. What is, however, slightly different is the analysis for Australia given the difference in estimation of labour share gaps for the country based on the approach.

First, Φ_3 is now far more statistically significant (even though sign and relative coefficient sizes are similar). However this pushes both Φ_4 and Φ_5 into statistically insignificant territory. In relation to table 2b, however, Ψ_3 is now extremely significant where it was previously not. In this case, the coefficient is negative and significant. This signals that, as the labour share moves above its real-GDP-maximising value, household credit growth declines by 0.36 percent. This implies, again, that an improvement in income distribution towards the labourer class would improve credit rather than sustain it.

Nevertheless, for the most part, it should be said that using either form of analysis (NLS or DOLS) in order to ascertain optimal labour share values has a relatively negligible impact on regression analysis when including one such labour share gap as an explanatory variable. For the sake of parsimony, it is the DOLS labour share gap which will be drawn forward into both the next section of the current chapter and the final chapter of the current dissertation as a means to measure the labour share cycle. This, we attest, is due to the inherent similarity between results when using either DOLS and NLS labour share specifications.

Of course, coefficients attached to VARs or SVARs are often not cited directly. Instead, impulse response functions regarding each analysis are critical to provide considering the likely long-term impulse pathways associated with changes in each variable of interest. A summary of these impulse response functions in relation to shifts in the labour share away from its optimal value (derived through DOLS) are provided below and overleaf:




france, lsgapdls, gcredit
france, lsgapdls, gy
.004
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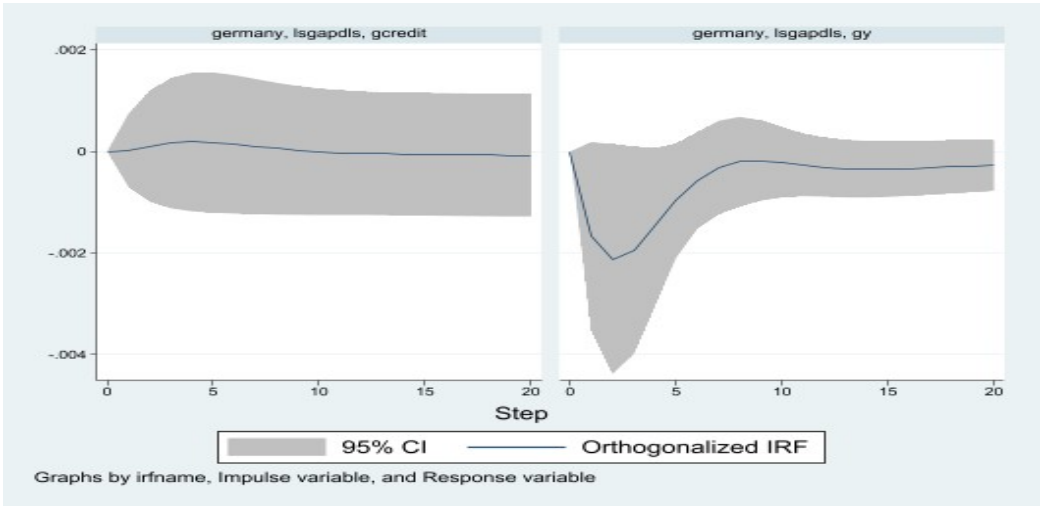
20
Step
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable


germany, lsgapdls, gcredit
germany, lsgapdls, gy
.002
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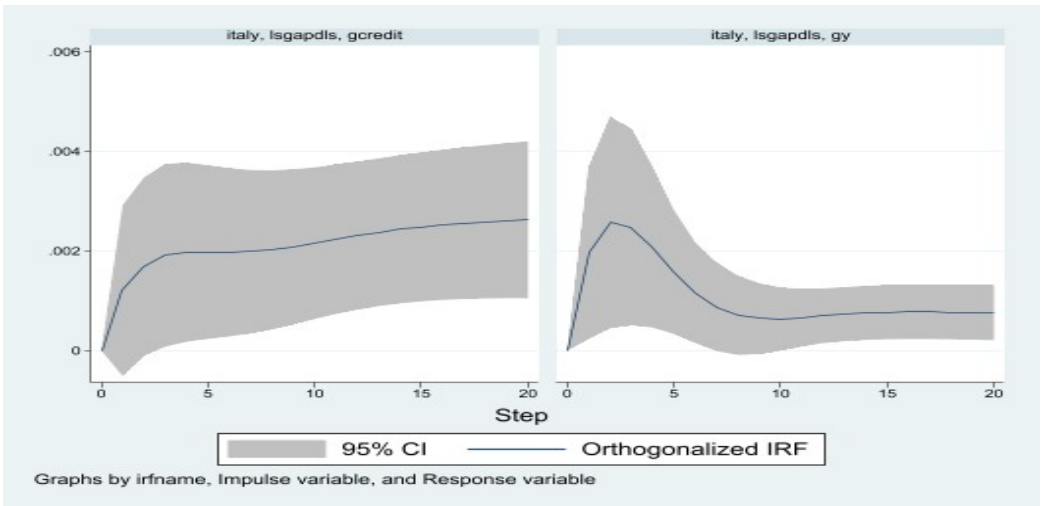
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable


italy, lsgapdls, gcredit
italy, lsgapdls, gy
.006
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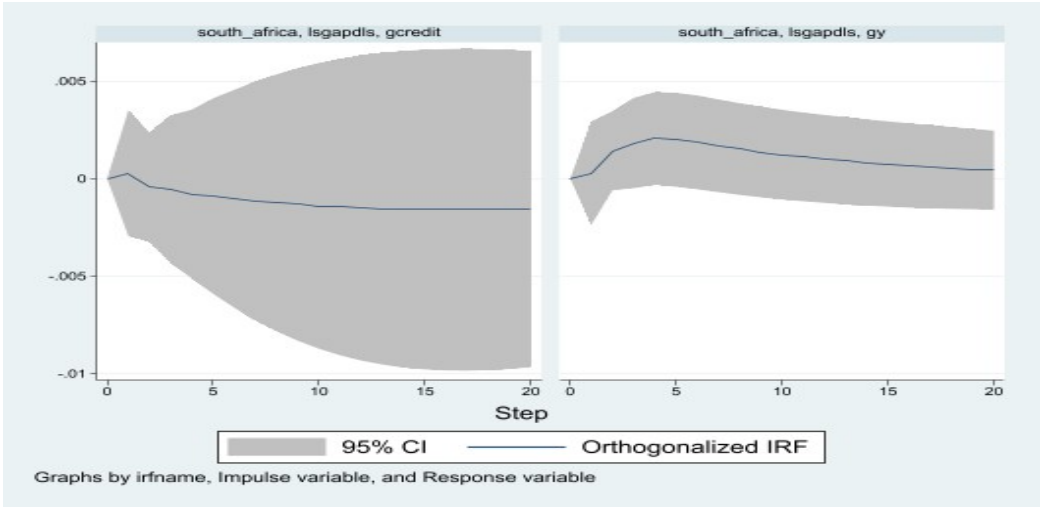
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable


south_africa, lsgapdls, gcredit
south_africa, lsgapdls, gy
.005
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-.005
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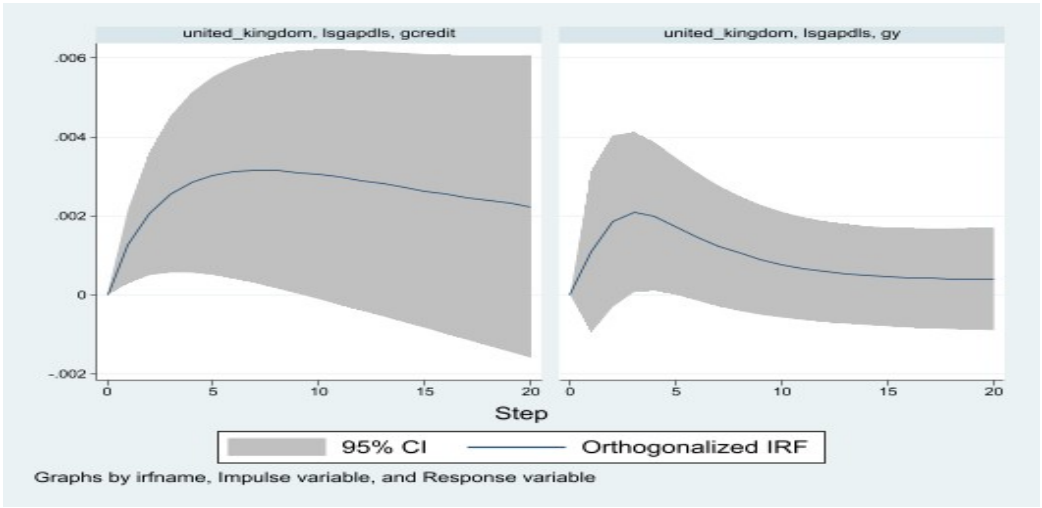
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable


united_kingdom, lsgapdls, gcredit
united_kingdom, lsgapdls, gy
.006
.004
.002
0
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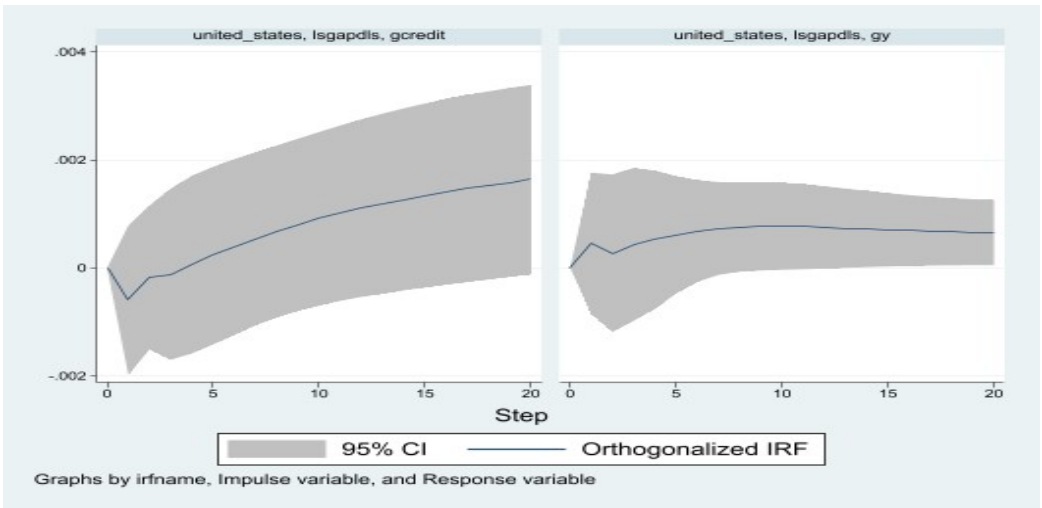
Step
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable


united_states, lsgapdls, gcredit
united_states, lsgapdls, gy
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Step
95% CI
Orthogonalized IRF
Graphs by irfname, Impulse variable, and Response variable

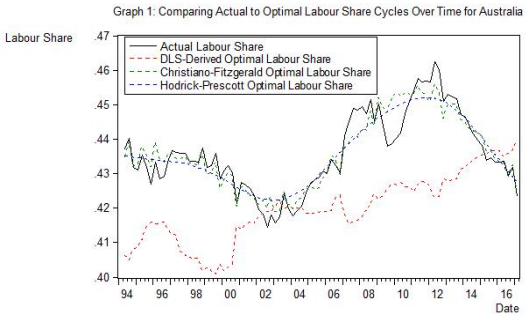
Based on the impulse responses, and across most country contexts, the effects of an increase in the labour share above it's GDP-optimising-level relate to a non-transient increase in both GDP growth (gy in the above graphics), and credit growth (gcredit in the above graphics).

