



KADIR HAS UNIVERSITY
SCHOOL OF GRADUATE STUDIES
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**INEQUALITY, POST-COVID INFLATION AND
INCOMES POLICY IN A TWO HOUSEHOLD SFC
MODEL FOR THE UK ECONOMY**

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INCOMES POLICY IN A TWO HOUSEHOLD SFC
MODEL FOR THE UK ECONOMY**

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APPROVAL

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OKTAY ÖZDEN

Date 15/01/2025



To My Dearest Family...

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INEQUALITY, POST-COVID INFLATION AND INCOMES POLICY IN A TWO HOUSEHOLD SFC MODEL FOR THE UK ECONOMY

ABSTRACT

This thesis examines the dynamics of post-COVID inflation in the UK economy, focusing on the interplay between inflation and income inequality through the lens of income conflict theory. It introduces the first two-household Stock-Flow Consistent (SFC) model tailored to the UK economy, providing a comprehensive framework for analyzing inequality and inflation dynamics. The model's insights are further enhanced by the development of the UK-SFC App, an innovative R Shiny-based tool enabling interactive policy simulations and educational applications. The findings reveal that income claims, driven by distributive dynamics, play a central role in inflationary pressures and demonstrate the critical role of incomes policy design. Simulation results indicate that an incomes policy, when well-designed by addressing income inequality, may simultaneously reduce inflation and income inequality. The research advocates for the adoption of incomes policy as a dual mechanism to address both inflation and inequality, by emphasizing the critical importance of effective incomes policies in achieving effective economic outcomes.

Keywords: Income conflict, Incomes policy, Post-COVID inflation, SFC model

BİRLEŞİK KRALLIK EKONOMİSİ İÇİN İKİ HANEHALKLI SFC MODELİNDE EŞİTSİZLİK, COVID SONRASI ENFLASYON VE GELİRLER POLİTİKASI

ABSTRACT

Bu tez, gelir çatışması teorisi perspektifinden enflasyon ve gelir eşitsizliği arasındaki etkileşime odaklanarak Birleşik Krallık ekonomisinde COVID sonrası enflasyonunun dinamiklerini incelemektedir. Çalışma, Birleşik Krallık ekonomisine yönelik uyarlanmış ilk iki-haneli Stok-Alım Tutarlı (SFC) modelini sunarken eşitsizlik ve enflasyon dinamiklerini analiz etmek için kapsamlı bir çerçeve sağlamaktadır. Modelin sağladığı bulgular, interaktif politika simülasyonları ve eğitim uygulamalarını mümkün kılan yenilikçi bir R Shiny tabanlı araç olan UK-SFC Uygulaması'nın geliştirilmesiyle daha da güçlendirilmiştir. Bulgular, bölüşüm dinamikleriyle yönlendirilen gelir taleplerinin enflasyonist baskılarda merkezi bir rol oynadığını ve gelir politikası tasarımının kritik önemini göstermektedir. Simülasyon sonuçları, gelir eşitsizliğini ele alacak şekilde iyi tasarlanmış bir gelirler politikasının, hem enflasyonu hem de gelir eşitsizliğini aynı anda azaltabileceğini göstermektedir. Araştırma, enflasyon ve eşitsizliği ele almak için gelir politikasının çift yönlü bir mekanizma olarak benimsenmesini savunmaktadır ve etkili ekonomik sonuçlar elde etmede, etkin gelirler politikalarının kritik önemini vurgulamaktadır.

Anahtar Sözcükler: Gelir çatışması, Gelirler politikası, COVID sonrası enflasyon, SFC modeli

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LIST OF SYMBOLS

Symbol	Meaning
α	Rate of dividend distribution
α_w	Worker receives rate of NFC dividends
α_R	Rentier receives rate of NFC dividends
α_{NFC}	Share of net operation surplus distributed as dividend by NFC
β	Capital stock adjustment coefficient
γ	Speed of adjustment
δ	Rate of depreciation
δ_K	Rate of capital stock depreciation
δ_{NFC}	Share of NFC' capital equipment depreciation over δ_K
δ_H	Share of house depreciation over δ_K
ϵ_1	Export share of GDP
ϵ_2	Import share of GDP
ϵ_3	Government investment share of GDP
ϵ_4	Government GOS share over total GOS
ϵ_5	The share of imported commodities over import
θ	Exogenous factors influencing NFC's markups
π_0	First parameter of worker annuity payments
π_1	Second parameter of worker annuity payments
π_2	First parameter of rentier annuity payments
π_3	Second parameter of rentier annuity payments
π_4	Share of profit distributed by insurance corporations and pension funds
π_5	Share of government expenditure over GDP
π_6	Share of state pension of workers over GDP
π_7	Share of state pension of rentiers over GDP
π_8	Share of gross operating surplus of government over GDP
$\rho 0_t$	Exogenous factors influencing rentier wage target
$\rho 1_t$	Productivity factor influencing rentier wage target
$\rho 2_t$	Aggregate demand factor influencing rentier wage target
$\rho 3_t$	Bargaining power of rentiers
σ_0	The average rate of population growth of the UK
σ_1	The first parameter of housing transaction coefficient
σ_2	The parameter of housing price change affecting housing transaction
σ_3	The first parameter of the price of houses
σ_4	The parameter of household disposable income effecting price of houses
σ_5	The parameter of mortgage interest rate effecting price of houses
σ_6	The parameter of housing stock effecting price of houses
σ_7	Worker share of mortgages
σ_8	Rentier share of mortgages
σ_9	The first parameter of the housing investment function
σ_{10}	The parameter of new mortgages effecting housing investment
σ_{11}	The parameter of price of houses affecting housing investment
τ	Tax rate
τ_t^i	Income tax rate
τ_t^W	Tax on worker wages
τ_t^R	Tax on rentier wages
τ_t^F	Tax on rentier financial incomes
τ_t^{PI}	Share of production and import tax less subsidies over IMP
τ_t^{EP}	Excess profit tax
$\varphi 0$	Markups charged by banks
$\varphi 1$	Markups charged by non-financial corporations
$\omega 0_t$	Exogenous factors influencing worker wage target
$\omega 1_t$	Productivity factor influencing worker wage target
$\omega 2_t$	Aggregate demand factor influencing worker wage target
$\omega 3_t$	Bargaining power of workers
$c 0_t$	Obligatory consumption to survive
$c 1_t$	Consumption out of disposable income
$c 2_t$	Consumption out of net wealth

LIST OF ACRONYMS AND ABBREVIATIONS

Term	Meaning
A_t	Central bank advances
ANN_t^W	Annuities of worker households
ANN_t^R	Annuities of rentier households
ANN_t^H	Total annuities of household sector
$ASSET_t^W$	Total assets of worker households
$ASSET_t^R$	Total assets of rentier households
B_t	Government bonds
B_t^{GOV}	Government bonds (extended model)
B_t^{MFI}	Government bonds stocks of monetary financial institutions
B_t^{ICPF}	Government bonds stocks of insurance corporations and pension funds
B_t^{ROW}	Government bonds stocks of rest of the world
C_t^R	Rentier consumption
C_t^W	Worker consumption
$CBprofit_t$	Central bank profit
CON_t^R	Rentier consumption (extended model)
CON_t^W	Worker consumption (extended model)
CON_t^H	Total consumption of household sector
D_t^R	Rentier Deposit
DA_t	Depreciation allowance
DEP_t^{NFC}	Deposits of non-financial corporations
DEP_t^{ROW}	Deposits of rest of the world in the UK economy
$depr$	Rate of depreciation
$DEP.HH_t^W$	Deposits of worker households
$DEP.HH_t^R$	Deposits of rentier households
$DEP.ROW_t^{MFI}$	Deposits of monetary financial institutions in RoW
Div_t^{FS}	Dividends of financial corporations
Div_t^{NFS}	Dividends of non-financial corporations
Div_t^{ROW}	Dividends of rest of the world
E_t^R	Equity stock of rentiers
EF_t	External finance
EF_t^{NFC}	External finance of non-financial corporations (extended model)
EXP_t	Export
$EQUITY_t^W$	Worker equity stocks
$EQUITY_t^R$	Rentier equity stocks
FI_t^{MFI}	Foreign investment of monetary financial institutions
FI_t^{ROW}	Foreign investment demanded by RoW
FNW_{MFI}	Financial net worth of MFI
G_t^{Exp}	Government expenditure
G_t^{well}	Welfare spending of the government
G_t^{Texp}	Total government expenditure
G_t^{INV}	Government investment
$G_t^{T.Inc}$	Government total income
G_t^{Def}	Government deficit
G_t^{Inc}	Government income
GDP_t	Gross domestic product
GDP_t^{EXP}	Expenditure side of GDP
GDP_t^{INC}	Income side of GDP
$GDP.DEF_t$	GDP deflator
$G.GDP.DEF_t$	The growth of GDP deflator
GFC_t	Gross fixed capital formation or total capital stock of the economy
GOS_t	Gross operating surplus of the economy
GOS_t^W	Gross operating surplus of household sector
GOS_t^H	Gross operating surplus of household sector
GOS_t^{GOV}	Gross operating surplus of government sector
GOS_t^{NFC}	Gross operating surplus of non-financial sector
GOS_t^{FC}	Gross operating surplus of financial sector
$H.STOCK_t$	House stock
$H.SOLD_t$	Housing transaction
I_t	Investment
I_t^{NFC}	Investments of non-financial corporations
I_t^{House}	Housing investment
$ICPF_t^A$	Total assets of insurance corporations and pension funds
$ICPF_t^L$	Total liabilities of insurance corporations and pension funds
IF_t	Internal Finance
IF_t^{NFC}	Internal Finance of non-financial corporations (extended model)