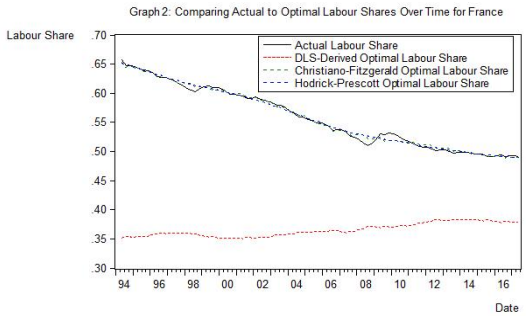
These non-transient changes indicate that unintended shifts in the labour share (and therefore, income distributions between classes) have an inherently destabilising impact, shifting an economy to an altered structural growth and credit trajectory, as Flaschel and Krolzig (2003) confirm.

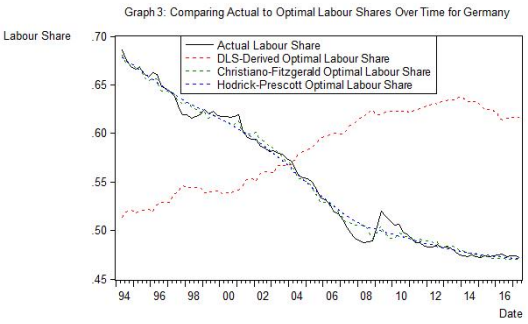
4.4 On Using Filtered Natural Rates

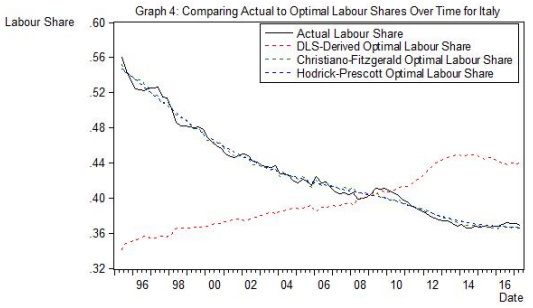
As is gleaned from the third chapter of the analysis, the estimation of an optimal labourer's share may itself seem quite an arduous process. What, then, is the point of estimating one such optimal, as opposed to, say, using techniques already employed in Macroeconometrics to date? As will be shown, above and beyond the generic problems with filtering various variables through the use of ubiquitous methods (inter alia, the Hodrick-Prescott- HP- or Baxter-King/Christiano-Fitzgerald - BK/CF- filters, as summarized in Hamilton (2017)), these filters also overemphasize the rapidity with which an economy transitions between profit-led or wage-led regimes.

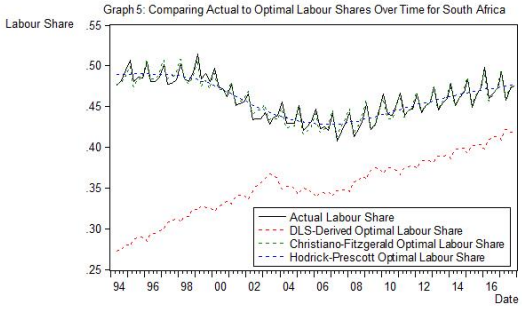
To this end, the figures both below and overleaf aim to show these overemphases in transition time. As such, Figures 1-7 plot the actual labour share, as well as optimal labour shares derived from the first chapter, and when using both the HP and asymmetric CF filters over time.

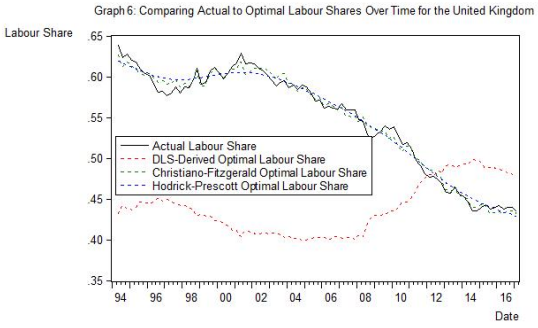


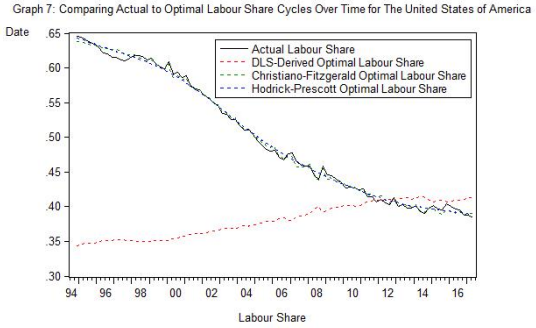












As briefly touched upon beforehand, the use of the gap between actual and optimal labour share values can be linked with whether a nation is profit- or wage-led. If the actual labour share is below the optimal, the labour share is in "recession"- an increase in that labour share towards the real GDP maximising level would yield an increase in GDP, and as such, the economy in question is deemed wage-led. If, in juxtaposition, the actual labour share were above its real GDP maximising value, a decrease in the labour share would improve national production, implying that the economy is profit-led.

When using a filter to ascertain the natural level of the labour share, however, there is no guarantee that moving towards said natural rate yields increased

production. Rather, an analysis using one such labour share gap seeks to understand at what period the labour share were at a maximum or minimum; when relating a labour share gap like this to real GDP, one can then come to a conclusion about whether the economy in question is profit- or wage-led.

If and when this is done, the true problem comes to the fore; when deriving the optimal labour share from generally feasible functions (as has been the case in chapter one of the current thesis), it appears as though the cyclical behaviour of the labour share is more gradual. This itself makes inherent sense- in general, a shift in income distribution signals, among other things, the change in a nation's institutional structures. This itself, as many attest, is a long and often arduous process. As such, regimes should change gradually over time (as is exposed by the length of time it takes for the nations in question to move from being profit- to wage-led).

Due to the features of each filter, however, one runs the risk of assuming that cycles in the labour share occur all too frequently (in most instances from Graphs 1-7, this appears to be anywhere between a quarterly fluctuation, to a yearly/biyearly occurrence as opposed to once or twice in the 23 year period). A researcher attempting to understand transitions between being wage-led to profit-led, or vice versa, should at the very least be cognizant of using one such "easy-fix" solution in attempting to gauge optimal labour share values, whose cycles may indeed be more gradual than either the Hodrick-Prescott or Christiano-Fitzgerald filters can attest (see work done by Hamilton (2018), cautioning against the use of such filters).

Above and beyond these inherent problems, using such filters and attempting to understand whether in fact a nation is profit- or wage-led, or whether the economy in question accumulates household debt or sheds that debt at an increase in the labour share, comes with inaccuracies when using regression analysis (see work done by Blecker (2016), highlighting that such filters aren't typically used in Structural macroeconomic analysis).

These inaccuracies are outlined in an excerpt below, running the same system inclusive of either HP and CF filtered values as relative labour share optima. Thus, Table 3 reads:

Table 3: Replacing the Optimal DOLS-Derived Labour Share with Filtered Values

	$\Phi_{3,HP}$	$\Psi_{3,HP}$	$\Phi_{3,CF}$	$\Psi_{3,CF}$
Australia	0.371^{***}	-0.900^{**}	0.371^{***}	-0.916^{***}
France	0.303^{**}	-0.392	0.256	-0.274
Germany	0.013	-0.009	-0.100	0.152
Italy	0.223	-0.235	0.348^{**}	-0.480
South Africa	0.077	0.074	0.942	-0.136
United Kingdom	0.241^{**}	-0.176	0.150	-0.104
United States of America	0.233	-0.332	-0.182	0.250

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

The above, a summary of all coefficients relating to the labour share gap, underpins- quite well- why the use of filters in one such situation is sub-optimal. In the research done from both chapters one and two, it appears as though all nations' economies are a mixture of being wage led in nominal GDP (all countries in the sample save for Germany, and arguably the UK) and debt-accumulating (that is to say that an increase in the labour share significantly increases the amount of household debt accrued- as is the case for all economies).

Given the use of filtered labour share values, this trend is not the case. In the significant cases, it appear as though Australia and -to a lesser extent- France, Italy and the UK (using either the HP or CF filter) are wage led in nominal GDP (see, for example, work done by Onaran and Galanis (2012) confirming the above). Australia alone is the economy significantly linking household debt to income distribution changes. This relationship, however, is debt-shedding rather than debt-accumulating. This signals that, when income distribution shifts towards the working class, household debt is paid off more so than it is accumulated. In all other instances, the labour share is insignificant in influencing either nominal output or household debt.

This set of findings when using natural rates also goes directly against the plethora of work quoted in Onaran and Galanis (2012), as well as general literature relating income to debt accumulation (as pointed to recently by Mason (2018), although the expanse of works linking a shift in income distribution to household debt accumulation through collateralisation is widely researched).

Further, when estimating impulse response functions using such non-structurally estimated natural rates, the effects of a shift in the labour share are, in the main, considered transient or temporary. This transient effect is contrary to

the inherently destabilising nature of shifts in functional income distribution between classes, as pointed out by Flaschel and Krolzig (2003).

These inherent inaccuracies when using filtered labour share values, we attest, warrant levels of inaccuracy which policy makers should be aware of when using simple filters to estimate structural coefficients like the labour share gap.

5 Chapter 5: A Dynamic "Distribution-Sensitive" Model of an Open Macroeconomy with stabilising Monetary Policy Implications

5.1 Introduction

The IS-PC-MR (Investment and Savings, Phillips Curve, Monetary Rule) model is often considered the most ubiquitous tool used to understand a basic macroeconomy (Blanchard and Johnson, 2014). While extremely informative, various augmentations and expansions of this IS-PC-MR model are necessitated to ensure that the model reflects more and more closely the complex reality of macroeconomic systems and their interactions. Some of these expansions, as the literature review touch on, relate to including exchange rate or unemployment dynamics and augmenting the system to include financial system indicators, inter alia. However, as Taylor (2009) points out, the inclusion of income distribution dynamics are usually glossed over when deciding on augmentations to the classical full-economy model.

This lack of attention paid to income distribution dynamics is a clear gap in analysis which requires direct attention, especially outside of the United States, where similar models are regularly estimated (Flaschel and Krolzig, 2003; Flaschel, Franke and Proano, 2006; Setterfield, 2021; Barrales-Ruiz and Von Arnim, 2021; Barrales-Ruiz, et al., 2022).

Beyond applying these models to other country contexts, it is also possible to augment the structure proposed in the literature to include novel findings from the first chapter of this thesis regarding the national income maximising level of a country's labour share. With this augmented open-economy model, it is possible to determine with a greater degree of accuracy whether monetary policy within a particular country is, in fact, stabilising when taking to account the distribution of income across classes.

In order to fill these gaps, the current research synthesises the open-economy models proposed by Flaschel and Krolzig (2003) and Flaschel, Franke and Proano (2006) as its basis, while adapting it to the use of national GDP (as opposed to capital utilisation which is difficult to reliably estimate) and to include cyclical labour share dynamics. The approach to including such dynamics is provided next.

5.2 Theoretical Framework

In line with Flaschel and Krolzig's (2003) methodology then, it is apt to initialize the formation of this economic system (in continuous time) by looking first at movement in wage and price inflation as below:

5.2.1 Wage Inflation

First, one could suggest a Wage Phillips Curve adapted from Flaschel and Krolzig (2003), augmented to include variation in the exchange rate, as seen in equation 1:

$$5.1. \quad \pi^w = \phi_p \pi^p - \phi_u (U^l - U_0^l) \pm \phi_S (S - S^*) \pm \phi_e (e - e_0) + \phi_{we} \pi^e$$

Where wage inflation (π^w) relates to price inflation (π^p), as well as the growth rate in unemployment ($U^l - U_0^l$), the deviation of the labourer's share of national income from its optimal level (as derived in Chapter one) ($S - S^*$), the growth rate of the domestic economy's nominal direct Dollar exchange rate ($e - e_0$) and expected wage inflation π^e.