IMP_t	Import
$Imp.Cost.Capture_t$	Relative change of import deflator to GDP deflator
$IMP.COM_t$	Imported commodities used in production
$Imp.Cost.Con_t$	Import cost contribution to change in GDP deflator
$Imp.Cost.DEF_t$	Imported cost deflator
$Imp.Cost.Receive_t$	Imported cost of the economy received by the rest of the world
INT_t^{GOV}	Interest rates of government bonds
$INT.DEP_t^{ROW}$	Interest rates of RoW deposits
$INT.DEP.HH_t^R$	Interest rates on rentier deposits
$INT.DEP.ROW_t^{MFI}$	Interest rates of MFI deposits in RoW
$INT.DEP.HH_t^W$	Interest rates on worker deposits
$INT.EARN_t^R$	Interest earnings of rentier households
$INT.EARN_t^W$	Interest earnings of worker households
$INT.FI_t^{NFC}$	Interest rates of foreign investment
$INT.LOAN.HH_t^W$	Interest rates on worker consumer credits
$INT.PAY_t^{MFI}$	Interest payments of monetary financial institutions
$INT.PAY_t^{ROW}$	Interest payments of rest of the world
$INT.PAY_t^R$	Interest payments of rentier households
$INT.PAY_t^W$	Interest payments of worker households
$INT.REC_t^{MFI}$	Interest receives of monetary financial institutions
$INT.REC_t^{ROW}$	Interest receives of rest of the world
$i0_t$	First parameter of investment function
i^A	Interest rates of advances
i^B	Interest rates of government bonds
i^{CBrate}	Central bank policy rate
i^D	Interest rates of rentier deposits
i^{Lcon}	Interest rates of consumer credits
i^{Lpro}	Interest rates of producer credits
$i_t^{NFC.DEP}$	Interest rates of non-financial corporations' deposit
$i_t^{NFC.LOAN}$	Interest rates of producer credits
$LIABILITY_t^R$	Total rentier liability
$LOAN.HH_t^W$	Worker household loan or mortgages
$LOAN.HH_t^R$	Rentier household loan or mortgages
$Int.earnings_t^{FS}$	Interest earnings of financial sector
$Int.payment_t^{FS}$	Interest payments of financial sector
L_{con}	Consumer credits
L_{pro}	Producer credits
$LOAN.HH_t^W$	Worker consumer credits
$LOAN.HH_t^R$	Rentier consumer credits
$LOAN.HH_t^{W+R}$	Total households' credits
$LOAN_t^{NFC}$	Producer credits (extended model)
MFI_t^A	Total assets of monetary financial institutions
MFI_t^L	Total liabilities of monetary financial institutions
mw_{ratio}	Ratio of household GOS divided by worker wages payments
N_t^{Act}	Number of actual workers
N_t^{Full}	Number of full employments
N_t^R	Number of rentiers
N_t^W	Number of workers
$N.Int^{NFC}$	Net interest payment of non-financial corporations
$N.WORTH_t^W$	Net worth of worker households
$N.WORTH_t^R$	Net worth of rentier households
$N.WORTH_t^{ICPF}$	Net worth of insurance corporations and pension funds
$NET.EQE_t^W$	Net equity earnings of worker households
$NET.EQE_t^R$	Net equity earnings of rentier households
$NET.EQUITY_t^{ICPF}$	Net equity earnings of insurance corporations and pension funds
$NEW.MORT_t$	New mortgages
NLP_t^W	Net lending position of worker households
NLP_t^R	Net lending position of rentier households
NLP_t^{NFC}	Net lending position of non-financial corporations
NLP_t^{FS}	Net lending position of financial corporations
NLP_t^{GOV}	Net lending position of government
NLP_t^{ICPF}	Net lending position of insurance companies and pension funds
NLP_t^{RoW}	Net lending position of rest of the world
NOS_t	Net operating surplus
NOS_t^W	Net operating surplus of household sector
NOS_t^{NFC}	Net operating surplus of non-financial corporations
$Other.Inc.Capture_t$	Relative change of other income deflator to GDP deflator
$Other.Inc.Con_t$	Other income contribution to change in GDP deflator
$Other.Inc.DEF_t$	Other income deflator
$Other.Inc.Receive_t$	Other income category received by the worker households
P_t	Unit prices

$PEN.CON_t^W$	Pension contributions of worker households
$PEN.CON_t^R$	Pension contributions of rentier households
$PEN.CON_t^H$	Total pension contributions of household sector
$PENSION_t^W$	Worker pension stock
$PENSION_t^R$	Rentier pension stock
$PENSION_t^H$	Total pension stock of household sector
$pen.coef0$	First parameter of pension contribution function of workers
$pen.coef1$	Second parameter of pension contribution function of workers
$pen.coef2$	First parameter of pension contribution function of rentiers
$pen.coef3$	Second parameter of pension contribution function of rentiers
pr_t^W	Worker productivity
pr_t^R	Rentier productivity
P_t^H	Price of houses
$PROFIT_t^{ICPF}$	Total profit of insurance corporations and pension funds
$PROFIT_t^{ROW}$	Total profit of rest of the world
$Profit.Capture_t$	Relative change of profit deflator to GDP deflator
$Profit.Con_t$	Profit contribution to change in GDP deflator
$Profit.DEF_t$	Profit deflator
$Profit.Receive_t$	Total profit received by non-financial corporations
rrr	Required reserve ratio
$R.RES_t$	The rentier response for income recovery
RES_t	Bank reserves in their central bank account
$STAT^{DIF}$	Statistical differences between expenditure and incomes sides of GDP
$S.PEN_t^{HH}$	Total state pension to household sector
$S.PEN_t^R$	State pension to rentier households
$S.PEN_t^W$	State pension to worker households
$TAX.Capture_t$	Relative change of tax deflator to GDP deflator
$Tax.Con_t$	Tax contribution to change in GDP deflator
$TAX.DEF_t$	Tax deflator
$Tax.Receive_t$	Tax income received by the general government
$TAX.PRO.IMP_t^{NFC}$	Production and import tax less subsidies paid by NFC
$TAX.PRO.IMP_t^G$	Production and import tax less subsidies received by government
TFN_t	Total financing need of non-financial corporations
TP_t^{EP}	Excess profit tax received by government
TP_t^R	Tax payment of rentiers
TP_t^W	Tax payment of workers
UC_t	Unit cost
UC_t^R	Unit rentier cost
UC_t^W	Unit worker cost
Y_t	Total output
YD^{NFC}	Disposable income of non-financial corporations
YD_t^R	Rentier disposable income
YD_t^W	Worker disposable income
Vh_t^R	Rentier net wealth
Vh_t^W	Worker net wealth
$Wage.Con_t$	Wage contribution to change in GDP deflator
$Wage.Capture_t$	Relative change of wage deflator to GDP deflator
$Wage.Receive_t$	Total wages received by household sector
WP_t^W	Worker wage payments
WP_t^R	Rentier wage payments
WP_t	Total wage payment
$WP.DEF_t$	Wage payment deflator
W_t^W	Average worker wages
W_t^R	Average rentier wages
$W_{t^{Tar}}$	Target average wage income of workers
$W_{t^{Tar}}$	Target average wage income of rentiers
$W.RES_t$	The worker response for income recovery

1. INTRODUCTION

Inflation and income inequality have long been two central themes in economic literature. Following the Great Stagflation of the 1970s, global economies experienced a steady decline in inflation rates for nearly three decades. However, with the onset of the COVID-19 pandemic, this trend reversed, as pandemic-related disruptions to supply chains and economic slowdowns triggered a surge in inflation. Researchers aimed to explain dynamics of this inflation, suggesting many reasons ranging from expansion of money supply (Kumari et al. 2021) to supply constraints (Giovanni et al, 2022; Santacreu and Labelle, 2022), Ukraine war (Caldara et al. 2022; Maurya et al. 2023), corporate profit surge (Bivens 2022, Macdonald, 2023), and seller inflation (Weber and Wasner 2023).

On the other hand, the eruption of the financial crisis of 2007-2008 and the interventions then after led to great interest in the subject of economic inequality. With the publication of impressive books of Stiglitz's, *the price of inequality* (2012), Piketty's *Capital in the 21st century* (2014), and Atkinson's *Inequality* (2015), the subject reached a wide audience and became one of the leading topics in economics agenda. In the years following the 2008 financial crisis, many scholars conducted intensive research about drivers of inequality. In the context of the UK, structural changes such as the decline of manufacturing value added, the rise of financialization, and invigoration of austerity policies have played a significant role in shaping income and wealth inequality. These shifts have amplified inequalities, particularly by reducing the bargaining power of labor.

Various studies have aimed to establish links between inflation and income inequality, suggesting a U-shaped relationship where higher income inequality is associated with low inflation rates, and lower income inequality is observed as inflation increases (Monnin, 2014). Researchers have also examined the role of institutional quality in clarifying the relationship between inflation and income inequality (Law and Soon, 2020; Göcen, 2024), the impact of monetary policy (Ampudia et al., 2018; Cavino and Levchenko, 2020; Eskelinen, 2021), the influence of financial development (Kim and Lin, 2023), and class-based distributive conflict in relation to inflation (Amitrano and Vasconcelos,

2019). According to post-Keynesian economists, inflation is fundamentally a phenomenon of income conflict (Hein, 2024).

The onset of the COVID-19 pandemic brought attention to the significant role corporate profit margins play in driving inflation, a point initially raised by Josh Bivens (2022) and later popularized by Weber and Wasner (2023). According to Weber and Wasner, post-COVID-19 inflation had unfolded in three stages. The first stage began with supply chain disruptions or major cost shocks, during which large corporations exploited market uncertainty to raise prices and secure excessive profits, sparking further price increases across other sectors. In the second stage, firms in these sectors have responded by raising prices to protect their profit margins, leading to a decline in workers' real incomes. Finally, in the third stage, workers have increased wage demand to restore their purchasing power. If these demands were to be met, firms would initiate another cycle of price hikes.

Weber and Wasner focus on firms' pricing behavior in the first two stages, examining cost-push inflation and strategies to maintain profit margins. The third stage is characterized by conflict-driven inflation. This study has fueled debate among heterodox economists about the underlying causes and solution of inflation (e.g., Vernengo and Perez 2023; Lavoie 2023a, 2023b, 2023c, 2024; Storm 2023; Matamoros 2023; Cycignatto et al. 2023; Nikiforos et al. 2024) and has drawn growing attention to the conflict theory of inflation, which links inflation to distributional dynamics.

However, since 2022, economic authorities have attempted to tame inflation using monetary policy rather than fiscal policy, as a consequence of the dominance of Neo-Classical and New-Keynesian theories, which together form the framework of New Consensus Macroeconomics. It is widely known that mainstream monetary policy tools aim to reduce aggregate demand by increasing the rate of interest, which further creates unemployment (Epstein and Yeldan, 2007, Rochon and Rossi, 2006) and contributes to income inequality (Altunbaş and Thornton 2020). While implementing mainstream monetary tools, an independent Central Bank is required but Aklin et al. (2021) shows its negative effect on employment and growth. They show that the idea of Central Bank Independence is not convenient for income equality. They put forward three channels

reinforcing inequality: (1). Central Bank Independence constrains the effectiveness of fiscal policy and government ability to redistribute income, (2). It encourages the government to deregulate financial markets, further empowering the ascendancy of finance over real economy; and (3) to control inflationary pressure, the government promotes policies that break the bargaining power of labor.

In the context of the UK economy, literature on post-COVID19 inflation primarily concentrates on New-Keynesian models of price rigidity and menu costs (Davies, 2021), the effect of Brexit, labor shortages, and energy shocks (Castle et al., 2023; Ahmet et al., 2023; Lu et al., 2024), particularly oil and gas shocks (Abubakar et al., 2024). While discussing these, some researchers highlights the role of fiscal policy (Nabarro, 2021; Gao 2024), the output gap and fiscal measures to boost demand (Haldane, 2021) as well as changes in consumption patterns (Grigoli and Pugacheva, 2024). However, the literature on UK inflation lacks to explain the role of income conflict as drivers of inflation, leaving an important aspect of the inflationary process unexplored. Addressing this gap, the thesis employs the framework of income conflict to explore the following key questions: What role did income claims play in post-COVID19 inflation within the UK economy? What were the underlying distributional dynamics? Given the UK evidence, how significant is the role of incomes policy? and, can an effectively designed incomes policy mitigate income conflicts while reducing both inflation and income inequality? The thesis aims to achieve three main objectives: (1) to investigate the role of income conflict under the post-COVID19 inflation dynamics in the UK, (2) to evaluate the underlying distributional dynamics that drive these conflicts, and (3). to propose and assess the effectiveness of incomes policy as a dual mechanism to reduce inflation and address income inequality.

It is the contestation of this thesis that by addressing these research objectives, it will contribute to an analytical understanding of the post-COVID19 inflationary processes in the UK economy, and will offer viable insights for policymakers.

The analytical structure of the thesis is built on the Stock-Flow Consistent (SFC) modeling methodology. Although this approach has been developed over more than five decades, it gained significant prominence in macroeconomics, particularly following the 2008 global financial crisis. Two key contributions have driven the increased popularity

of SFC modeling: Godley's (1999) insights into the predictive abilities of the methodology regarding crises and the publication of *Monetary Economics* by Godley and Lavoie (2006), which preceded the financial crisis. This book has been widely recognized by SFC practitioners as foundational, offering a comprehensive introduction to the principles and fundamentals of SFC modeling, along with its analytical tools and policy implications. When the 2008 Financial Crisis unfolded, academicians and professionals were able to analyze future risks, owing to the framework and analytical provisions outlined in the book. Additionally, SFC modeling enables the construction of more realistic economic systems, grounded in empirical observations, while incorporating crucial assumptions such as monetary endogeneity. It also facilitates adaptation to the complex and adaptive nature of economic systems by consistently linking real and financial sectors (Ciani et al. 2015).

Therefore, this thesis develops a two household SFC model for the UK economy, using the UK Economic Account dataset as well as Wealth in Great Britain and Family spending datasets. All are provided by the Office for National Statistics. The model is the first of its kind tailored to the UK economy, integrating uniquely inflation and income inequality dynamics into the Stock-Flow Consistent (SFC) framework. The model generates stable results that validate and track the 2020 macroeconomic variables of the UK economy. Given the tracking power of the model, the recovery years between 2020 and 2023 are then calibrated. The forecasting period covers 2024 over to the future.

The thesis examines the post-COVID19 inflation dynamics in the UK through the framework of income conflict theory within the model. It draws attention to the significance of distributional dynamics in shaping inflationary pressures. It puts forward the critical role of incomes policy in taming inflation, offering an alternative to the prevailing reliance on monetary policy. By proposing incomes policy as a viable alternative, this thesis contributes to ongoing debates about the limitations of conventional monetary policy in addressing the dual challenges of inflation and inequality. It highlights the need for integrated approaches that address the root causes of income conflicts rather than merely suppressing demand.

Furthermore, the thesis provides an innovative data science application called the UK-SFC App, developed using R Shiny data science technology. The UK-SFC App hosts the two household SFC model developed in this thesis and serves as an interactive platform for SFC modelers and students, offering hands-on practice and exploration. This application represents a pioneering contribution to the field in terms of its scale and functionality. The app enables users to interactively simulate various policy scenarios, making it a useful tool for both academic research and teaching. While codes and data are supplied by GitHub link available from <https://github.com/oktayozden/UK-SFC-model>, the UK-SFC App is accessible online at: <https://oktayozden.shinyapps.io/UKSFC/>.

The thesis is structured under six chapters, each addressing key components of the research. Chapter 2 reviews the literature on income and wealth inequality, offering a classification of recent literature into five sub-sections. Chapter 3 focuses on methodology, beginning with an introduction to the fundamentals of Stock-Flow Consistent (SFC) modeling. It then explores recent developments in the SFC literature, categorizing studies into eight sub-sections, with particular attention to advancements following the highly cited literature survey papers by Caverzasi and Godin (2015) and Nikoforos and Zezza (2018). The final section of this chapter discusses the dynamic SFC model developed by Bank of England, the first such model for the UK economy, concentrating financial balances.

Chapter 4 introduces a medium-scale SFC model featuring six sectors. This serves as the analytical for the more advanced two-household SFC model presented in Chapter 5, the core of the thesis. Chapter 5 is divided into four sub-sections. Sub-section 5.1 outlines the derivation of the model, detailing the identification and determination of the stocks and flows for the UK economy. Sub-section 5.2 presents the behavioral equation and macroeconomic identities, which represent the UK economy. Sub-section 5.3 examines the dynamics of income and wealth inequality in the UK during the post-COVID19 era, providing scenario analyses to evaluate various policies. This section demonstrates that incomes policy can effectively address income conflicts, reduce inflation, and mitigate income inequality when properly designed. Finally, Chapter 6 concludes the thesis, summarizing key findings and highlights implications of the research findings.

2. INCOME AND WEALTH INEQUALITY

This chapter provides a comprehensive and recent literature review on income and wealth inequality, with a particular focus on studies conducted after the COVID-19 pandemic. Scholars examine the topic from various perspectives, exploring different channels and links that connect income and wealth inequality. Most of the researchers do not clearly construct simple links. That is, most of researches include multiple channels. This causes that it is not easy to present a literature review with clear-cut classification. Yet, the section presents a classification for literature with five categories. The first one presents the technology related studies, focusing on the relationship between income and wealth inequality and technology related topics such as R&D investment, innovation, rent, automation, knowledge-based improvement, and digitalization. Following these studies, the section secondly provides the studies connecting the issue with financial globalization and capital income. Then, the third category concentrates the studies, concentrating on the effect of monetary, fiscal and macroprudential policies on income and wealth distribution. In the fourth one, the studies associated with neoliberal policies, changes in income shares, and the bargaining power of labor and firms are provided. The last one includes the review of remaining specific topics such as marriage, crime, health and so on.

2.1 Technology related studies

In the early study of Frederiksen and Poulsen (2010), the determinants of change in income distribution, using an equilibrium search framework are evaluated. According to findings, skill biased technological change and employees' relative productivity have impacts on rising income inequality. Antonelli & Tubiana (2020) examine shift from industrial economy to knowledge-based economy, leading to knowledge rents. It causes the depolarization of labour market. While creative workers can involve into the rents related knowledge exploitation, ordinary workers face to dismantlement of their process from production, signifying a decline in employment within deunionised manufacturing industries. Therefore, such a knowledge intensive radical change is associated with rising income inequality, empirically demonstrated by Antonelli & Tubiana (2020) over 20

OECD countries from 1990 to 2016. Knowledge based enhancement brings about automation. For instance, Mall et al. (2020) analyze distributional effects of automation. High skilled workers and capital owners are greatly benefited from new technologies, obtaining more returns of wealth. On the other hand, automation causes stagnant wages and incomes for those on the bottom of the distribution. Wang et al. (2024) propose a theoretical framework to connect the relationship between inflation and income inequality with an open economy model, including heterogenous firms, firm level innovation, and restrictions on R&D investment. They demonstrate that the channel of global real interest rate may play an essential role in the determination of this relationship. Among countries in the sample, small economies experience worsening income inequality as inflation rate increases. However, larger economies have a U-shaped relationship between income inequality and inflation. Hailemariam et al. (2021) examine the major factors behind income inequality in the OECD economies, using long period panel dataset from 1870 to 2016. They consider the Gini coefficient and the top 10 income percentile as a measurement of inequality. Findings show that income distribution is significantly and negatively influenced by a positive shock to government expenditure and the real interest rate. They find that a positive innovation shock initially reduces income inequality. However, such an effect becomes opposite with some time lag for top income inequality. Tian and Xiang (2024) investigate the relationship between income inequality and digitalization and technological improvements. The findings show that digital economy has a linear repressing effect on income inequality. In the study, heterogeneity analysis shows that the repressive effect of digitalization and technological improvements on income inequality in capitalist economies is much stronger than in ex-communist economies.

2.2 Financial globalization and capital income

Heimberger (2020) analyzes the effect of economic globalization on income inequality. Using meta-analysis and meta regression techniques, this paper highlights that globalization generally increases income inequality with financial globalization having a sharper impact than trade globalization. The effect is similar in both developing and advanced countries, contradicting theories that globalization reduces inequality in

developing countries. Furthermore, technology and education moderate the impact of globalization on inequality. The analysis found no significant publication selection bias affecting these results. Arrigoni (2024) examine the contribution of financial globalization to rising wealth inequality in France, the U.S., and the U.K. The findings demonstrate that positive changes in the standard measure of financial globalization may lead to increased wealth shares for the top 1% and 10% of the population, while decreasing the wealth share for the bottom 50%. Furthermore, the increase in wealth shares is driven by financial derivatives and portfolio equities.

Globalization and financialization boost capital income and concentration of wealth, resulting in inequality. For instance, Hoffman et al. (2020) examine the income inequality trends in the U.S. The rising capital income exacerbates the income inequality, while the capital to labour income ratio increased among high income households. Findings also show that inequality among large European economies such as Germany, Italy, and the U.K increases as fast as in the U.S. This article addressed income inequality to education and capital income, suggesting differences across European economies and the U.S. Blanchet & Martines-Toledano (2023) elucidate the relation between the wealth distribution and the long-term dynamics of aggregate household wealth in Europe and the U.S. They construct the Distributional Wealth Accounts for Europe, containing individuals' assets, liabilities, investment flows, and the distribution of wealth for European countries between 1970-2020. The results indicate that wealth concentration has escalated much more rapidly in the United States, faster than European economies, while aggregate household wealth to income ratios have risen similarly in both Europe and the United States since 1970. Furthermore, they observe that Europe's more restrained increase in wealth concentration since the mid-1980s may be attributed to a lesser growth in inequality of labor income and a greater increase in house prices compared to financial assets, when contrasted with the U.S. Another cross-national study conducted by Pfeffer and Waitkus (2021) concentrate on cross national differences in wealth inequality, using harmonized data including 15 countries. They show a lack of relation between national levels of income and wealth inequality and concentration. They put forward that the distribution of housing equity is essential reason of the variation of wealth inequality and concentration across nations.

Financialization boosts and eases free capital flows across nations. Some studies demonstrate these flows raise income and wealth inequality. For instance, Kumar and Dash (2024) elucidate the relationship between income inequality and sectoral capital flows, including net corporate, bank and sovereign flows in 83 countries. The findings demonstrate that an increase in net bank flows has a tendency to decrease inequality, especially in countries where regulations support credit expansion to secondary sectors. Furthermore, a radical increase in net corporate flows damages income distribution, particularly in countries featured by higher dividends flow and lower wage income flow. Financial assets and flows create income and wealth inequality among social groups. For instance, Dossche et al. (2024) evaluates differences in liquid assets as well as wages, income, consumption wealth differences. They use household surveys in the euro area and compare individuals born in their own country and individuals migrated from other EU countries and non-EU countries. The distinction in wealth and other liquid assets are more significant than others. The findings show that immigrants have earnings on average 30 percent lower than natives and own approximately 60 percent less net wealth. In all variables, demographics such as age, gender, marital status, and so on can only a small proportion of distinction between natives and immigrants.

2.3 Monetary, fiscal and macroprudential policies

In the literature, some researchers concentrate on policy effects on income and wealth inequality. However, there is no consensus on how monetary policy affects inequality. For instance, Albert et al. (2020) evaluate the impact of monetary policy shocks on income and wealth inequality, scrutinizing the housing and fiscal channels as well as traditional transmission channels put forwarded in recent literature. The results demonstrate no significant impact of expansionary monetary policy on income inequality as a result of the existence of opposite channels. However, it exacerbates wealth inequality through the mechanism of portfolio channel. Also, O'Farrell and Rawdanowicz (2017) put forward that the effect is not a matter of certainty, but exists in very complex ways. By investigating the effects of monetary policy on inequality through the business cycles and its impacts on returns, cost of debt servicing and asset prices for several advanced economies, they demonstrate ambiguous effects of monetary policy effect on

income and net wealth through the financial channels. Effects are based on the relative size and distributions of assets, liabilities, and incomes. For example, rising house prices generally decreases net wealth inequality. However, the opposite effect is the case for increases in stock and bonds. Another significant research conducted by McKay and Wolf (2023) who examine the link between monetary policy and inequality, evaluating the last three decades of the US and drawing three main conclusions. First, monetary policy influences households similarly overall. Second, recognizing differences among individuals changes our understanding of how monetary policy works, though it doesn't change our broader view of its macroeconomic effects. Third, these insights somewhat constrain the role of household inequality in shaping optimal monetary policy, even with a broad mandate. They propose future research should address the effects of supply sides changes, variations in household consumption patterns, and the limitations of current empirical data on these effects.