ϕ_p is positive, and captures the wage-price spiral effect (where individuals caucus for higher wages in the wake of higher prices, which in turn bid up prices, ad infinitum (Blanchard and Johnson, 2014)). Further, as unemployment rises above its natural level (when the unemployment gap is positive), worker's experience a decrease in their bargaining capabilities. This decreased bargaining power forces the average worker to accept a lower wage than they otherwise would have had a large reserve army not existed, implying negativity in ϕ_u (Phillips, 1958). Finally, considering expected wage inflation, it is argued that an increase in expectations on the wage rate would yield an increase in credit-based consumption (based on an expected improvement of future earnings); this consumption increase woud act in such a way so as to bid up economic activity, and with it, the wage rate in a self-fulfilling manner (Flaschel and Krolzig, 2003). As such, ϕ_w should be positive.

The inclusion of the labour share also proxies for bargaining power dynamics which relate ambiguously to wage inflation until measured. Should the labour share increase, but overarching economic power structures exist such that bargaining power is kept in check while wages increase such that unemployment rates increase (i.e., labourers are "reformist"), an increase in the labour share might bid down wage inflation net-net, implying that ϕ_s is negative (Flaschel and Krolzig, 2003).If, however, the labour force was sufficiently militant, an increase in the labour share would not be met with layoffs, creating a (more likely) case for positivity in ϕ_S (Taylor, 2009). Importantly, it is assumed in the case of Flaschel and Krolzig (2003) that the working class are reformist in

order to maintain stability in their posited economic system. This may not be the case, and may in fact have destabilising influences on the macroeconomy- a position which will be examined in section 3 of the current paper.

Ultimately, considering exchange rate growth (where growth indicates a depreciation of the domestic currency), a depreciation of the domestic currency could either bolster trade outcomes (and with it, economic growth and growth in wages) or depress economic growth (especially if debt in a domestic economy is dollarised). In the former instance, a short term depreciation of the currency will yield improved economic outcomes (with relatively cheaper exports and relatively expensive imports), bolstering economic activity and- with it- growth in wages. This makes the case for positivity in ϕ_e (Appleyard, et al., 2008). If, however, domestic debt is predominantly dollar denominated, a depreciation in the domestic currency may hamper economic growth (through an increased level of debt repayment), and ultimately decrease the ability for wages to increase. Thus, in some instances, ϕ_e may also be negative (Ize and Parrado, 2002).

5.2.2 Price Inflation

The above discussion makes no mention of the formulation of price inflation. As such, one could posit a similar model in line with Flaschel and Krolzig (2003), inclusive of augmentations regarding the nominal exchange rate:

$$5.2. \quad \pi^p = \theta_p \pi^w + \theta_y(y - y_0) \pm \theta_S(S - S^*) \pm \theta_e(e - e_0) + \theta_{pe}\pi^e$$

Equation 2 notes that price inflation relates to wage inflation, the rate of output growth$(y - y_0)$, growth in the labour share and exchange rate as well as expectations on inflation (π^e).

Simply, it is suggested that an increase in wages should lead to an increase in the price of goods and services, bidding up the price inflation rate (making θ_w positive, and a signal to gauge the wage-price spiral). Further, an increase in economic growth from the demand side inducses increased prices, indicating positivity in θ_y (Blanchard and Johnson, 2014). In relation to expectations, it is assumed that what inflation might do tomorrow will actually influence the inflation rate in a self-fulfilling way. If, for instance, the general consumer were to expect the inflation rate (and thus the price level) to be high in the future, they would increase their demand of a particular good currently, bidding up the price. Thus, it is expected that θ_p be positive (Roberts, 1995).

Once more, the relationship between the labour share and price inflation is ambiguous (Goodwin (1967); Franke, Flaschel and Proano (2006)). From the

standpoint of a labour share increase, it stands to reason that- when in an upswing during the business cycle, the capitalist class may simply choose to increase the price of goods and services when bargaining power increases as a means to recoup some of its profits (linking an increase in total cost to a concomitant increase in total revenue, which the market may not mind due to the economic upswing) (Goodwin, 1967). This creates a case for positivity in θ_S. If, however, this increased bargaining power comes at a time when the economy is in a downturn, it may be that- in order to stave off a largely decreased profit- the capitalist class may simply pay a higher wage, while simultaneously laying off a large portion of workers. This mass layoff of workers coupled with an increase in wages for the few who remain inside the system (tantamount to a slightly increased labour share) may in fact induce a decrease in the market price of goods and services due to decreased aggregate demand on the part of those without a job (Flaschel, Franke and Proano (2006)). In this instance, an increased labour share may yield negativity in θ_S.

Considering the exchange rate, it should once more be noted that its link to the price inflation rate is ambiguous. If a depreciation of the domestic currency links to an increase in economic growth from the standpoint of effective demand, it stands to reason that θ_e would be positive (with a depreciation inducing demand-pull inflation) (Appleyard, et al., 2008). On the other hand, the same depreciation may see a decrease in economic activity if that economic activity is predominantly dependent on repayment of dollarised loans- thus, demand-pull deflation may in fact take hold (as was analogous to the analysis of sign expectations in the Wage Phillips Curve). Thus, θ_e may also be negative (Ize and Parrado, 2002).

5.2.3 Inflation Expectations

Inflation expectations are governed by a simple adaptive framework as found in Flaschel and Krolzig (2003) where:

$$\dot{\pi^e} = \beta_\pi(\pi^p - \pi^{p.f}) \tag{5.3}$$

Or, more formally, the change in expected inflation is governed by the deviation of actual and forecasted ($\pi^{p,f}$) inflation. It is argued that, if actual inflation exceeds its forecasted value, participants in the economy would have to increase their expectations for the forecast in the next period. Thus, the change in expected inflation is positively related to how large a forecasting error is made previously by a factor of β_π

5.2.4 Unemployment

Considering the work done by Flaschel and Krolzig in 2003, it is arguably more useful to include unemployment dynamics which they themselves, along with others, introduced in another closed-economy model in 2006 (augmented, of course, with the inclusion of the labour share cycle measured in chapter one of the current thesis), where:

$$5.4. \quad \dot{U^l} = -\delta_Y(y - y_0) \pm \delta_S(S - S^*)$$

In essence, it is suggested that an increase in output allows for an expansion of employment in the economy, ensuring negativity in δ_Y (Okun, 1963).

From the standpoint of the inclusion of the labour share, Goodwin's adaptation of the Predator-Prey model may allow for ambiguity in δ_S. If, for instance, the economy is in a boom, an increase in bargaining power may in fact yield an increased employment rate- hence δ_S may be negative. If, however, the economy is facing recessionary pressure, unemployment may still increase in the event that bargaining power is improved (where the wage of workers increases and the demand for labour decreases in step). In this instance, δ_S may be positive (Goodwin, 1967).

5.2.5 Effective Demand and Income Distribution

Based on the above, it stands to reason that- in order for the dynamic Keynesian system structured within this paper to be robust- a relation should govern the way in which actual output evolves. Considering the specification found in Flaschel and Krolzig (2003), the model previously posited works in a closed economy context. As such, the current paper posits a model of effective demand which looks at adding variation in output driven by the rest of the world, while then allowing for monetary policy to stabilise the system given movements in the exchange rate.

Thus, from a classical standpoint, Keynes' (1936) outlook on effective demand can be viewed as follows:

$$5.5. \quad Y = C + I + G + (X - M)$$

Where output is governed by movements in private consumption (C), firm-driven investment (I), government expenditure of the non-exogenous kind (G), and net exports ($X - M$)

Considering consumption, it is apt to point to the fact that both workers and profiteers consume. Each have their own savings rates and tax rates (Taylor, 2009); this is made evident below:

$$5.6a. \quad C = (1 - s_w)(1 - \tau_w)S + (1 - s_p)(1 - \tau_p)(1 - S)$$

More formally, consumption decreases as either the tax rate faced by workers (τ_w) or profiteers (τ_p) increases, or as workers and profiteers save more (with respective savings rates s_w and s_p). Furthermore, consumption(from the labourer's perspective) increases in step with either the labourer's share of national income (S), or with an increase in the profiteer's share of national income ($1 - S$) (Flaschel and Krolzig, 2003).

Following this, it is argued that income earned within a particular economy-particularly the income earned from the perspective of the profiteer- drives firm-level investment, while the interest rate within an economy acts as the cost of investment within that economy (Taylor, 2009). From this, one could look at a simplistic investment function where:

$$5.6b. \quad I = \alpha_p(1 - S) - \alpha_r(i - \pi^p)$$

Considering the profiteer's share of income, it is argued that an increased labourer's share cuts into profit. This decreased profit forces a decrease in investment in large capital projects (with workers being compensated more, firms are less able to purchase capital). Thus, the labourer's share negatively relates to investment, implying that the profit share directly relates to the level of investment extant within an economy. Put differently, an increased profit share increases the ability of firms to obtain capital, bolstering investment by a factor of α_p. (Taylor, 2009)

Looking now to the real interest rate ($i - \pi^p$), one could simply suggest that-with an increased amount of repayable debt (i.e., with an increased real interest rate), firms are less able to invest; hence, it is expected that α_r be negative (Blanchard and Johnson, 2014).

Penultimately, considering the government expenditure component of effective demand, it is important to point to a stylized fact which influence its (government expenditure's) composition; tax paid by both the working and profiteer class bolsters the ability of the fiscus to spend (Taylor, 2009). Thus, government spending should be of the form:

$$5.6c. \quad G = \tau_w S + \tau_p(1 - S)$$

Where, simply, an increase in either class' income should yield higher taxes, which implies an increased ability for the fiscus to expend- hence, each income share is positively related to government expenditure weighted by their respective tax rates.

Once more, embellishing on the open-economy augmentation of the Flaschel-Krolzig model, a Thirwallian stance can be taken regarding the level of net exports within an economy. In a simplistic manner, it can be argued that exports are priced with the real exchange rate of a country, and are further determined by income available to the trading partners of a particular economy. Imports, on the other hand, depend on both the real exchange rate and the domestic level of income within a particular country (Thirlwall, 1979). In this vein, one could suggest a (linear) net exports function of the form:

$$5.6d. \quad (X - M) = \psi_{re}(P^F e)/P + \psi_{yf} Y^F - \psi_{yd} Y$$

Formally it is argued that- when foreign income (Y^F) increases, exports increase (due to an increase in the wealth of a domestic economy's trade partners, export demand from that domestic economy will increase); from this, ψ_{yf} is expectedly positive when related to net exports. In juxtaposition, an increase in domestic income (Y) allows the domestic populace to demand more foreign goods, bolstering imports (which are negatively related to net exports), making ψ_{yd} negative (Thirlwall, 1979)

Looking at the real direct exchange rate ($(P^F e)/P$- made up of the foreign price level- P^F; the nominal direct exchange rate- e; and the domestic price level- P), however, one could argue that a real exchange depreciation makes exports more cheaply attainable from the rest of the world's perspective, while the very same depreciation decreases the demand for imports (with exports becoming more expensive in this instance). With this in mind, a depreciation of the real exchange rate (an increase in its value) bolsters net exports, making ψ_{re} positive.