The heterogeneous effect of monetary policy on households and their income and wealth is also highlighted by Andersen et al. (2023). They analyze the distributional consequences of monetary policy. Using administrative household level dataset of Denmark between 1987-2017 and exploiting a long-term currency peg regime that causes exogenous variation in monetary policy, they show that the advantages of softer monetary policy, in terms of higher income, wealth, and consumption, tend to increase for those with higher initial income. This happens because people experience monetary policy influences differently, particularly through channels unrelated to labor, such as leverage and investment in risky assets. Consequently, softer monetary policy tends to widen income inequality. Garcia & Cross (2024) reach a similar conclusion, analyzing the implementations of monetary policy such as inflation targeting. They examine the effect of inflation targeting on the relation between monetary policy and income inequality for G7 economies. Using a long-term period dataset between 1974-2019, their findings demonstrate that tightened monetary policy increases income inequality. However, controlling for inflation targeting adaptation decreases the degree of this effect in Japan and the UK, but not in Canada and the US. This result proposes that country-specific inflation targeting may alleviate the inequality led by unexpected monetary tightening. Gokan & Turnovsky (2023) analyze the consequences of implementing Taylor rules for

income and wealth inequality by comparing the two forms of government spending. The results suggest a significant impact on distribution. When a country implements the active Taylor rule, wealth inequality will increase, even so the government expenditure increases through consumption or production. More specifically, the government's consumption expenditure increases income inequality, while productive expenditure decreases it. On the other hand, when the Taylor rule is not active, government expenditure, through consumption or more productive way, reduces wealth inequality. However, income inequality rises initially but it also decreases over time.

Fiscal policy is another field investigated by researchers. For instance, Muinelo-Gallo and Roca-Sagales (2013) examine joint determinants of fiscal policy, inequality and economic growth for 21 high income OECD countries between 1972 and 2006. They indicate that gross income inequality plays a significant role in shaping fiscal policy outcomes. The findings also reveal that distributive expenditures and direct taxes can lead to notable reductions in both GDP growth and net income inequality. Furthermore, the results suggest that the most effective fiscal policy approach during periods of fiscal consolidation is to reduce non-distributive spending, as this could boost GDP growth while also lowering income inequality. Cevik and Correa-Caro (2020) analyze the empirical characteristics of income inequality in China and several emerging market economies. They concentrate on the redistributive contribution of fiscal policy. Using instrumental variable techniques, they demonstrate the evidence of the presence of a Kuznets-typed relationship, which is an inverted U shaped observation between economic development and income inequality in China and the panel of BRIC+ economies. Specifically, empirical findings show that government spending and taxation have impacts on income inequality in China. It is reduced by taxation but increased by government spending. Conversely, Konstantinou (2024) scrutinizes the impact of fiscal tightening on income inequality, employing dynamic average treatment effect for 16 OECD economies between 1978-2018. The findings indicate that income inequality is worsening when fiscal austerity is implemented. However, the increases show themselves depending on unannounced fiscal measures. If it is low, the effect on income inequality is low and vice versa. However, income inequality is not changed for the intermediate levels of fiscal measures.

International institutions such as IMF and World Bank are interested in rising inequality and the role of fiscal policy. For instance, Bastagli et al. (2012) highlight the tendency to increase in income inequality in most advanced and developing economies, driven by factors such as globalization and technological change. A notable aspect is the significant variation in average disposable income inequality across regions, largely explained by differences in tax and spending policies, particularly their level and progressivity. In advanced economies, fiscal policy has played a crucial role in reducing inequality, primarily through progressive taxation and social expenditures. However, they emphasize that since the mid-1990s, reforms have reduced the progressivity of tax systems and the generosity of social benefits, diminishing the redistributive impact of fiscal policy. In the face of fiscal consolidation, tax and spending reforms must aim to preserve or enhance the distributive effects of fiscal policy while maintaining economic efficiency. They suggest key strategies that include curbing tax evasion and avoidance, increasing the progressivity of income taxes on higher earners, cutting unproductive expenditures, and expanding means-tested programs. On the other hand, Martinez- Aguilar et al. (2017) analyzes the distributional effects of Chile's 2013 fiscal policy. This world bank paper indicates four key outcomes that highlight the overall positive impact of fiscal interventions on poverty and inequality. First, while subsidies have a modest impact, direct transfers are progressive, reducing the poverty headcount by 4 to 5 percentage points. Second, social contributions increase inequality, but direct income taxes are equalizing, and indirect taxes, despite raising poverty, reduce inequality (Lambert's conundrum). Third, social spending on tertiary education is slightly equalizing but not pro-poor, unlike spending on basic education, secondary education, and healthcare, which are both equalizing and pro-poor. Finally, the tax/transfer system benefits more individuals than it harms, with gains outweighing losses.

Macroprudential policies such as access to finance and credit restraints are examined. Barra et al. (2024) point out the importance of financial access on income inequality and draw an attention how cooperative and commercial banking have effects in determination of that relationship, using a quintile regression approach for 57 developed and developing economies between 2004-2019. Furthermore, this research suggests a new insight for policy implications. If policy makers facilitate financial access of the most disadvantaged

groups to capital, this may lead to a greater improvement of entrepreneurial capabilities and a higher quality of human capital, acquiring a higher level of education. Gatt (2024) examines macroprudential policies that improve economic outcomes, reducing the possibility of financial crises. He scrutinizes the impact of a reduction in the maximum ratio of loan to value on the rate of home ownership, house prices and housing wealth inequality for two countries, which have different initial wealth distribution. Using a heterogeneous agent model in which households have an endogenous borrowing limit, he demonstrates that if the LTV limit decreases, borrowing constraints tighten and thus the level of wealth changes. Particularly, initial conditions are crucial because a higher share of households is influenced in case of more equal wealth distribution.

The policies focusing on climate change are also investigated. For instance, Bettarelli et al. (2024) evaluate the dynamic effect of climate change policies on income inequality within 39 developed and developing economies between 1990-2020. The findings suggest that these policies are related to rising income inequality. These have important policy implications, signifying the emphasis of timing and design of climate change policies.

2.4 Neoliberal policies and bargaining power of labors and firms

The literature includes numerous studies focusing on the impact of neoliberal policies on the laboring class. These studies establish strong links between inequalities and policies that cause deunionization, a decline in bargaining power of labor, and a fall in labor income despite significant increases in labor productivity. Since 1980, labor income has stagnated and has not kept pace with productivity growth. The trends of rising profit shares and declining labor shares contribute to income and wealth inequality. According to literature, neoliberal policies play a crucial role in these trends by promoting deregulation, privatization, fiscal austerity, labor market flexibility, and policies that suppress the labor class. For instance, Polacko (2021) investigates causes and consequences of income inequality. Inequality is driven by a multitude of political choices, embracing neoliberal policies, which promote globalization, technological

development, tax policy, executive pay and deunionization. Polacko alleges that these policies cause harmful outcomes but can be prevented.

Labor market reforms are investigated in various contributions. Dosi et al. (2018), for instance, studies the impacts of structural reforms degenerating labor market by using an Agent-Based model and introducing a change in policy regime in labor market imposed by a set of structural reforms. The model demonstrates that structural change in the labor market decreases bargaining power of labor, results in repressing wages, unemployment, functional and personal income inequalities. Such a degeneration brings about segmentation of the labor force. Medeiros and Trebat (2022) analyze the patterns in employment and income distribution in developed countries over the last two decades. This paper conceptualizes the neoliberal as characterized by relocation of production facilities, outsourcing, and segmentation of the labor force. The paper points out the increasing patterns in precarious employment, including no social protection or job mobility in services. The frequency of working poor, even if it is always a structure characteristic of underdeveloped economies, has become a standard character of the advanced economies. This is a product of labor market reforms.

Institutional differences are also examined by scholars. Fuller et al. (2020) investigate the effects of economic, political and institutional factors on wealth inequality, using the dataset from the World Income Database, including Western European and OECD countries. The findings point out that the political and institutional determinants that influence income inequality do not affect the wealth to income ratio in either the short or long term. However, economic factors such as rising housing prices and price change in financial assets drive wealth inequality, but political and institutional ones such as home ownership or national saving rates do not affect wealth inequality. In some research, these economic factors are expanded. The effects of financial assets distribution is studied because they generate significant implications, suggesting redistributive policies. For instance, in the study of Policardo & Carrera (2024) the association between wealth inequality and economic growth in case of France and the US is examined. The findings particularly show a negative relation between wealth inequality and economic growth in France because poor individuals have a relatively large proportion of non-productive assets/luxury commodity. However, the findings show no such a relation for the US. They

conclude that the redistribution policies from rich to the poor is significant for sustainable economic growth.

Income and wealth inequality is also analyzed by connecting the productivity growth. For instance, Lee (2023) highlights a channel between inequality and productivity growth in theoretical examination that contains the endogenous growth model with heterogeneous individuals. In the calibrated model, an increase in wealth inequality leads to transition dynamics characterizing a fall in productivity, lower aggregate demand, and lower rates of interest. These are consistent with empirical literature. On the other hand, Gabauer et al. (2021) investigate predictive power of labor productivity on growth rate of income inequality in the U.K., using quarterly dataset from 1975 to 2016. They found higher strength of the predictive power towards the end of the sample, especially post global financial crisis. Findings demonstrate a negative relation between the growth rate of labor productivity and inequality, excluding an initial positive impact in the short term.

The fall in labor market and labor income is a product of deunionization, abolishing collective labor rights and other factors leading to a decline in the bargaining power of labor. Collective labor rights provide partible ability to involve in collective organization. Using panel dataset of 100 developed and less developed countries between 1985-2002, Kerrissey (2015) investigate the connection between these collective labor rights and income inequality. The findings show that repression of labor rights decreases the capacity of worker organizations, resulting in effectivity to combating income inequality. The random and fixed effect models reveal that the strong labor rights are closely associated with the lower income inequality in many countries in the sample, including those in the Global South. Furthermore, regional interactions with labor rights demonstrate the broader context influences labor organizations' ability to decrease inequality. During the period used in this study, labor rights were crucial for combating inequality in the West but less so in Eastern Europe.

The collective labor rights that generate unionization are crucial because unionization has a positive impact on distribution. For instance, Herzer (2016) examines the effect of labor unions on the income distribution for 20 economies. Employing heterogeneous panel cointegration and causality models, the research points out that unions have a positive

long-run effect on income distribution, reducing inequality and there is significant heterogeneity in the impacts of unionization on income distribution across economies. Moreover, the direction of the long run causality is not unidirectional. Thus, unionization reduces income inequality, while a higher inequality leads to lower rates of unionization.