Thus, when combining equation 5 with equations 6a-6d, effective demand for an open economy assumes the following form:

$$5.7a. \quad Y = (1 - s_w)(1 - \tau_w)S + (1 - s_p)(1 - \tau_p)(1 - S) + \alpha_p(1 - S) - \alpha_r(i - \pi^p) +$$
$$\tau_w S + \tau_p(1 - S) + \psi_{re}(P^F e)/P + \psi_{yf} Y^F - \psi_{yd} Y$$

This, in reduced form (accounting for the multiplier effect) yields:

$$5.7b. \quad Y = \rho_c \pm \rho_S S - \rho_r(i - \pi^p) + \rho_{re}(P^F e)/P + \rho_{yf} Y^F$$

Where, in most instances, each coefficient relates similarly to national income as it did to each individual component of the effective demand equation, save for the coefficient attached to the labourer's share of national income. If, for instance, an increase in this labour share had to improve economic activity (implying positivity in ρ_S), the economy is deemed to be wage-led. If, instead, an increase in the labourer's share hampers economic activity, ρ_S is seen to be negative, and the economy is assumed to be profit-led (Bhaduri and Marglin, 1991).

In order to make output dynamic, we assume aggregate excess demand to be of the widely used form (for instance, see work done by Taylor (2009), although the dynamical equation itself can be traced back to Keynes' (1936) output multiplier assumption):

$$5.8. \quad \dot{Y} = \sigma_Y(Y - Y^S)$$

Where the change in an economy's output is effectively given by the difference between aggregate effective demand (as described previously), and aggregate supply (Y^S). Presumably, because of the less-than-unity marginal propensity to consume, the difference between demanded output and supplied output is less than zero (Keynes, 1936).

5.2.6 The Labour Share

Knowing that the labour share (i.e., $\frac{WL}{PY}$) can be written as Nominal Unit Labour Cost (NULC) divided by the price level inherent to an economy. As such, taking the growth rate of this standard structural equation yields:

$$5.9. \quad \dot{S} = \pi^w - \pi^p$$

Which simply shows that growth in the labour share comes about due to a difference between wage and price inflation.

5.2.7 Monetary Policy

What is, perhaps, missing from the above modelling framework is the relation between a macroeconomy's inner workings, and the way in which monetary policy attempts to guide those workings towards a semblance of stability. From the standpoint of a reasonable monetary policy rule, one could follow Mohanty and Klau (2005), adding an augmentation from Flaschel and Krolzig (2003) themselves, such that the prevailing interest rate evolves as such:

$$5.10. \quad \dot{i} = \mu_\pi(\pi^p - \pi^{p,t}) + \mu_Y(y - y_0) \pm \mu_e(e - e_0) \pm \mu_S(S - S^*)$$

Here, a change in the interest rate relates to a deviation of inflation from its target level ($\pi^{p,t}$), output growth, growth (either an increase/depreciation or decrease/appreciation) in the nominal direct exchange rate and the deviation of the actual labour share from its optimised value.

The monetary policy rule in equation 10 is mostly of standard form, indicating that a central bank has a distaste (and therefore, increases policy rates) as inflation increases above its target, or as an economy grows from the demand side and potentially overheats. As a result, both μ_π and μ_Y are also expectedly positive, although μ_π is likely higher than μ_Y due to a central bank's general penchant for maintaining inflation deviations more so than deviations in output (Taylor, 1993). Further, depending on the preference of the central bank in question (i.e., whether exchange rates should be kept relatively stable or not), there are two cases for the sign of μ_e. Should exchange stability be a major goal of a central bank, an exchange depreciation would be met by an increase in the policy rate to re-appreciate the nominal currency, with the inverse also holding true in the case where such a bank is not concerned about exchange stability (Mohanty and Klau, 2005).

Finally, as considered in Flaschel and Krolzig (2003) and Capazario (2022), changes in functional income distribution may influence monetary policy decisions through three avenues, as discussed below:

- The inflation regime followed by the labour share - should an increase in the labour share increase prices, an inflation targeting central bank would likely hike rates indicating positivity in μ_S, with the inverse also holding true.
- The output regime followed by the labour share - should an increase in the labour share yield increased output, a central bank that viewed demand side growth as a potential inflationary event would likely hike rates indicating positivity in μ_S, with the inverse also holding true.
- Whether the central bank in question includes a mandate to protect income distribution dynamics or not- As Capazario 2022 (pp 9) points out, "Beyond the obvious channels mentioned above, central banks may [... react by] stabilising the macroeconomic system [...] by moving an economy towards a particular equilibrium. Depending on how a central bank wishes to stabilise the economy (at least in the short-term), an increase in the labour share can either be met with an increase or a decrease in the interest rate accordingly"

5.2.8 The Open Economy

Notwithstanding the prior theory, it is important to define variation in the exchange rate in some non-arbitrary way; as such, a simplistic uncovered

interest parity relation as found in Appleyard, Cobb and Field (2008) may be utilised as a means to close off the dynamic macroeconomic model in totality, such that:

$$5.11. \quad \dot{e} = \kappa_i(i^F - i) - \kappa_S(S - S^*)$$

Where it is argued that a change in the exchange rate positively relates to the differential between foreign and domestic interest rates. If, for instance, the foreign interest rate were above the domestic interest rate, capital would flow from the domestic economy and enter into the foreign economy, depreciating the domestic currency with respect to that foreign currency- hence, as the interest rate differential increases (becomes more positive), it is expected that the exchange rate depreciates, and thus that κ_i is positive (Appleyard, Cobb and Field (2008)).

Furthermore, as per Stockhammer, et al. (2008), there is an intimate relationship between the compensation of employees and price levels. There is then a further link between price levels and exchange rate volatility (which is often deemed the pass-through between changes in export prices, and changes in the exchange rate). If an economy is profit led (i.e., if the optimal value derived is above the actual value of the labour share) for instance, it stands to reason that increasing the labour share towards it's real- GDP-maximising level (i.e., a boost in wages, ceteris paribus) yields higher domestic prices, and thus higher trade prices, appreciating the exchange rate. Thus, it is expected that κ_s negatively relate to the direct exchange rate.

5.2.9 Stability Analysis

It is ultimately important to understand the stability properties inherent to the system. This system, in dynamic as opposed to discrete time, is of the following form:

$$5.12(eqs\ 5.1{+}5.2{+}5.3). \quad \dot{\pi^e} = \beta_\pi(\theta_w(\phi_p\pi^p - \phi_u(U^l - U_0^l) \pm \phi_S(S - S^*) \pm (\phi_e - \theta_e)(e - e_0)) + \theta_Y(Y - Y_0) \pm \theta_S(S - S^*) - \pi^e)$$

$$5.13.(eqs\ 5.5{+}5.6{+}5.7{+}5.8). \quad \dot{Y} = \sigma_Y(\rho_c \pm \rho_S S - \rho_r(i - \pi^e) + \rho_{re}\frac{P^F e}{P} + \rho_{Yf}Y^F - Y)$$

$$5.14(renamed\ from\ 5.4). \quad \dot{U^l} = \pm\delta_S(S - S^*) - \delta_Y(Y - Y_0)$$

$$5.15(eqs\ 5.1{+}5.2{+}5.9). \quad \dot{S} = \phi_p\pi^p - \phi_u(U^l - U^{l,*}) \pm (\phi_S - \theta_S)(S - S^*) \pm (\phi_e - \theta_e)(e - e_0)$$

$$-\theta_p\pi^w - \theta_Y(Y - Y_0) + (\phi_{we} - \theta_{pe})\pi^e$$

5.16(*renamed from* 5.10). $\dot{i} = \mu_\pi(\pi^p - \pi^e) + \mu_Y(Y - Y_0) \pm \mu_e(e - e_0) \pm \mu_S(S - S^*)$

5.17(*renamed from* 5.11). $\dot{e} = \kappa_i(i^F - i) \pm \kappa_S(S - S^*)$

For simplicity, in order to reduce the dimensions of the system, a few steps can be taken:

1. In the augmented Okun's Law equation (equation 14), make $(Y - Y_0)$ the subject of the formula
2. Referring now to the UIP relation in equation 17, isolate $(S - S^*)$ on the LHS, and plug this result into the result from step 1 above.
3. Substitute this new result (combining steps 1 and 2) into the Monetary Policy rule in equation 16, and solve for i
4. As per Flaschel and Krolzig themselves, substitute this final result into the real interest rate term in the IS curve in equation 13.

This creates a condensed dynamical system (in the same spaces as Flaschel and Krolzig (2003)) of the following nature:

5.18. $$\dot{\pi^e} = \beta_\pi(\theta_w(\phi_p\pi^p - \phi_u(U^l - U_0^l) \pm \phi_S(S - S^*) \pm (\phi_e - \theta_e)(e - e_0)) + \theta_Y(Y - Y_0) \pm \theta_S(S - S^*) - \pi^e)$$

5.19. $$\dot{Y} = \sigma_Y(\rho_c \pm \rho_S S - \rho_r(\pm\frac{\delta_Y\kappa_i}{\kappa_S\delta_S\mu_Y}[\dot{i} + \mu_\pi(\pi^p - \pi^e) + \mu_e(e - e_0) + \mu_S(S - S^*)] + \frac{\dot{u}}{\delta_S} - \frac{\dot{e}}{\kappa_i} - \pi^e) + \rho_{re}\frac{P^F e}{P} + \rho_{Yf}Y^F - Y)$$

5.20. $$\dot{S} = \phi_p\pi^p - \phi_u(U^l - U^{l,*}) \pm (\phi_S - \theta_S)(S - S^*) \pm (\phi_e - \theta_e)(e - e_0) - \theta_p\pi^w - \theta_Y(Y - Y_0) + (\phi_{we} - \theta_{pe})\pi^e$$

Which produces a Jacobian of the form:

$$\left|J\right| = \begin{vmatrix} \frac{\partial\dot{\pi^e}}{\partial\pi^e} & \frac{\partial\dot{\pi^e}}{\partial Y} & \frac{\partial\dot{\pi^e}}{\partial S} \\ \frac{\partial\dot{Y}}{\partial\pi^e} & \frac{\partial\dot{Y}}{\partial Y} & \frac{\partial\dot{Y}}{\partial S} \\ \frac{\partial\dot{S}}{\partial\pi^e} & \frac{\partial\dot{S}}{\partial Y} & \frac{\partial\dot{S}}{\partial S} \end{vmatrix}$$

This, in turn, results in the following derivatives:

$$\begin{vmatrix} -\beta_\pi & \beta_\pi\theta_Y & \pm\beta_\pi\phi_S \\ \sigma_Y\rho_r & -\sigma_Y & \pm\sigma_Y\frac{\delta_Y\kappa_i\mu_S}{\kappa_S\delta_S\mu_Y} \\ (\phi_{we}-\theta_{pe}) & -\theta_Y & \pm(\phi_S-\theta_S) \end{vmatrix}$$

In order for the system to be stable necessarily, the trace should be negative. This, without the presence of income distribution dynamics, would prove to be the case unambiguously. With income distribution dynamics, however, there is ambiguity in whether or not the system could stabilise without a guiding hand. For the trace to be less than zero strictly, the following criterion needs to hold:

$$5.21. \quad -\beta_\pi - \sigma_Y \pm (\phi_S - \theta_S) < 0$$

A few comments should be made at this stage: firstly, from the perspective of the labour share, growth in the labour share ($\dot{S}$) depends heavily on where the labour share was in the labour share cycle in time "t-1".