In the literature, some research indicates uncertainty for impacts of unions. For instance, Chang and Hung (2016) present a trade union model demonstrating the interdependence of growth, unemployment and income inequality. The number of employed laborers is decreased by increased unionization. However, higher unionization affects working hours, potentially leading to high unemployment and growth. The effect on income inequality is not certain, depending on direct and indirect unionization effects. Numerical analysis shows that higher elasticity of substitution between labor and capital increases income inequality and economic growth but decreases the labor income share, with unionization that reinforces this decline. Chu et al. (2016) examine the macroeconomic effects of labor unions, using an R&D based growth model including two economies where innovation incentives are determined by the market size of each economy. Using a dataset covering the U.S. and the U.K. between 1980-2007, the results demonstrate that the rising bargaining power of laborers causes a fall in employment in the domestic economy, resulting in two crucial implications on innovation. First, it lowers the rates of innovation and economic growth. Second, it redirects innovation toward the foreign economy, leading to a long-term negative impact on domestic wages compared to foreign wages. According to this study, the fall in the bargaining power of the labor unions causes significant welfare gains for the US and the U.K.

Unionization determines the bargaining power of labor and firms that is one of the crucial channels explored by scholars. For instance, Kollmeyer (2018) argues that the link between union decline, deindustrialization and offshoring intensifies inequality more than each factor alone. Using data between 1947-2015, findings show that these interactions, along with financialization, public sector cuts, and unemployment, drive inequality, while technological change does not significantly impact on it. Nolan et al. (2019) investigate the drivers of income inequality in advanced economies, focusing on the income inequality in the entire distribution, instead of only on the top shares. They provide detailed conceptual framework with examination of recent literature and review how

inequality emerged across the OECD economies, highlighting a variety of sources. They reveal marked distinctions in trends and patterns across economies and over time. Tippet et al. (2024) elucidate the drivers of wealth inequality in France, the U.S. and the U.K and find particularly that bargaining power of workers is a key determinant of the top wealth shares. Employing a semi-structural vector autoregression model between 1970-2019, they provide empirical evidence that shocks to bargaining power of workers explain respectively 32 percent, 8 percent and 32 percent of variation in wealth inequality in the UK, USA and France. Another intensive study conducted by Rolim et al. (2022) investigates the impact of the growth of labor productivity, bargaining power of labors, and revision rules of legal minimum wage on income distribution within the agent based macroeconomic model inspired by post-Keynesian specifications such as wage bargaining process and markup pricing rules. Therefore, nominal wages are determined endogenously by the interaction between firms and workers, depending on both of bargaining powers. The results emphasize the crucial role of the coevolutionary interaction between labor's bargaining power and productivity growth in shaping the dynamics of income inequality and its connection to economic output, by highlighting on the social conflict over income distribution.

In some industries, lack of bargaining power is a feature of sectors such as the care industry. Folbre and Smith (2017) state that the uneven bargaining power of firms and workers may contribute to rising income inequality in the U.S, demonstrating empirically earning inequalities in care industries are significantly more than other industries. Care industries supply unpriced benefits for society, but many consumers are less likely to pay for these services. This industrial feature puts weak bargaining position to care service providers.

Numerous works suggest solutions to the inequality by suggesting policies which increase the bargaining power of the labor. For instance, Kochan and Riordan (2016) elucidate the causes of growing income inequality and suggest that potential options may reverse it. They particularly concentrate on the changes in the employment relation associated with labor market institutions, covering the unions and other forms of worker organizations, and related with wage regulations, while accounting for examination and proposals that prioritize technology, globalization, skills and education. Furthermore, they argue that

organizational restructuring becomes important to the studies of inequality and its recipes. On the other hand, Malloy (2020) focuses on the minimum wages and examines how it may improve relative bargaining power between labors and firms. They use a country-level panel dataset that include differences in the minimum wage levels across countries in order to demonstrate that higher minimum wages along with higher unionization rates, and higher rates of top marginal tax are crucial factors to decrease overall income inequality, especially by decreasing flows going to the top 1% income groups.

2.5 Remaining channels: marriage, crime, health etc.

In literature, there are a lot of studies, exploring different topics such as marriage, crime, health, stock market indicators, and trade openness. For example, Song et al. (2024) examine the effect of income inequality on marriage with dataset including 35 large and medium sized cities between 2004-2019. The results reveal that worsening income distribution emerges as a significant factor that contributes to the fall in marriage rates. The impact plays a crucial role in spatial and temporal differences in urban areas. Furthermore, internet penetration, housing prices, and urbanization are essential channels from income inequality to the marriage rate. Pazzona (2024) investigate the relation between income inequality and crime, a widely accepted issue in the literature, conducting a meta-analysis that depends on 1341 estimates obtained from 43 studies in economics journals. The findings show statistically significant but economically insignificant effects of income inequality on crime, asserting minimal impact of inequality on crime if there is an effect. Moreover, this study indicates that inequality may not be the leading factor to understand criminal behavior because inequality measures are very sensitive to statistical results. In essence, other potential factors may play a more significant impact on crimes. Employing advance forecasting models to anticipate future patterns, Wang et al. (2024) investigate the role of income inequality in health disparities in the U.S. The research emphasizes the significance of healthcare analytics to understand income inequality. Dang et al. (2024) investigate the impacts of stock market indicators such as market accessibility, efficiency, and stability on income and wealth inequality for the BRICS and G7 economies. Employing the Autoregressive Distributive Lag-Mixed Data Sampling model (ADL-MIDAS), they find that income inequality in the BRICS and

G7 economies may be reduced only by enhancements in market stability. Nam et al. (2024) examine the impact of trade openness on income inequality, signifying the role of institutional quality over the Association of Southeast Asian Nations. The findings demonstrate the inverted U-shaped relation between trade openness and income inequality. Beyond the certain level, trade openness begins to mitigate income inequality. The quality of institutions plays an important role in the reduction of inequality. Guvenen et al. (2022) introduces the database of the Global Repository Income Dynamics, which includes a wide range micro statistic regarding income inequality. They provide a set of trends in income inequality and dynamics for 13 economies.

3. STOCK-FLOW CONSISTENT MODELING

This chapter is divided into three subsections. The first explains the principles of stock-flow consistent modeling. The second provides a review of recent literature on the stock flow consistent modeling, with particular focus on two widely cited papers: Caverzasi and Godin (2015) and Nikoforos and Zezza (2018). These summarize the core concepts of SFC modeling, discuss various analytical tools and model solutions, and provide extensive literature surveys on SFC modeling, connecting with financialization, distributional and environmental policies, and exchange rate modeling. The third subsection focuses specifically on the Bank of England's SFC model, developed by Burgess et al. (2016), which is the first SFC model tailored to the U.K economy. Overall, this chapter relies heavily on the insights from these key papers, presenting recent literature developments and summarizing notable SFC models tailored to the UK economy.

3.1 Stock-flow consistent modeling

The origin of SFC models can be traced back to Copeland's work on the flow of funds analysis of the U.S. (Copeland 1947, 1949). SFC modelling has been developed over more than five decades, with various variants and investigations appearing in the literature (Caverzasi and Godin 2015, 160-163; Nikoforos and Zezza 2018, 2-6). However, SFC modelling gained prominence in macroeconomics, particularly after the 2008 global financial crisis. According to Nikoforos and Zezza (2018, 2), the early study titled "Seven Unsustainable Processes: Medium-Term Prospects and Policies for the United States and the World", which highlighted risks and the ability to predict the crisis by Godley (1999), and the publication of *Monetary Economics*, by Godley and Lavoie (2006) before the financial crisis, are two crucial contributions behind the increased popularity of SFC modelling. The book has been widely accepted by SFC professionals as foundational material, encompassing the principles and fundamentals of the SFC modelling, along with its analytical tools and policy implication. When the 2008 Financial Crisis occurred, academicians and professionals were able to analyze future risks, thanks to the book and its analytical provisions. Furthermore, SFC modeling allows for the construction of more

realistic economic systems, grounded in empirical observations, and incorporates crucial assumptions such as monetary endogeneity. It also facilitates the adaptation to the complex and adaptive nature of economic systems by consistently linking real and financial sectors (Ciani et al. 2015).

SFC models are based on two main components: the accounting framework and behavioral equations. The accounting framework is built on a set of matrices that reproduce the balance sheet, transaction flows, and capital gains for each sector. The economy is divided into real and financial sectors, including households, firms, financial firms, banks, central banks, the government, and the external sector. Each sectoral agent has both stocks and flows. In the transaction flow matrix, one entity's outflow is always another's inflow just as one entity's asset is another's liability in the balance sheet. These principles ensure sectoral consistency in stocks and flows. This consistency allows for simultaneous tracking of all income flows and accumulated stocks, leaving nothing unexplained within the system.

The second component is behavioral equations, which define each term in the accounting side by modelling the evolution of all transactions and stocks. These equations are determined by specific assumptions. For this reason, the accounting framework becomes a post-Keynesian model, when the behavioral equations are defined using post-Keynesian assumptions.

The SFC model allows for a more realistic representation of the economy by incorporating heterogeneity and diverse sectors. However, as the modeler introduces more heterogeneity and diversification into the system, the number of behavioral equations can grow significantly, making the system increasingly complex and challenging to manage. To deal with this complexity, practitioners often rely on computer software such as R, Eviews, and Dynare to solve the model. This approach is known in the literature as a numerical solution.

According to Caverzasi and Godin (2015), solving the model numerically involves two fundamental challenges. The first challenge is determining the values of parameters and the initial values of variables, while the second is deciding how to use the simulation

results. There are two primary methods for determining parameter values and initial variables. Practitioners can either use *estimation*, a statistical technique that employs time series data, or *calibration*, which assigns values to derive the model solution (Caverzasi & Godin, 2015). When it comes to using simulation results, practitioners typically follow one of two approaches: they either start the model from a steady-state situation and then introduce a shock, or they begin from a baseline scenario without constraints and then impose various scenarios by altering certain parameters.

Although numerical solutions, particularly those using calibration techniques, are the most commonly adopted methodology, they come with drawbacks. In very large models, practitioners must overcome significant mathematical complexity, making economic inference difficult. Additionally, they face dependency on initial values, as recognized by Lavoie and Godley (2002, p. 296). Another limitation of this methodology is that it allows practitioners to analyze only local stability, despite the possibility of other stable equilibria (Lavoie & Godley, 2001-2002, p. 296). To address these issues, two alternative solutions exist: analytical solutions and discursive solutions, as proposed by Caverzasi and Godin (2015).

Analytical solutions focus on much simpler models, which may lead to a loss of realism and a complete representation of more complex theories. Despite these limitations, analytical solutions still provide valuable economic insights. For example, Dos Santos and Macedo e Silva (2009) highlight in their review of Dos Santos and Zezza (2008) that when an economy is in equilibrium, both flows and stocks increase at the same rate, stabilizing the ratios between different variables. This steady growth allows for the analysis of equilibrium by focusing on the variables that determine these ratios. They particularly emphasize how the equilibrium can be visualized graphically, considering that the growth rates of debt stocks and households' wealth must equate. A notable advantage of analytical solutions is their utility as both theoretical and educational resources. Taylor (2004) provides an example of this by using a model developed by Godley and Lavoie (2001-02) and its analytical solution to demonstrate the post-Keynesian approach to debt and growth within an endogenous money framework. This model is subsequently expanded to simulate a Minskyan business cycle driven by animal spirits (Caverzasi & Godin, 2015, p. 164).