Secondly, it should be noted that ϕ_S and θ_S relate to how income distribution influences wage and price inflation, respectively. The ambiguity in this relationship between $\dot{S}$ and S (i.e., $\pm(\phi_S - \theta_S)$) comes about due to a regime either being militant or reformist (whether, in fact, increases in the labour share increase or decrease inflation from the perspective of the wage-price spiral). This is an inherent structure to the economy which, when known, can be utilised to the advantage of the central bank in designing a policy which ensures that the system is stabilised.

Put more eloquently (from beginning to end), if a regime is militant (where increases in the labour share see increases in inflation), then $\frac{\partial\dot{S}}{\partial S} > 0$. If, on the other hand, a regime were Reformist, then $\frac{\partial\dot{S}}{\partial S} < 0$.

In these instances where the trace might present a priori as ambiguous (and dependent on slope coefficient sizes), a central bank may intervene so as to force the determinant of the Jacobian to be negative in an attempt to maintain stability within the economic system. The determinant of the simplified 3x3 system is given by the below, and constrained to be less than 0, such that:

$$5.22. \quad -\beta_\pi([-\sigma_Y][\phi_S-\theta_S] \pm [\sigma_Y\frac{\delta_Y\kappa_i\mu_S^*}{\kappa_S\delta_S\mu_Y}][-\theta_Y]) - \beta_\pi\theta_Y([\sigma_Y\rho_r][\phi_S-\theta_S]$$

$$\pm[\sigma_Y\frac{\delta_Y\kappa_i\mu_S^*}{\kappa_S\delta_S\mu_Y}][\phi_{we}-\theta_{pe}]) \pm \beta_\pi\phi_S([\sigma_Y\rho_r][-\theta_Y] \pm [-\sigma_Y][\phi_{we}-\theta_{pe}]) < 0$$

With this, an optimal criteria for monetary policy may be set- that is, a μ_S may be set so as to stabilise the economy. Luckily, each country's individual estimation results provide guidance as to possible coefficients. This allows the ascertainment of a critical value for μ_S- what we deem μ_S^*- which aids a central bank in stabilising the economic system given fluctuations in the labour share cycle.

Simplifying this determinant, so as to ascertain one such critical value, yields:

$$5.23. \quad -(\phi_S-\theta_S)(1+\theta_Y\rho_r)\pm\phi_S\theta_Y\rho_r\pm(\phi_{we}-\theta_{pe})\pm\frac{\mu_S^*}{\mu_Y}(\frac{\delta_Y\kappa_i}{\kappa_S\delta_S}[\theta_Y+\phi_{we}-\theta_{pe}])<0$$

Solving for μ_S^* suggests the optimal criterion which ensures a stabilising central bank reaction to income distribution fluctuations:

$$5.24. \quad \mu_S^* < \frac{[(\phi_S-\theta_S)(1+\theta_Y\rho_r)\pm\phi_S\theta_Y\rho_r\pm(\phi_{we}-\theta_{pe})]\mu_Y}{(\frac{\delta_Y\kappa_i}{\kappa_S\delta_S}[\theta_Y+\phi_{we}-\theta_{pe}])}$$

In order to ascertain this in numerary terms, the use of various regression coefficients when employing the preceding theoretical framework is crucial.

Importantly, this system in the Flaschel and Krolzig (2003) sense does not include dynamics from the open economy. Thus, when attempting to calculate one such critical value of μ_S^*, a closed economy model may under- or overstate the way in which a central bank should steer the economy in the event of progression in the labour share cycle. This is portrayed by the inclusion of both UIP coefficients (κ_i and κ_S) in the formation of the "optimal criterion". All coefficients are, once more, determined by the employment of an SVAR for the same reasons as mentioned in Chapter 4.

With this model, the thesis is able to provide an holistic view of a country's macroeconomic system, bearing in mind income distribution dynamics. Such a system augments work done by Flaschel and Krolzig (2003) to include open-economy dynamics as well as the inclusion of the labour share cycle, and their concomitant impact on macroeconomic stability. Understanding such impacts is crucial for policymakers across the globe, especially in the wake of income distribution shocks which destabilise macroeconomic systems, and subsequently create the need for an adequate policy response. With the system designed above, a policymaker is able to trace such instabilities, and provide suggestions as to how to re-stabilise such an economy by providing quantitative and measured evidence (as Flaschel and Krolzig (2003) initially intended such a system to be used).

5.3 Estimation and analysis

With model in tow, each country's estimation is thematically treated by equation type in the ensuing sub-sections (although, it should be reiterated here that the entire set of equations is estimated simultaneously).

5.3.1 Wage Phillips Curve

First and foremost, it is important to gauge Wage Phillips Curves for each country, as per the defined methodology:

Table 1: WPC

	Australia	France	Germany	Italy	SA	UK	USA
ϕ_w	0.841^{***}	0.814^{***}	0.850^{***}	0.779^{***}	0.984^{***}	0.845^{***}	0.691^{***}
	(0.055)	(0.065)	(0.043)	(0.092)	(0.039)	(0.091)	(0.053)
ϕ_p	0.292^{***}	0.072	0.124^{*}	0.217	-0.018	0.072	0.321^{***}
	(0.090)	(0.073)	(0.065)	(0.136)	(0.048)	(0.109)	(0.101)
ϕ_u	-2.023^{***}	-0.147	-1.097^{***}	-0.770	0.023	-1.181	-2.916^{***}
	(0.006)	(0.282)	(0.003)	(0.561)	(0.101)	(0.999)	(0.045)
ϕ_S	0.002	-0.013	-0.014	0.019	0.014	0.027	0.038^{***}
	(0.006)	(0.009)	(0.091)	(0.029)	(0.026)	(0.025)	(0.013)
ϕ_e	-0.014	0.022	0.027	-0.012	-0.000	-0.081	-0.514
	(0.017)	(0.014)	(0.019)	(0.043)	(0.002)	(0.069)	(0.947)
R Squared	0.777	0.908	0.886	0.691	0.640	0.669	0.847
DW Statistic	2.133	1.044	1.901	2.344	1.965	2.128	2.593

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Between 64 and 91 percent of the variation in wage bill inflation is encapsulated in the variation inherent to all explanatory variables. Most Durbin-Watson statistics, save for the French estimate, signal that there is no autocorrelation. In the French estimation, positive autocorrelation is arguably apparent.

Focusing on ϕ_w, all autoregressive terms across economies are positively and extremely significantly related to wage inflation in the current time period. Given the French estimation, wage inflation of 1 percent in time "t-1" relates to increased wage inflation in time "t" by approximately 0.814 percent.

In only a handful of estimations (for Australia, the USA and, to an extent, Germany), however, is price inflation significantly related to wage inflation. In this vein, an increase in price inflation by 1 percent in Australia links to an increase in Australian wage inflation by approximately 0.29 percent. This signals, as Blanchard (1986) points out, a significant wage-price spiral. An increase in prices in these instances is met with increased wage demands, and

thus increased wage-inflation. These relationships are confirmed by cross-country research done by, for example, Mokoka (2017) who finds positive and significant relationships between wages and prices in Australia, Germany and the USA.

However, it bears mentioning that the coefficients attached to this wage-price spiral coefficient were also positive and significant for South Africa and the UK in such research, which this analysis does not find. It is possible that, due to the increased number of parameters included in the current system of equations, the significance of the wage-price spiral impact has been negated somewhat for the latter two countries or does not occur contemporaneously based on the current evidence.

Focusing on a change in the unemployment rate, it stands to reason that rising unemployment leads to decreased bargaining power (due to an engorging reserve army as per Blanchard (2014)), and this relationship is significantly ascribed to ϕ_u in Australian, German and American estimations. In the German case, an increase in unemployment above its previous level by 1 percent leads to decreased wage inflation of approximately 0.01 percent. In all other instances, this relationship between wage inflation and unemployment is insignificant, although in most cases, there is still negativity in ϕ_u. This is, once more, confirmed by research done by Mokoka (2017), both in terms of the relationships' significance and coefficient size.

Focusing now on ϕ_S, when the actual labour share is above its contemporaneous Real-GDP maximising labour share counterpart, there is only a significant increase in wage inflation in Australian and American estimations. A percentage increase of the actual labour share in time "t-1" above said optimal leads to an increase in wage inflation in time "t" by 0.038 percent in the US. Thus, an improvement in bargaining power has a limited impact on wage inflation given the system of equations under review.

Interestingly, according to the assumption made by Flaschel, Franke and Proano (2006), the USA was reformist (i.e., as the labour share increased, wages tended to decrease, driven by unemployment and the concomitant impact that unemployment has on driving down a country's wage bill). However, this is not the case in the USA for the period under review. On the contrary, it is expected that the United State's wage regime is militant, signalling that increased bargaining power (proxied for by an increase in the labour share above it's real GDP maximising level) is met with increased wage demands.

Finally, focusing on the nominal exchange rate and ϕ_e, there is no significant impact that a depreciation in the nominal exchange rate (with respect to the US dollar in most instances) has on domestic wage inflation. [1]

5.3.2 Price Phillips Curve

Continuing on with the modelling process, Price Phillips Curve relations for the 7 countries of interest are estimated and shown below:

Table 2: PPC

	Australia	France	Germany	Italy	SA	UK	USA
θ_p	0.819^{***}	0.794^{***}	0.889^{***}	0.896^{***}	0.839^{***}	0.928^{***}	0.699^{***}
	(0.062)	(0.060)	(0.042)	(0.030)	(0.050)	(0.030)	(0.061)
θ_w	0.086^{*}	0.145^{**}	-0.007	0.067^{***}	0.116^{**}	-0.007	0.023
	(0.046)	(0.066)	(0.036)	(0.032)	(0.056)	(0.022)	(0.032)
θ_Y	-0.000	0.000^{*}	0.000^{***}	0.000	-0.000	0.000	0.000^{***}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
θ_S	0.028	-0.014	0.009^{*}	-0.019	-0.021	0.007	0.009
	(0.066)	(0.012)	(0.006)	(0.008)	(0.033)	(0.006)	(0.007)
θ_e	0.005	0.000	0.004	0.002	0.004	0.023	1.066^{*}
	(0.011)	(0.013)	(0.013)	(0.012)	(0.002)	(0.021)	(0.567)
R Squared	0.704	0.816	0.766	0.883	0.785	0.830	0.698
DW Statistic	1.547	1.692	2.086	1.221	0.885	1.272	1.571

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Importantly, it appears as though goodness of fit across the board is relatively high, hovering between 69 and 89 percent of the explainable variation in price inflation. For the most part (save for Italian, South African and UK estimates), there is no suspected autocorrelation. In the other cases, countries whose DW statistic are not significantly close to 2 may suffer from positive autocorrelation.

Focusing on inflation inertia, it appears as though all once-lagged inflation values are extremely significant across the board, and relate positively to current inflation. That is, inflation of one percent in the previous time period for Italy relates to an increase in current inflation by approximately a 0.9 percent. In South Africa, the coefficient attached to the inertial price inflation term sits at roughly 0.84 percent. This is in line with coefficients estimated in earlier research (for instance, Capazario and Mokoka (2018)).

[1] Importantly, we use the exchange rate between the Dollar and Yuan as a means to gauge the appreciation/depreciation of the US dollar in the American estimation (which is a common thread throghout the analysis).

Furthermore, we find only a handful of significant wage-price reaction across the board- from the French perspective, for instance, an increase in wage inflation by 1 percent relates to an increase in price inflation by 0.145 percent. This, as Heise, Karahan and Sahin (2020) point out, is due to both increasing import competition and rising market concentration which weaken the pass-through of wage inflation to price inflation. Together, this evidence creates weaker wage inflation rates experienced across many developing countries (Forbes, Gagnon, and Collins (2020)).

Looking now to output, it appears as though, for the most part, an increase in output above its quarter-previous level is met with an increase in price inflation across some estimations. Importantly, an increase in year-on-year output growth, as Romer (2012) posits, has a very different influence in resulting Phillips Curve equations. For the purposes of this paper, however, adapting Flaschel and Krolzig's model as closely as feasible is of interest, although future research could see how the system fairs in such an event that the growth rate of output is replaced in the PPC estimation.

Penultimately, it appears that chasing one such real-GDP optimising labour share has no significant impact on price inflation in the short term. This is, again, theoretically linked to the weakening of passthrough between wage and price inflation (Heise, Karahan and Sahin (2020)), even if the labour share were to increase to above its real-GDP-maximising level.

Finally, focusing on a depreciation in the exchange rate, it appears as though only in America does a depreciation relate to increased inflation. This, as Appleyard, Cobb and Field (2008) suggests, may be due to an increase in aggregate demand, given a weaker currency, which then props up inflationary pressure. More probabilistically, this increase in cost may be due to the relatively increased cost of inputs purchased from abroad, making the inflation linked to one such exchange rate depreciation against the Yuan predominantly cost-push in nature (Blanchard, 2014).

5.3.3 Okun's Law

Table 3: OL

	Australia	France	Germany	Italy	SA	UK	USA
δ_u	1.020^{***}	0.994^{***}	1.011^{***}	1.014^{***}	0.996^{***}	1.014^{***}	1.034^{***}
	(0.011)	(0.019)	(0.003)	(0.004)	(0.017)	(0.007)	(0.007)
δ_S	0.029^{*}	0.015	0.005^{**}	0.001	0.053^{*}	0.010^{***}	0.016^{***}
	(0.016)	(0.010)	(0.002)	(0.006)	(0.027)	(0.002)	(0.003)
δ_Y	-0.068^{***}	0.087^{***}	-0.050^{***}	-0.072^{***}	-0.042	-0.053^{***}	-0.099^{***}
	(0.021)	(0.032)	(0.011)	(0.016)	(0.049)	(0.010)	(0.012)
R Squared	0.977	0.813	0.990	0.982	0.788	0.975	0.983
DW Statistic	1.493	1.932	0.996	1.704	2.121	1.272	1.058

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

In general, it appears as though goodness of fit is extremely high, with between 0.79 and 0.99 percent of the variation in unemployment being explained by the postulated model. This, along with no expected autocorrelation in estimations for Australia, France, Italy, South Africa and possibly the UK makes for a relatively robust model specification.

Turning now to δ_u, the inclusion of inertia in unemployment is paramount to the robustness of the estimate (something which Flaschel, et al. in 2006 do not include). Importantly, in most cases, the Okun's Law estimates of δ_u exhibit no stable own-dynamics; that is to say that an increase in unemployment in time 't-1' yields a greater than 1 increase in unemployment in time 't'. From the standpoint of the way in which unemployment feeds into a decrease in output (which itself feeds into decreased unemployment as per Okun (1963)), this is an extremely integral conclusion- one which policy makers should be intimately aware of at the sign of rising unemployment.

Nevertheless, for South Africa, an increase in unemployment by 1 percent in time 't-1' yields an increase in unemployment in time 't' by approximately 0.996 percent.

In most instances, there is an extremely significant and negative relationship between output growth and unemployment. If output growth increases by 1 percent in the USA, this relates to a decrease in the unemployment rate by approximately 0.05 percent.

According to work done most recently by Aguiar-Conraria, Martins and Soares (2020) and Gonzalez and Jontxen (2020)- although mirrored by work done by Ball, Leigh and Loungani (2017) - the coefficients attached to the output growth rate tend to be much lower than those estimated through

simple output-unemployment relationships. However, given the inclusion of the labour share term (which accounts for a non-negligible portion of the variation in the unemployment rate), and considering that this analysis does not make use of various filters to assess the steady-state of output, the coefficient sizes attached to the output growth rate are still within reasonable bounds, and still- most crucially- negative where significant.

Shifting focus to an increase in the labour share above its real-GDP maximising level, it stands to reason that an increase in wage demands often yields an increase in unemployment, especially when an economy is in contraction (Blanchard, 2014). Put into context, an increase in the labour share above its real-GDP maximising level for Germany by 1 percent leads to an increase in the unemployment rate by approximately 0.005 percent.

5.3.4 Investment and Savings

Table 4: IS

	Australia	France	Germany	Italy	SA	UK	USA
ρ_c	202110.1**	1255997.0***	767805.3***	855082.9***	550483.8***	299189.8**	26363121.0***
	(79147.98)	(27678.74)	(35968.34)	(32248.19)	(89068.60)	(125820.7)	(966368.6)
ρ_S	124704.0	−1489258.0***	−471559.9***	−1165998.0***	−872578.4***	−85937.89	−29091117.0***
	(188115.8)	(46067.58)	(57841.97)	(70337.27)	(200912.2)	(203943.9)	(1688759)
ρ_r	−383190.8**	93508.12	529477.7***	471708.7***	−340309.5	38696.04	12512495.0***
	(150720.1)	(79828.24)	(200751,4)	(113163.6)	(222023.1)	(168983.7)	(3898172.0)
ρ_{re}	−175243/0***	−71650.74***	−22972.81	−105597.9***	37864.96	−260861.1***	−
	(31188.72)	(16180.27)	(31595.68)	(23758.74)	(93945.44)	(50896.39)	(-)
ρ_{yf}	0.010***	0.002***	0.012***	0.000	0.050***	0.013***	0.186***
	(0.000)	(0.016)	(0.001)	(0.000)	(0.001)	(0.002)	(0.021)
R Squared	0.932	0.991	0.977	0.956	0.981	0.915	0.979
DW Statistic	0.548	0.430	1.010	0.259	2.176	0.486	0.388

Standard errors in parentheses; significant at 1***, 5** and 10* percent

As before, it appears that goodness of fit is generally quite high in the analysis, where between 91 and 99 percent of the variation in nominal GDP (measured in millions of the domestic currency, for simplicity). Each DW statistic, however (save for the South African Estimation) shows off possible positive autocorrelation in the error terms. This serial correlation, as per Gujarati and Porter (2008) may confound significance of variables, but otherwise should not impede correctness of coefficient size.

Nevertheless, and so as to step with caution, a caveat should be made with regards to the level of significance of each variable and the (im)plausibility with which one could extend these results further than a current scenario analysis.

As such, the first coefficient of interest is ρ_S. Immediately, it should be at the attention of the researcher that not using a labour share gap has potential estimation problems which bias the actual sign of ρ_S. This, as Malikane (2017) points out, is due to the structure of the labour shaere- because the labour share in 't-1' is the wage bill ($W_{t-1}L_{t-1}$) divided by output ($P_{t-1}Y_{t-1}$), it stands to reason that regressing Y_{t-1} on Y_t as a denominator in the labour share term will immediately imply negativity in ρ_S.

Put differently, the inertia from Y_{t-1} on Y_t is positive and close to unity, and this implies a negative relationship between the lagged level of the labour share (which is structured with Y_{t-1} in its denominator) and Y_t. This negative relationship is present and significant in most ρ_S (save for the Australian estimation), but as Malikane (2017) cautions, should not be used to ascribe output regimes (i.e., whether the economy is wage- or profit-led) to a particular economy. Instead, the inclusion of an IS curve augmented with the labour share is to make as precise an estimation of nominal output which is then used in subsequent equation estimations.

Nevertheless, focusing on the real interest rate, perversion of some signs is apparent.This is the case for Germany, Italy and the USA, while all other estimations of ρ_r are statistically insignificant. Only in the Australian estimation is an increase in the real interest rate related to decreased GDP (Blanchard, 2014).

In nations where ρ_r is positive and significant, however, the arguable obfuscation of the IS cuvre becomes apparent. This, we posit, is due to the presence of a particular brand of monetary policy. If output increases in these instances, it stands to reason that inflation is likely to increase due to demand pressure. This is linked to an increase in the interest rate, which decreases interest sensitive spending between 12 to 18 months later. Ergo, an

increase in either Germany's, Italy's, or America's output is combatted by a contemporaneous hike in the interest rate, making the relationship between output and the real interest rate positive. This much is pointed to in Taylor (1999) and in Sauer and Sturm (2007) as an inherent consequence of inflation targeting.

Focusing now on ρ_{re}, it is generally seen that all coefficients follow the Marshall-Lerner condition when significant- that is to say that, in the short run, a depreciation in the real exchange rate decreases output due to inherent contract-induced stickiness in returns to contracts (i.e., a price effect- a decrease in prices- which overshadows a quentity effect- i.e., a quantity remaining constant in the short run) (Thirlwall, 1979). In this light, a real depreciation of the Australian Dollar by 1 percent in comparison to an American-Dollar-weighted index ends up decreasing contemporaneous output (in millions of Australian Dollars).

Ultimately, focusing on the relationship between foreign income (proxied for by Chinese GDP in the Millions of Yuan) and domestic output, it stands to reason that improved foreign wealth increases domestic exports, and with it, increases domestic output. Thus, positivity in ρ_{yf} is significant in all instances save for the South African regression analysis.

5.3.5 Monetary Policy Rule

Table 5: MR

	Australia	France	Germany	Italy	SA	UK	USA
μ_i	0.900^{***}	0.932^{***}	0.933^{***}	0.869^{***}	0.826^{***}	0.941^{***}	0.945^{***}
	(0.032)	(0.030)	(0.015)	(0.019)	(0.042)	(0.031)	(0.030)
μ_π	0.113^{**}	0.014	0.090^{**}	0.086^{***}	0.132^{***}	0.002	0.112^{***}
	(0.035)	(0.044)	(0.041)	(0.039)	(0.038)	(0.042)	(0.040)
μ_Y	0.140^{***}	0.170^{***}	0.109^{***}	0.118^{***}	0.084^{***}	0.059^{***}	0.053^{***}
	(0.046)	(0.021)	(0.015)	(0.016)	(0.024)	(0.017)	(0.015)
μ_e	-0.026^{***}	−0.004	−0.004	0.002	0.003	-0.053^{***}	-0.817^{**}
	(0.006)	(0.090)	(0.010)	(0.010)	(0.002)	(0.020)	(0.323)
μ_S	−0.004	-0.020^{***}	0.017^{***}	−0.002	0.056^{*}	−0.001	−0.007
	(0.035)	(0.007)	(0.004)	(0.008)	(0.002)	(0.009)	(0.007)
R Squared	0.950	0.976	0.973	0.973	0.943	0.975	0.975
DW Statistic	0.974	1.537	1.419	1.256	1.600	1.224	1.247

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Across the board, it appears as though goodness of fit is high with between 93 and 98 percent of the variation in the short term interest rate. DW statistics for France, Germany and South Africa are sufficiently close to 2 to

rule out positive autocorrelation, with this not being ruled out in the other estimations.

Focusing on interest rate inertia, it stands to reason that the previous interest rate has an approximately 1-1 relation with the current short term interest rate. That is to say that a one-quarter-previous interest rate of 1 percent is met with a current interest rate of 1 percent (Rudebusch and Svensson, 1999). This inertia is highly significant across the board, and in particular, a one-quarter-lagged South African interest rate relates to an increase in the current interest rate by 0.826 percent. According to Kemp and Hollander (2020), both sign and coefficient size on the interest smoothing term are sufficiently similar.

From the perspective of inflation, an increase in the inflation rate above the UK inflation target by 1 percent- for instance- relates to an increased British interest rate by a statistically insignificant amount of 0.002 percent. As per Bhattarai and Carter (2018), the coefficient attached to the inflation gap in the UK Taylor Rule during the same time period under review is similarly insignificant, signalling that monetary policy in the UK does necessarily respond to changes in the inflation rate.