The third approach to solving SFC models, as suggested by Caverzasi and Godin (2015, p. 168-169), is called discursive resolution. This method focuses on approaching economic models primarily through the accounting framework rather than numerical or simulation-based solutions. Discursive resolution highlights the critical insights that the accounting framework can provide even before the simulation results are considered. Studies using this approach concentrate on theoretical and verbal analysis rather than progressing to the stage of mathematical resolution. Essentially, results are derived by examining accounting relationships and budget constraints theoretically, without necessarily moving toward a complete mathematical solution. In such cases, models may not be fully calculated or validated through simulations, but the focus remains on understanding the logic and structure of the model. Thus, discursive resolution emphasizes theoretical analysis and discussion as key components of the solution.

3.2 Recent literature on the SFC modeling

Caverzasi and Godin (2015) and Nikoiforos and Zezza (2018) provide well-documented surveys of the SFC literature. After these two crucial surveys, the literature has significantly extended both empirically and theoretically. This subsection provides the recent studies with a topic-based classification but accepts potentially different classifications. The difficulty in the clear-cut division of recent literature stems from the articles' examination and their focus. For instance, studies may include agent-based integration of SFC modeling and policy examination of climate change at the same time. Moreover, some studies conduct triple or even more policy examinations.

Therefore, this subsection classifies the recent literature respectively: theoretical integrations, methodological examinations, financial and business cycles, climate change studies, COVID-19 pandemic, studies related to distribution, inequality, and conflict, effects of monetary and fiscal policies and remaining policy implications and examinations with PhD dissertations. Additionally, this subsection contains several works ignored by these two surveys.

3.2.1 Theoretical integrations

In the literature, scholars try to integrate SFC modeling with other theoretical models such as agent-based modeling, Sraffian supermultiplier, theory of monetary circuit, and input-output structure.

Carvalho and Di Guilmi (2020) introduce an agent-based stock-flow consistent (Henceforth ‘AB-SFC’) model that incorporates effective demand, endogenous money creation, and labor-saving technological progress. Their study explores how technological unemployment impacts both personal and functional income distribution and affects household debt. The simulation findings reveal that technological unemployment can destabilize the economy and that an increase in the profit share of income exacerbates the adverse effects of income inequality on the business cycle and economic growth. The sensitivity analysis highlights the potential effectiveness of various fiscal and redistributive policy combinations but also underscores that the success of these measures is strictly influenced by behavioral and institutional factors. Fanti (2021) presents an AB-SFC model to explore directed and induced technical change within a Keynesian demand-side and evolutionary endogenous growth framework. This paper analyzes how credit-constrained, heterogeneous firms decide on labor or capital-saving innovations. The model demonstrates that while the long-term trend aligns with Kaldor’s stylized facts of labor-saving technical change, the transitional phase exhibits a pattern of labor-saving and capital-using innovations. This leads to a stabilizing aggregate output-capital ratio and a persistent decline in labor share, common in many economies. These results are mainly due to the interaction of directed technical change, wage formation, and aggregate demand. The study compares a baseline scenario with neutral technical progress, with findings confirmed by sensitivity analysis of key parameters.

Pedrosa and Lang (2021)¹ develop an AB-SFC model that integrates evolutionary theory with a Keynesian-Kaleckian demand framework and incorporates financial development

¹ Many interpretations of the Financial Instability Hypothesis use aggregate leverage ratios to measure the financial fragility of non-financial firms, but internal critiques question this assumption's validity. These critiques highlight difficulties in understanding the monetary effects of pro-cyclical profits and neglect the impact of profit-rate diversity. This study addresses these gaps.

to understand financial fragility. This model uses a synthetic index of profit-debt distribution to demonstrate how cash flow variations among firms influence the relationship between aggregate leverage ratios and systemic financial fragility. The findings indicate that firms with low leverage have more variable ratios, which significantly impacts the overall economy's leverage ratio. This suggests that systemic financial fragility only imperfectly reflects aggregate leverage ratios. Finally, they offer new theoretical insights into why empirical studies often find limited support for the FIH and underscore the importance of incorporating evolutionary dynamics and micro-macro analysis into the study of financial fragility. Reissl (2021) introduces a hybrid AB-SFC model with heterogeneous banks to analyze how variations in banks' expectations and forecasting behavior impact the economy and to explore monetary and prudential policy effects. He initializes the model to a deterministic stationary state, with some parameters empirically calibrated to align with UK macroeconomic data. He focuses on how banks form expectations and forecasts, allowing them to switch forecasting strategies and use least-squares learning. The results indicate that simple heuristics are significantly effective in a stable environment, with more sophisticated expectation mechanisms showing minimal impact. However, in less stable environments, alternative heuristics can be destabilizing. The paper concludes with policy experiments pointing out that a well-designed combination of monetary and prudential policies can significantly reduce macroeconomic volatility.

Schütz (2022) introduces a two-country AB-SFC model of a monetary union, focusing on three key factors believed to have contributed to the imbalances leading up to the Great Recession: disparities in investment, diverging competitiveness, and wage growth. The model incorporates several innovative aspects. Unlike traditional models, it does not assume fixed propensities to import; instead, agents from different regions participate in a unified market, with import shares emerging endogenously based on geographical distance between agents. Additionally, the model includes labor hoarding by firms and a banking sector that exhibits Minskyan characteristics. The model successfully reproduces the scenario of low unemployment rates in the Northern region, alongside declining unemployment in the Southern region and trade imbalances favoring the North. Catullo et al. (2022) suggest an AB-SFC model to explore how varying levels of sophistication

in an agent's behavioral rules can influence both individual and macroeconomic outcomes. Specifically, this study examines the impact of incorporating firms into an agent-based macro model that can generate effective sales forecasts using simple machine learning algorithms. These algorithms, particularly genetic algorithms, produce predictions that are generally unbiased and reasonably accurate. The findings indicate that while machine learning enables firms to boost profits, it also leads to a reduced wage share and lower long-term growth. Additionally, these predictive methods can maintain unbiased expectations in the absence of major shocks, offering firms forecasting capabilities that align somewhat with the Lucas Critique.

Grabner-Radkowsch et al. (2022) use an AB-SFC model of a closed economy without technological progress to explore how rising saving rates affect the accumulation and distribution of private financial wealth and public debt. The model incorporates various household classes, status consumption, and a Minskyan banking sector. The findings support Keynes' assertion that increased saving does not necessarily lead to higher investment. This can result in persistent government deficits or high unemployment if the government does not accommodate these deficits. These outcomes arise endogenously from the interactions of decentralized agents. Additionally, the model suggests that boosting consumer credit provides only temporary relief to these issues. Reale (2024) examines modern payment systems by focusing on banks' maturity mismatch practices and their impact on financial stability when banks refuse to roll over short-term interbank liabilities. Using an agent-based stock-flow consistent model, it explores how maturity targets influenced by the Net Stable Funding Ratio affect interbank market dynamics and the effectiveness of monetary policy. The results show that mismatches between deficit and surplus banks undermine market efficiency, increase reliance on central bank facilities, and reduce the effectiveness of interest rate policies. The study also identifies a dual stability structure in the banking sector, similar to the segmented European interbank market. It suggests that maturity mismatches in the balance sheets of banks could lead to asymmetric funding frictions, which might contribute to interbank tensions beyond credit and sovereign risk factors. Finally, the paper highlights the importance of combining macroprudential tools with interbank dynamics to better understand regulatory impacts on banking sector stability.

Sraffian super-multiplier models are a class of economic models that are grounded in post-Keynesian theories to explore how autonomous spending drives overall economic growth. These models concentrate on the idea that an increase in autonomous expenditure, such as government spending and consumption out of wealth, can lead to a more than proportional increase in output and income through a process of cumulative causation. Unlike traditional models, super-multiplier models emphasize the role of autonomous spending in driving economic activity rather than relying on traditional notions of equilibrium or capacity constraints. They often highlight how changes in autonomous expenditure can affect the broader economy, including its growth and stability. However, these models are based on relatively simplistic economic assumptions and mainly focus on flow aspects, neglecting the financial factors influencing autonomous expenditures. As a result, the output growth rate eventually aligns with the externally determined growth rate of “non-capacity creating” autonomous expenditures, and the utilization rate returns to its normal level. Consequently, the paradoxes of thrift and costs are applicable only as level effects related to average growth rates.

In the literature, scholars construct the Sraffian super-multiplier model within the SFC framework. For instance, Brochier and Silva (2019) examine whether the main conclusions of super-multiplier models hold in a complex SFC model. In the model, private business investment is fully driven by income, while the component of autonomous expenditure, specifically consumption out of wealth, becomes endogenous. The numerical simulations indicate that the paradox of thrift can persist in terms of growth effects, and a lower profit share may correspond with a higher accumulation rate, albeit with a reduced profit rate. Mandarino et al. (2020) propose a super-multiplier SFC model, including economic growth led by debt-financed consumption of labors. The simulation results confirm that an increase in labor’s credit-financed consumption initially raises their debt but leads to a decline in indebtedness in the long run, regardless of their initial financial status or the relative sizes of certain economic parameters. Interest rate shocks have ambiguous effects on economic activity, influenced by labor’s and rentiers’ consumption propensities and their debt levels. The primary contribution of the model is its exploration of how investment and consumption can be financed within super-multiplier models, highlighting the importance of understanding firms’ financing

decisions and the role of passive banks. They consider that their model will serve as a useful framework for other researchers who adopt different perspectives on these issues and impose different closures. Teixeira and Petrini (2023) develop a fully specified, parsimonious super-multiplier model within a SFC framework. The model includes two types of non-capacity-creating autonomous expenditures: residential investment and capitalist consumption. It represents a closed economy without a government sector and features two types of households: workers and capitalists, with only the latter being free from credit constraints. It incorporates two real assets: firms' productive capital and households' real estate. In this setup, the growth rate of residential investment adjusts in response to changes in house price inflation, while capitalist consumption is funded through financial wealth. The simulation results are consistent with the core findings of the traditional Sraffian super-multiplier growth model. An increase in the growth rate of residential investment specifically results in a decreased proportion of real estate within total real assets. The simulations also reproduce key economic patterns, including the role of residential investment in driving the business cycle and capital accumulation.

The theory of monetary circuit (henceforth 'TMC') was developed by continental Keynesians such as Augusto Graziani and Alain Parguez. Some researchers constructed the SFC model using the TMC. For instance, Sawyer and Passarella (2017) investigate how the TMC can be adapted to incorporate key aspects of the financial system's evolution over the past thirty years, a period often referred to as financialization. To achieve this, they integrate Graziani's foundational single-period monetary circuit framework into a more complex set of institutional arrangements, utilizing the SFC modeling approach developed by Godley and Lavoie to support the analysis. The paper suggests that financialization has likely contributed to worsening income distribution and increased household indebtedness, particularly among working-class households. The transformation of household loans into financial products by intermediaries, along with the class divide in access to bank credit, are identified as key drivers of these trends. While the model has limitations due to its simplicity, this feature enables it to clearly illustrate basic causal relationships between financial and macroeconomic variables, providing a foundation for future theoretical developments.