Output growth of 1 percent in the UK, on the other hand, relates to a 0.06 percent increase in the interest rate. According to Bhattarai and Carter (2018), both sign and coefficient size are sufficiently similar to indicate that the inclusion of other controls does not influence the size of the coefficient on the output term in the monetary policy rule in the UK drastically.

Focusing on exchange rate variation, it appears as though some central banks (Australian, English, and American) favour to depreciate their currency further (i.e., decrease the amount of foreign currency needed to purchase 1 unit of domestic currency) when there is a nominal depreciation. In this way, a 1 percent depreciation of the American Dollar against the Yuan relates to a decrease in the interest rate of approximately 0.82 percent. This rather excessive reaction, it should be noted, is due to the fact that the Dollar at this stage is much stronger than the Yuan, and a full percentage depreciation against the Yuan would thus be a massive change in the amount of Yuan spent to obtain 1 US Dollar.

Ultimately, looking at μ_S, only a handful of countries react to changes in income distribution to above its real-GDP maximising level. These are France (who themselves are part of the European Union), Germany, and to a lesser extent, South Africa. In the cases of France and Germany, it could be argued that the ECB deems changes in these two nation's income distribution

destabilising to EU inflation. As such, the ECB deems France sufficiently reformist (where an increase in the labour share would decrease inflation perhaps to below target level, and thus would require a decreased interest rate), while it may deem Germany to have a sufficiently militant labour force (where as the labour share increases, so too would inflation; in order to combat said inflation, increased interest rates would decrease interest sensitive output and keep the economy from overheating).

Importantly, it is this relationship between the interest rate and labour share cycle which is pivotal in understanding the stability inherent to an economy. This stability, after the explanation of Uncovered Interest Parity, will be subject of further analysis.

5.3.6 Uncovered Interest Parity

Table 6: UIP

	Australia	France	Germany	Italy	SA	UK	USA
κ_e	1.003^{***}	1.012^{***}	0.996^{***}	1.000^{***}	1.017^{***}	1.011^{***}	1.008^{***}
	(0.009)	(0.023)	(0.006)	(0.005)	(0.015)	(0.006)	(0.002)
κ_i	-0.931^{**}	-0.745^{**}	-0.785^{**}	-0.784^{**}	-4.729^{***}	0.009	0.009
	(0.398)	(0.328)	(0.331)	(0.328)	(2.698)	(0.259)	(0.141)
κ_S	0.731	-0.062	-0.044	-0.078	2.651^{**}	-0.049^{*}	-0.004^{**}
	(0.495)	(0.110)	(0.045)	(0.070)	(1.168)	(0.029)	(0.002)
R Squared	0.935	0.935	0.936	0.936	0.958	0.866	0.995
DW Statistic	1.387	1.491	1.477	1.493	1.490	1.314	1.061

Standard errors in parentheses; significant at 1^{***}, 5^{**} and 10^{*} percent

Considering goodness of fit, an R squared value of between 87 and 99 percent suggests that the UIP model is able to robustly explain variation in the nominal direct exchange rate quite well across the board. Most Durbin-Watson statistics. although not strongly, indicate that there is little to no serial correlation in any estimation save for America's UIP.

Furthermore, it appears that previous exchange rate volatility plays a significant role in current exchange rate levels. These reactions, importantly, do not showcase own-stable dynamics for the most part, and often exceed unity due to the way in which the depreciation of a currency tends to be deepened by the multiplier effect (as per Keynes (1936), although this is mentioned to an extent in Appleyard, Cobb, and Field (2008)). Nevertheless, a depreciation in the Rand by 1 percent in time period 't-1' relates to a depreciation of the same magnitude in time 't'.

Penultimately, all κ_i are as expected- negatively related to the direct nominal exchange rate of a nation (when significant). If a foreign interest rate is higher than the domestic interest rate, it stands to reason that, ceteris paribus, money will follow the relatively higher return (as Appleyard, Field and Cobb (2008)) attest. Thus, if the South African interest rate is lower than the American interest rate by 1 percent, a depreciation of the Rand by approximately 4.73 (Rands per Dollar) is expected.

It also appears as though, for the most part, an increase in the labour share above its optimal value ambiguously relates to exchange rate volatility. In South Africa, an increase in the labour share is met with an exchange rate depreciation, while in the US and arguably UK, the same increase in the labour share appreciates the nominal direct exchange rate marginally as a prior expected (from the perspective of Stockhammer, et al. (2008)).

This positivity in the South African estimate of κ_S may be due to the fact that the nation is profit-led and that decreased output relates to a decreased domestic price level, which then translates to lower trade prices, but further examination of one such sign perversion is of utmost importance for future research.

5.4 Stability Analysis

In light of the aforementioned stability analysis approach, the following table is important to gauge whether- in fact- there could be ambiguity in the trace, or whether $\phi_S - \theta_S$ is negative from the onset. This difference between coefficients is measured in Table 7:

Table 7: Estimates of Coefficient Differences

	Australia	France	Germany	Italy	SA	UK	USA
$\phi_S - \theta_S$	-0.026	0.001	-0.023	0.038	0.035	0.020	0.029

Importantly, in all countries with the exception of Australia and Germany (who themselves have reformist inflation regimes), there exists a possibility for the trace to be positive, implying the possibility for instability in the system for the remainder of countries. Luckily, due to the presence of a monetary policy rule inclusive of income distribution dynamics, this instability may be kept in check, at least locally.

In these instances where the trace is ambiguous (and dependent on slope coefficient sizes), a central bank may intervene so as to force the determinant of the previously embellished determinant of the Jacobian to be negative in an attempt to maintain stability within the economic system. The determinant

of the simplified 3x3 system is given by the below, and constrained to be less than 0, such that:

$$-\beta_\pi([-\sigma_Y][\phi_S-\theta_S]\pm[\sigma_Y\frac{\delta_Y\kappa_i\mu_S^*}{\kappa_S\delta_S\mu_Y}][-\theta_Y])-\beta_\pi\theta_Y([\sigma_Y\rho_r][\phi_S-\theta_S]\pm[\sigma_Y\frac{\delta_Y\kappa_i\mu_S^*}{\kappa_S\delta_S\mu_Y}][\phi_{we}-\theta_{pe}])$$

$$\pm\beta_\pi\phi_S([\sigma_Y\rho_r][-\theta_Y]\pm[-\sigma_Y][\phi_{we}-\theta_{pe}])<0$$

With this, an optimal criteria for monetary policy may be set- that is, a μ_S may be set so as to stabilise the economy. Luckily, each country's individual estimation results provide guidance as to possible coefficients. This aids in the ascertainment of a critical value for μ_S- what we deem μ_S^*- which aids a central bank in stabilising the economic system given policy which moves towards the real-GDP maximising level of the labourer's share.

Simplifying this determinant, so as to ascertain one such critical value, yields:

$$-(\phi_S-\theta_S)(1+\theta_Y\rho_r)\pm\phi_S\theta_Y\rho_r\pm(\phi_{we}-\theta_{pe})\pm\frac{\mu_S^*}{\mu_Y}(\frac{\delta_Y\kappa_i}{\kappa_S\delta_S}[\theta_Y+\phi_{we}-\theta_{pe}])<0$$

Solving for μ_S^* then posits the optimal criterion which ensures stability within the model:

$$\mu_S^*<\frac{[(\phi_S-\theta_S)(1+\theta_Y\rho_r)\pm\phi_S\theta_Y\rho_r\pm(\phi_{we}-\theta_{pe})]\mu_Y}{(\frac{\delta_Y\kappa_i}{\kappa_S\delta_S}[\theta_Y+\phi_{we}-\theta_{pe}])}$$

Furthermore, and in order to ascertain this in numerary terms, the use of various regression coefficients found in the preceding analysis is integral. Importantly, this system in the Flaschel and Krolzig (2003) sense does not include dynamics from the open economy. Thus, when attempting to calculate one such critical value of μ_S^*, a closed economy model may under- or overstate the way in which a central bank should steer the economy in the event of progression in the labour share cycle. This is portrayed by the inclusion of both UIP coefficients (κ_i and κ_S) in the formation of the "optimal criterion".

Nevertheless, this critical level of μ_S^* is therefore shown, per country, below. This is juxtaposed to the actual level of μ_S, given a nation's monetary policy preferences.

Table 8: Optimal Criterion Estimation Using Structural Equation Estimates

	Australia	France	Germany	Italy	SA	UK	USA
Critical Value of μ_S^*	−0.009	−0.003	−0.001	−0.000	0.074	0.046	0.009
Actual Value of μ_S	−0.004	−0.020	0.017	−0.002	0.057	−0.001	−0.003

In each instance, the determinant of the Jacobian will be negative if the monetary policy reaction to the labour share cycle is less than the critical value expressed in Table 7 above.

Currently, only Australian and German monetary policy reactions are sufficient to ensure stability as and when shocks to the labour share (particularly, shocks that move the labour share above or beyond it's real GDP optimising value) occur.

In contrast, the remaining five countries (France, Italy, South Africa, the United Kingdom, and the United States of America) have insufficient monetary policy reactions to income distribution shocks.

6 Chapter 6: Concluding Remarks

As touched on before, the core research problem of this thesis was the following

Income distribution dynamics are cyclical (Goodwin, 1967; Palley, 2017). How can such a cycle be estimated empirically, and how does such a cycle influence the stability of the macroeconomy at large and the prospects of economic expansion?.

To address this problem, this thesis has set out, in general, to develop an income-distribution sensitive set of models using the Structuralist methodology as follows:

- In chapter 3, we developed a means to assess a GDP-maximising level of the labour share without relying on a Cobb-Douglas function, and without needing to assess that optimal labour share at the mean. The model proposed in this chapter was parsimonious, and estimated using both NLS and DOLS (to correct for non-linear paramaters and different orders of integration between left- and right-hand-side variables, respectively).
- In chapter 4, we developed a model that monitored the interplay between an economy's position in the labour share cycle, and the influence that this position might have on an economy's position in the financial cycle (proxied for by household credit) and output cycle.
- In chapter 5, we augmented an economy-wide model developed by Flaschel and Krolzig (2003) which looked to assess the impact that changes in income distribution might have on a macroeconomic system's stability by including open-economy dynamics and the inclusion of the labour share cycle term.

6.1 Income Distribution and its Role in maximising Real Output

The model in Chapter 3 is developed off the back of clear macro-fundamentals based on a particular labour demand equation drawn, in part, from Keynes' (1936) postulates, and in part, by Microeconomic modelling practice (a la Varian (1992) or other such works). Concerning the estimation of this labour demand function, the relationship between the ratio of total revenue and cost plays an integral, and statistically significant role, in driving employment (realized labour demand). As revenue increases more than costs, employment is grown on a less than one-to-one basis across countries.

Importantly, so as to prove that the labour-share-weight (this relationship between the revenue-cost ratio and realised labour demand) is relatively stable across the time period, estimations of labour demand were conducted by splitting the sample. Once more, further research could look to estimate this β in a time-varying manner or through a cointegrating lens in order to understand whether either of these methods produces a substantive difference in current findings.

Focusing now on estimation of the aggregate effective demand equation, it is important to initially, the estimation itself by no means aims to gauge the output-labour regime in any direct way. Instead, the consequence of using an optimisation framework such as the one outlined is that, when comparing the actual labour share to its optimal value, one is able to then unearth what should happen to the labour share in order for real output to increase.