There are a lot of researchers who emphasize the similarities and differences between SFC models and TMC. Cottin et al. (2022) highlight the similarities between SFC modeling and TMC models, but they differ significantly in how they handle the reflux phase, where bank-issued credits are repaid. This phase is a fundamental aspect of MCT models but is typically not explicitly addressed in SFC models. The authors propose an SFC model where bank loans issued at the start of a period are explicitly repaid at the end. The repayment of long-term bank loans, which finance investments, would then act as a leakage from the monetary circuit, influencing aggregate demand and the model's dynamics. They demonstrate that considering these repayments could have a lasting impact on corporate profits, corporate debt levels, and production growth. This finding suggests that incorporating the reflux phase, inspired by MCT, into SFC models could offer valuable insights. Berr and Monvoisin (2023) state that the core principles of SFC models are closely tied to the TMC, heavily influenced by Alain Parguez. TMC, developed in France, was significantly shaped by national accounting practices, including the categorization of agents, tracking of economic and financial flows, and the hierarchy of these transactions. These elements are also central to the structure of SFC models. Additionally, the SFC model's emphasis on money creation being linked to production rather than investment reflects TMC's strong stance on this issue. The primary focus of SFC models on distinguishing between flows and stocks is also rooted in TMC, which emphasizes the connections between money, production, and the overall economy. Although SFC modeling continues to advance and explore new dimensions, its foundational concepts are derived from the older macroeconomic analysis of the circuit, with the questions and solutions proposed by Parguez and the Circuitists remaining pertinent today.

Passarella (2022) provides new insights into the integration between SFC modeling and the TMC. The article also aims to clarify several common misconceptions about TMC. It argues that a market-clearing price mechanism does not necessarily imply a neoclassical closure of the model and that the definitions of bank loans in SFC models and TMC are compatible despite being based on different accounting periods. The paper further contends that consumer credit should be considered final finance rather than initial finance and that the so-called paradox of profit is not a logical dilemma but an abstract

counterfactual that emphasizes an often-overlooked role of government spending. Finally, TMC can be seen as a "Marxian" interpretation of Keynes's method of aggregates.

In some studies, scholars develop SFC models enhanced by input-output structure. For example, Passarella (2023) introduces a straightforward yet comprehensive input-output SFC model of a monetary production economy. In this model, credit money is endogenously created by commercial banks, the production sector is divided into various industries, and unit prices converge to their reproduction values in the long run, while supplies gradually adjust to meet the final demands for products. Next, after detailing the model's key characteristics, it is employed to examine the effects of technical change on the financial needs and profitability of specific industries. Di Domenico et al. (2023) present a SFC model including input-output structure to examine the relationship between the rate of interest and the public debt-to-GDP ratio. They focus on how changes in the central bank's interest rate influence the economy's capital intensity and, consequently, debt ratios. The findings indicate that the effect of a higher interest rate on the public debt-to-GDP ratio depends on how the rate change affects capital intensity through shifts in relative prices. They also reveal that beyond a certain threshold, increasing the base rate can lead to reverse capital deepening, where higher interest rates raise the public debt-to-GDP ratio by reducing capital intensity.

One specific example of theoretical integration belongs to the article of Jackson et al. (2023). They extend the FALSTAFF model, developed by Jackson and Victor (2015), to explore Baumol's Cost Disease within a SFC framework, focusing on sectors with differential labor productivity rates. The article introduces an input-output structure and a relative pricing mechanism to simulate interactions between fast and slow sectors. The extended model is used to demonstrate Baumol's effect, simulate a shift toward a service-based economy, and explore innovations relevant to a post-growth transition. The paper concludes by discussing the model's limitations and potential for future research.

3.2.2 Methodological examinations

The SFC approach expands rapidly. However, there are few contributions that focus on the methodology for constructing an empirical SFC model. Most studies tend to

incorporate national accounting data into a theoretical framework inspired by Godley and Lavoie (2006), though with varying levels of complexity. Some scholars concentrate on methodological advancements and suggest some methodological variations and implementations in SFC models. For instance, Zezza and Zezza (2019) argue that the structure of an empirical SFC model should be based on a thorough analysis of a country's specific sectoral balance sheets and flow-of-funds data, tailored to the particular research question being addressed. They demonstrate their emphasis with examples from Greece and Italy and offer suggestions for how to effectively use the financial and non-financial accounts of institutional sectors, highlighting the connection between SFC accounting structures and national accounting standards. Richters and Glötzl (2020) suggest a differential-algebraic equality framework for implementing constrained dynamics in monetary SFC models. In this approach, agents influence variables based on their objectives, such as gradually enhancing their utility. The parameter 'economic power' reflects their capacity to pursue their interests. Similar to Lagrangian mechanics, system constraints derived from accounting identities introduce additional constraint forces, which can lead to unintended dynamics. They demonstrate this method by using a basic SFC model and highlight its underlying assumptions regarding power dynamics and agents' preferences. Zezza and Zezza (2023) propose a prototype regional SFC model. To explore how a regional system with current account imbalances adjusts, the framework from Godley and Lavoie (2006) is adapted for two regions sharing the same monetary, fiscal, and exchange rate policies. This model is calibrated for Italian data with the introduction of a fragmented labor market. It captures crucial aspects of the Italian economy and highlights the interplay between financial and real markets in regional economies.

SFC models have not adequately addressed how households form expectations about future income flows in their macroeconomic simulations. Although most SFC models employ some form of adaptive expectations, the existing literature has yet to provide clear guidelines on how to effectively model these expected variables in general and specifically for income flows in consumption decisions. Consequently, there has been insufficient attention to how expectations influence the trajectory of variables and the steady-state composition of stocks. Kappes and Milan (2020) examine various

approaches to modeling income expectations and show that even minor differences in expectation modeling can significantly impact macroeconomic outcomes, particularly regarding transition dynamics and steady-state wealth composition. Meijers et al. (2023) also explore this issue, evaluating how SFC models respond to different types of expectations. They argue that expectations play a crucial role in determining the economy's response to shocks, as economic stability hinges on the nature of these expectations. Their findings indicate that backward-looking expectations tend to stabilize the economy, while forward-looking expectations can lead to instability. They conclude that the type of expectations incorporated into an SFC model significantly affects both the model's stability and its adjustment speed to shocks.

Zezza and Zezza (2022) present a quarterly structural SFC model of the Italian economy, addressing missing links between the real and financial sectors. Their model, which integrates SFC methodology with traditional structural models that incorporate microfoundations and rational expectations, offers an advancement over simpler models previously used by various researchers like Wynne Godley and Marc Lavoie. This approach addresses the shortcomings of earlier models that failed to anticipate the Great Recession. The model's strengths stem from its ability to maintain accounting consistency and adaptation to policy changes, such as the ECB's quantitative easing programs. However, it faces challenges with portfolio management, which will be explored in future research along with comparisons to simpler models. Due to the impact of the COVID-19 pandemic on economic data availability, detailed policy experiments will be postponed until sufficient data is obtainable.

Carnevali et al. (2020) evaluate the Marshall-Lerner condition, deriving the general equilibrium condition for the terms of trade in a two-country SFC model. They reveal that the Marshall-Lerner condition is merely a specific case of this broader condition, assuming full exchange rate pass-through to import prices. Contrary to its typical interpretation, the Marshall-Lerner condition does not serve as a useful approximation of the general condition. When applied in a dynamic SFC model, the assumption of full pass-through actually has destabilizing effects rather than stabilizing ones. More broadly, the extent of pass-through affects the economy's adjustment speed to equilibrium: higher pass-through results in slower adjustments, while lower pass-through leads to quicker

adjustments. This implies that the speed of adjustment is positively related to the strategic behavior of exporters, who aim to maintain their market share by keeping their foreign currency-denominated prices stable. Furthermore, Carnevali (2021) integrates two-country SFC model with the Verdoorn-Kaldor law, which suggests a positive relationship between output growth and productivity growth. The model illustrates how endogenous productivity can amplify economic shocks and highlights the limitations of relying solely on the buffer effect of flexible exchange rates for adjustment. Additionally, it presents a case for the importance of fiscal policy in both flexible and fixed exchange rate regimes and questions the long-term viability of austerity measures designed to achieve external balance.

Much research often treats the exchange rates as exogenous, which limits the analysis of how global financial cycles affect economies and how domestic economic policies influence the external sector and macro-financial stability. To overcome these limitations, Valdecantos (2022) introduces a quarterly empirical SFC model for Argentina that incorporates an endogenous exchange rate. The model integrates a range of economic policy tools that have historically impacted exchange rate stability and, by extension, the broader economy. The findings indicate that this model's approach could be beneficial for developing similar models for other peripheral countries, where the nominal exchange rate results from the interplay between domestic and global economic processes.

Specifically, some studies suggest different assumptions. For instance, Cottin-Euziol and Piluso (2023) focus on the bank's loan repayments used for business investment, while most works assume instead that these investments are funded by perpetual loans or continuous turnover. They challenge this assumption by developing a model based on recent research, where nonfinancial corporations repay a portion of their previous debt in each period. They then explore the dynamics of this revised model. Their findings show that incorporating loan repayments significantly alters the model's dynamics.

Finally, De la Luz-Tovar (2022) aims to provide a pedagogical introduction to the Godley-Lavoie approach for constructing a post-Keynesian SFC model, finding its solution, and conducting simulations using the software. He offers readers a clear and accessible explanation of the procedures used by experts and promotes a heterodox

macroeconomic approach among students and researchers. Finally, he demonstrates that accounting-based models offer a more precise method for examining economic realities and serve as a valuable alternative for simulating the interaction between real and financial markets.

3.2.3 Financial and business cycles

The SFC models allow the evaluation of financial and business cycles, including various policy analyses to investigate financial and real crises. Capital flows are a crucial factor that contributes to financial risks. Raza et al. (2019) employ an SFC model, drawing on the experience of the Icelandic Crisis, to explain how capital inflows contribute to economic booms and busts in a small open economy with a sovereign currency. They highlight the destabilizing impact of capital inflows on the economy, particularly when a sudden stop occurs. The authors also explore the use of capital controls as a policy response to crises triggered by sudden stops. Finally, they discuss the policy implications of their findings for addressing the destabilizing effects of financial flows in a small economy. On the other hand, Makrelov et al. (2021) examine the effects of capital flow reversals on the South African economy, particularly in the context of its well-developed financial sector and high dependence on capital flows. During the Covid-19 crisis, South Africa experienced significant capital outflows, which led to a sharp depreciation of the rand and increased bond yields. Using a SFC model, the study explores how such shocks impact the economy. The study concludes that even without substantial foreign currency-denominated debt, a capital flow reversal can have profound effects. A reduction in capital flows diminishes domestic liquidity and leads to higher domestic savings. This is perceived as an increase in financial risk, which forces the financial sector to accumulate higher reserves and reduce loan supply. These suppress economic activity, and the impact can be even more severe if there is a shift in household expectations, exacerbating economic volatility. The findings also emphasize the post-1994 growth and sophistication of South Africa's financial sector, which has heightened its capacity to amplify economic shocks.

In the post-Keynesian literature, the “Financial Instability Hypothesis” developed by Hyman Minsky (1982) is crucial to explain the emergence of the financial crisis. According to the *Hypothesis*, the financial fragility of corporations is expected to rise endogenously with the macroeconomic leverage ratio over the economic cycle. However, this hypothesis faces criticism for not adequately accounting for the pro-cyclicality of aggregate profits and for potentially misleading conclusions drawn from overly aggregated analyses of leverage and systemic fragility. Pedrosa and Land (2018) develop an AB-SFC model to evaluate these issues. Their calibrated and simulated model aligns with empirical data at both the micro and macro levels. By creating a financial fragility index, they explore how systemic fragility relates to aggregate leverage throughout the cycle. The results reveal both Minskian regimes, where aggregate leverage increases with investment, and Steindlian regimes, where investment reduces leverage. The findings indicate that the relationship between financial fragility and aggregate leverage is less pronounced than previously thought, and that the distribution of profits among firms significantly affects system stability, both immediately and over time due to leverage dynamics.