Particularly, if the difference between the actual and optimal labour shares is positive, it stands to reason that the output-labour regime is profit-led; that is to say, a decrease in the labour share should yield increased growth from the standpoint of increased real GDP levels. If, however, the difference between the actual and optimal labour share were negative, this would signal that an economy is wage-led in terms of real GDP growth. Unfortunately, this conclusion is caveated with the inherent complexity of dealing in ambiguity across nominal output and price inflation regimes.

It is this ambiguity (whether nominal output is profit-or wage-led, whether inflation characteristics are either militant or reformist simultaneously, and to what magnitude these regimes take hold in an economy) that creates a truly daunting task for the policy maker aimed at improving both national economic growth and bettering the spread of income between classes. Prior to any policy analysis, macroeconomic regulators and policy-setters should understand the extant complexity within the macroeconomy brought about by modelling with the labour share as a variable of interest.

Identification, in this regard, is absolutely paramount to breed successful policy aimed at bridging the gap between those who have, and those who have not. If, for instance, the working class were sufficiently militant in wage-bargaining, while nominal output were expected to be wage-led, rhetoric surrounding policy should surround which magnitude is larger (within reason)- if potential inflationary pressure from increased wages (and, ipso facto, improved labour share levels) was within target for a particular central bank, then a fiscus-driven stimulus package aimed at improvement of working class incomes would make for a conducive real-output-growth-environment which has, at least, some concordance between the various macroeconomic authorities. In light of this analysis, a policy-maker should be intimately aware of the various regimes at play within a macroeconomy, and should adjust policy accordingly.

Secondly, there appears to be periods of transition between an economy being profit-led and wage-led over time. This gives credence to Goodwin's (1967) theoretical notion that the labour share works in cycles. Important work can be done to understand the length of time that it takes for this labour share cycle to complete; this may also aid policy which necessitates the stabilisation of the economy. If, for instance, the labour share cycle were at a trough (where the actual labour share was far below its optimal level), this may have an influence on any number of key macroeconomic variables- a central bank or the fiscus within a country could use this information to change policy and steer the economy back to its optimal real GDP levels while counteracting inflationary and exchange rate pressures. This will further fuel and illuminate the rhetoric surrounding the need for cohesion and understanding between the key macroeconomic agents within an economy.

Concerning actual results for estimations, it is found that five countries in particular (Germany, Italy, the UK, the USA and arguably Australia- the latter having gone through possible regime changes) are all wage-led at their current position in their labour-share cycle. In static analysis, this set of results can be gleaned at the mean by a look at Bowles and Boyer (1995), Nastepad and Storm (2007), Hein and Vogel (2008) or Onaran and Galanis (2012), inter alia; in interesting juxtaposition to these studies, however, the current paper finds that the "wage-led" regime for most of these countries only started in the late 2000s. The remaining two countries (France and South Africa) are found to be non-statically profit-led regimes (as is also found in Malikane (2017)).

With the laid-out concluding remarks, one thing should ring clear- the distribution of income between classes influences output in non-negligible ways across countries. With the influence of output comes the concomitant influence of a multitude of other macroeconomic variables, which, we argue, sees

very little research in the modern-day orthodoxy of economic thought. One should not be so set in ideology or school of thought to allow for the absence of such an important macroeconomic driver like the labour share; it is with this plurality of ideas that a more broad perspective of macroeconomic health can be understood which should see improvement in understanding living standards the world over.

6.2 The Interplay between Output, Household Debt and the Labour Share

This current chapter has set out to find the tacit link between output, household debt, and cycles in the labour share. We have attempted to illustrate this link through an endogenized system including nominal output and household credit where, in the current schema, labour share dynamics were introduced exogenously (although, admittedly, this can be extended to include a third dimension which aims to endogenize labour share dynamics as well). Nevertheless, this was estimated using the Structural Vector Autoregression framework as adapted from the initial works by Sims and Bernanke (both independently published in 1986). This methodology seeks, with the aid of various slope coefficient restrictions, to shed light on the structural relationships between output, household credit and the labour share gap.

From this, a handful of extremely interesting results can be dissected; first, from the perspective of output-credit dynamics, it is clear to see that an increase in the wealth of the nations accounted for within this study spurs on credit accumulation, and for the most part, an increase in household credit is met with increases in a nation's wealth. This simultaneity is one which is, however, overweighted. In most instances, an increase in output by 1 percent yields a higher increase in household credit extension than a unitary increase in household debt increases output by. That is to say that, as income increases, credit extension increases at a faster pace.

A policy maker, especially one whose focus is on the financial cycle and its influences, should be cognizant of this- from the perspective of the fiscus, an increase in output growth driven by, say, increased government spending, will drive credit more so than output itself. This in and of itself quickens the approach of credit crises, and as such, the central bank should attempt to- in those situations- alleviate credit pressure by, perhaps, decreasing the interest rate. The impact of such reasoning on inflation and various other macroeconomic variables is subject to much closer scrutiny in future research, but given the current narrative, policy aimed at being cooperative (especially with the increased risk of financial collapse) should be of utmost importance to macroprudential authorities.

Secondly, it appears as though, for the most part, there is an ambiguous relationship between altering the functional distribution of income and both the levels of nominal output and household credit. For a handful of economies, dynamics are such that increasing the labour share ends up bolstering nominal output. This- in all instances apart from Australia when using the DOLS-derived labour share gap- comes at the price of an expanding the level of household debt accrued.

In some instances, the nominal output growth relating to a unitary increase in the labour share above its optimal level far outstrips the expected increase in nominal household credit extension from the same unitary increase. Thus, shifting the income distribution towards labourers in that instance signals an inherently growth-bolstering outcome, perhaps through the channel of credit-extension (and, ipso facto, access to collateral through improved earnings). This is the case in Australia, France and South Africa. Further work attempting to obtain a price-independent optimal labour share could shed light on this phenomenon from the perspective of real GDP growth as well (whose inclusion, due to the possibility of complete simultaneity between the left and right hand sides of each structural equation, was omitted).

Policy informed by this rhetoric should aim to focus on the extension of credit in a way that is not growth-defying, but growth improving. If, for instance, a policy-maker in South Africa saw it fit to introduce a new loan/bond aimed at the working class, said policy maker could do so when the labour share increases, because the credit effects of one such labour share increase are outweighed by the income growth effects of the same such increase.

If, however, the policy maker were in America (where an increase in the labour share depresses nominal output but increases debt accumulation), the same financial instrument aimed at bolstering working class access to collateral may in fact be regressive, and push those who make up the working class into further financial sequestration, perhaps setting on a labourer-driven financial collapse (as was, arguably the case in 2008).

Also, it is extremely important for the lay-researcher to realize that- when modelling for the optimal labour share, there are a plethora of approaches at her/his disposal. Although intuitively, this modelling process is most simplistically accomplished by utilising filters developed in order to extract cyclical data from various series, the most simple method is not always the most robust (unfortunately, contra Ockham). Instead, it is with taking care to model the optimal labour share in a structural way that the true richness of something so exotic as cycles in the labour share may be studied with a modicum of precision.

Finally, although somewhat trite to mention at this stage, it is imperative to understand that all analysis within the current expose is completely dependent on the ways in which each model is mathematically constructed and constrained; an alteration of either the way in which slope coefficients are constrained, or the manner in which the optimal (or regular) labour share is calculated, has an extremely tangible impact on the resultant analysis.

Further research could, upon disagreeing with those methodological manipulations or findings in chapter one or two, seek to alter the way in which output-credit dynamics and labour share cycles are modelled, and perhaps hone in on the methodological flaws of these chapters. An analysis of this nature, however, has not yet been done (from the maximising perspective as set out in the current thesis), and this brings with it a foothole from which to leverage further research in an attempt to ascertain the goal which each lay-economist sets his life to work towards- the improvement of living standards, given constrained resources and complicated economic dynamics.

6.3 A Dynamic "Distribution-Sensitive" Model of an Open Macroeconomy with stabilising Monetary Policy

The current paper has taken work done by Flaschel and Krolzig (2003), and augmented it so as to include:

1. Exchange rate dynamics
2. An augmented version of the Okun's Law relationship, inclusive of income distribution dynamics
3. Room for analysis in the event that a nation's macroeconomic workings were to relate to cycles in the labour share (with those cycles coming about due to the fact that the labour share may be able to maximise real GDP)
4. A possible quantitative framework with which to change monetary policy in the event that central banks the world over wish to smooth out fluctuations in the labour share cycle

From this set of augmentations, some key findings should be expanded upon so as to inform the policy maker in the event that s/he wishes to influence the functional distribution of income between classes. Firstly, it appears as though there is a negligible impact that moving the functional distribution of income towards its real GDP maximising level in a previous quarter has on inflation (either wage or price) in the current quarter. This analysis, we admit, is one based on the short term- an interesting way in which this section of the study could be expanded upon in the future would be to estimate the length

of time it would take for a change in the functional distribution of income to influence either price and/or wage inflation within the given countries.

This suggests to the policy maker that increasing real GDP through the lens of either increasing or decreasing the labour share (perhaps through a change in the minimum wage, or other employment policy) is feasible from the perspective of a short term inflation outlook.

Furthermore, we find that, when modelling Okun's law, there is a non-negligible influence that moving the labour share towards its real GDP maximising level has on unemployment. In some instances, an increase in the labour share gap (i.e., an increase in the labour share above it's so-called optimal) will increase unemployment for countries like Germany, the UK and the USA in particular. This is in line with Goodwin's (1967) analysis, which suggests that an increasing labour share, at some point in a capitalist mode of production's cyclical existence, will increase unemployment as a trade-off to higher wages.

Goodwin (1967), however, also posits that this change in unemployment is- itself- cyclical, and that an increase in the labour share is also able to bolster employment if it is able to be accompanied by productivity gains in employing more labourers. More work is needed in the area to understand these transition times between when an increase in the labour share is able to increase or decrease unemployment (as opposed to simply stating results at the mean), and this is ultimately what a policy maker will be able to utilise in order to time the possible shifts in the functional distribution of income between classes so as to, at the very least, maintain unemployment as unchanged. Nevertheless, the possible knock-on effects of employment increases over time due to increased real GDP may, in fact, offset such unemployment increases over a longer time horizon.

Regarding monetary policy, we find that- in most instances- central banks pay little attention to the functional distribution of income, or in fact, the labour share cycle. It is only in France, Germany, and to an extent, South Africa, that we find that central banks pay at least some heed to fluctuations in the labour share.

Further, in most instances in our sample under analysis, we find that central bank responses to the evolution of the labour share cycle over time is not sufficient to unequivocally enforce stability on those economies. This is particularly the case for for all economies save for Australia and Germany (here, we caveat this analysis by acknowledging that monetary policy in

the EU is very centralized, making the process of addressing labour share fluctuations across the various member states a difficult task).

Ultimately, we find that modelling for an open economy enriches the way in which various macroeconomic features interplay- although the modelling process is, perhaps, more difficult, it is imperative that a policy maker utilise data on (at the very least) exchange rate volatility as a means to put forward a fully fleshed out model of a working economy. In this way, it can be said that modelling with our advised augmentations to Flaschel and Krolzig (2003) are able to elucidate the way in which the macroeconomy is at interplay, and particularly, the way in which the labour share itself links to the macroeconomy at large.

With this information, a policy-maker is able to make relatively more robust policy given our contribution- this policy is then opened up to the possibility of including instruments which influence functional income distribution at a macroeconomic level, whose effect on the macroeconomy itself is able to be analysed meaningfully. It is this analysis, we believe, that will surely see an improvement in both the novelty with which policy can be created, and the effectiveness that redistribution across classes has at possibly improving the lives of lay people within the economic system in question. For this, the lay economist should strive, and for this, the lay economist is now at least relatively better informed.

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