The eruption of the euro area crisis has raised concerns about the fairness, sustainability, and viability of the current framework of the European Monetary Union (EMU). Mazier and Valdecantos (2019) employ a four-country SFC model to explore how adapting Keynes's plan for a clearing union with *bancor* balances to Europe could help mitigate the imbalances that contributed to the eurozone crisis. Their simulation experiments indicate that implementing Keynes's ideas could lead to a stronger and more sustainable growth cycle for European countries. However, such a brighter future requires the political will to either reduce structural heterogeneity within the euro area through supply-side policies that support the productive development of southern countries or to permit exchange-rate adjustments when external imbalances become unsustainable.

Byrialsen and Raza (2020) investigate a large-scale SFC model that calibrated with data from 1998 to 2016 to evaluate the macroeconomic stability of Denmark in light of high household debt. Simulation results compare a baseline scenario with the effects of two economic shocks: a drop in house prices and a rise in interest rates. Both are found to negatively impact the economy. While private domestic demand is highly sensitive to

these shocks, overall output remains relatively stable, largely due to a strong current account surplus. The study concludes that, in the absence of global shocks, domestic economic shocks are unlikely to significantly threaten Denmark's macroeconomic stability, particularly in terms of output growth and unemployment.

Understanding the connection between financial and business cycles hinges on the interactions among housing prices, credit volume, and real GDP. To explore these dynamics, Byrialsen et al. (2022) subsequently use an empirical SFC model for the Danish economy, specifically to analyze the cycles initiated by capital gains in the housing market. The results demonstrate that housing prices play a significant role in driving financial and business cycles. Regulating the housing market can mitigate their impacts, helping the economy recover more effectively after a negative shock. Stricter macroprudential policies would also reduce the risk of housing bubbles by curbing household debt and bank lending. Although specific economic conditions vary, the findings align with the international experience of housing bubbles in the US, Greece, Spain, and Ireland. Interestingly, despite rising house prices, household demand for credit has stagnated since the financial crisis.

Canelli et al. (2024) evaluate the impacts of the energy crisis in 2022 on the Italian economy using the medium-scale SFC model. They employ a rigorous accounting framework to capture the impact of rising energy costs and the resulting feedback on both real and financial variables, while also evaluating potential policy responses available to the EU and Italian authorities. The key conclusion is that the Italian economy faces a precarious situation. A soft landing could result in low inflation but would also lead to modest growth and dreadful public finances, potentially triggering punitive EU measures. Conversely, hard landing scenarios might control inflation or align the government deficit with EU rules, but at the cost of a severe recession and a significant increase in the government debt-to-GDP ratio.

Lastly, Gallo and Serra (2024) develop a SFC model, incorporating Kalecki-Steindly-Minsky features by including inventories, as well as firms' deposits and debt financing, into the investment function. They examine how investment decisions influence aggregate fluctuations over the business cycle. Business cycle dynamics are analyzed

under the assumption of a deterministic steady growth path, reflecting recent advances in heterodox growth theory. Simulations calibrated for the US economy demonstrate the inventory dynamics play a crucial role in economic cycles. Specifically, inventory investment affects shock propagation, wavelength, deviation magnitude, and convergence time. It also influences whether the economy experiences oscillations or steady convergence to the long-term trend and accommodates rapid changes in aggregate demand, though it does not generate a multiplier effect.

3.2.4 Climate change studies

The studies on climate change cover an important area in SFC modeling. In the literature, there is a substantial portion of the climate change works using SFC modeling. For instance, Bovari et al. (2018) introduce a macroeconomic model that integrates the economic effect of climate change with the critical role of private debt, using a SFC methodology grounded in Lotka-Volterra dynamics. The model links nonlinear monetary dynamics related to underemployment and income distribution with climate abatement costs. By calibrating the model to the global economy, they simulate scenarios. The findings show that achieving the +2 °C target is unlikely without negative emission. The long-term effects of climate change on economics could lead to severe economic outcomes, endangering financial instability. However, adopting an appropriate carbon pricing trajectory, along with policies that increase wage share, promote employment, and reduce private debt, can help to prevent undesired economic tightening and support the attainment of a 2.5 °C target.

Ponta et al. (2018) examine the economic impacts of a feed-in tariff policy designed to promote investments in renewable energy production. They construct an enhanced version of the agent-based Eurace macroeconomic model, which encompasses both fossil-fuel and renewable energy power producers. The study analyzes how these producers make pricing and capacity investment decisions influenced by fossil fuel prices and government feed-in tariffs. The findings demonstrate that the feed-in tariff policy effectively supports the transition to a sustainable energy sector and boosts investment levels, leading to lower unemployment rates. Furthermore, the policy does not burden

government finance, which improves due to better economic conditions. However, at higher policy intensities, the increased share of GDP allocated to the investment sector, driven by renewable capacity expansion, leads to reduced consumption, higher interest rates, and inflation. The overall impact on household well-being depends on how much the importance of sustainable economic and ecological growth is valued.

Jackson and Victor (2020) develop a SFC model for Canada to explore three potential future scenarios over a fifty-year period starting from 2017. The base scenario continues current trends, while a carbon reduction scenario implements measures specifically aimed at reducing carbon emissions. The sustainable prosperity scenario includes additional steps to enhance environmental sustainability and improve social and financial conditions. The study employs two composite indicators: an environmental burden index, measuring the model's environmental performance, and a sustainable prosperity index, which aggregates seven economic, social, and environmental performance metrics. Contrary to expectations, the findings indicate that the carbon reduction scenario might progress more slowly than the base scenario. However, the sustainable prosperity scenario shows that it is possible to achieve better environmental and social outcomes even if economic growth slows to zero.

Dunz et al. (2020) explores the impact of green fiscal and monetary policies on promoting a low-carbon transition, focusing on the uncertainty surrounding their implementation. A key gap in knowledge lies in understanding how investors' expectations of these policies influence economic competitiveness and financial stability. They examine two climate policies: the announcement of a carbon tax and green sovereign bonds, investigating how banks' anticipation or lack thereof could either promote or hinder low-carbon investments and influence asset valuations and portfolio performance. Employing an Eirin-SFC model, they show that investor anticipation of climate policies encourages low-carbon investments and improves bank balance sheets. However, green sovereign bonds have a more substantial positive impact than a carbon tax, which tends to negatively affect firms' capital accumulation and labor wages. The findings enhance the discussion on the role of financial regulation and sustainable finance in the European Sustainable Finance agenda.

For a successful green transition, policies like a global Carbon Tax (CT) and the Green Supporting Factor (GSF) in banking have been proposed, yet two key uncertainties persist. It's unclear how these measures will either promote green investments or introduce new risks to macroeconomic and financial stability. Additionally, the influence of banks' climate sentiments—anticipations of climate policy impacts on lending—remains uncertain. To address these issues, Dunz et al. (2021) develop a SFC model for a high-income country, incorporating banks' adaptive climate sentiment forecasting. The findings indicate that while the GSF boosts green investments in the short term, it also poses risks to financial stability. To avoid negative impacts on non-performing loans and household budgets, the CT should be accompanied by redistribution policies. Moreover, if banks adjust credit conditions based on firms' carbon profiles ahead of policy changes, they can help to align investments with low-carbon transition and enhance the financial stability of the banking sector.

Carnevali et al. (2021) construct an ecological SFC model to analyze how cross-area financial flows impact financial stability, economy, society, and the environment. The findings point out several key issues: Increased demand for safe financial assets brought about by uncertainty regarding climate change can influence economic growth and financial stability if it leads to higher idle balances. The search for green financial assets can worsen climate change if capital flows are unrestricted and exchange rates fluctuate, responding to financial flows. Green consumption influences the current account and government budgets in less ecologically efficient regions. If the government in these regions cuts green spending in response, the overall impact on regional output depends on the import sensitivity to such spending. Additionally, without strong coordination, green innovation policies may have negative side effects on other areas, and ecological gains may be offset by higher economic growth (rebound effect). Effective green policies require international coordination or selective capital controls to manage external imbalances and financial instability while promoting a low-carbon transition and reducing inequality.

Bendixen (2022) examines the macroeconomic and financial impacts of a green asset boom using a theoretical SFC model. The boom is driven by households reallocating their wealth towards green equity, fueled by enthusiasm for green returns. The analysis is

grounded in Minsky's financial instability hypothesis, which is used to model the overvaluation of green equity and how this overvaluation contributes to increased financial fragility. He simulates using different values for the responsiveness of investment to Tobin's q and the responsiveness of consumption to wealth. The sensitivity analysis reveals that a strong Tobin's q effect is necessary for the build-up of a green asset boom. When the propensity to consume out of wealth is high, it leads to a contractionary outcome. The article also discusses how these simulation results align with other research and established facts.

Xing et al. (2022) analyze the impact of a carbon tax on the transition to a low-carbon economy, employing a SFC model with a focus on commercial banks. The theoretical analysis reveals that a carbon tax's effectiveness in reducing emissions is enhanced by commercial banks through increased financing of green investments. The extent of this effect is affected by the bank's ability to issue green credits. The findings provide valuable insights into the role of carbon tax in conjunction with bank-centered financial policies, highlighting how commercial banking practices can support or alter the outcomes of carbon taxation. Subsequently, Xing et al. (2024) examine how green differentiated banking requirements impact credit creation by banks, highlighting the need for prudential regulations to foster low-carbon transitions. By integrating green supporting factors into the key prudential frameworks, such as the risk-based capital adequacy ratio, and the net stable funding ratio, they theoretically evaluate their constraining effects. Employing an AB-SFC model, they indicate that these green supporting factors have effects on credit creation based on the banks' balance sheet structures, particularly equity-to-reserve ratios. To effectively promote green credit issuance and support a low-carbon transition, different combinations of green supporting factors are necessary. Additionally, the findings offer insight into how financial regulators can encourage green economic transition through the banking sector.

Furthermore, Xing et al. (2024) examine how climate policies like carbon taxes and green finance initiatives interact and influence the transition to a low-carbon economy, using a SFC model. The study highlights the critical role of commercial banks in credit creation and explores how these policies, particularly when combined, can positively influence low-carbon transitions. The findings suggest that while both policies contribute to

reducing carbon emissions, combining green credit incentives with a carbon tax amplifies the positive impact. However, the transition could elevate financial risks for banks as firms' debt-equity ratio rises. The study also demonstrates that subsidies for green loans can accelerate the transition, improving social welfare and facilitating debt rollover, thereby highlighting the importance of active government intervention to optimize policy outcomes. The framework presented offers valuable insights into managing policy interactions for an effective low-carbon transition.

Jacques et al. (2023) develop a biophysical SFC model calibrated at a global scale, integrating detailed estimates of the high capital intensity of renewable energies and the declining energy return on investment (EROI) of fossil fuels. The results show that achieving a global energy transition consistent with the Paris Agreement's 1.5 °C target would result in a reduced energy return on investment and lead to significant increases in investment, employment, and inflation. Additionally, the results suggest that a slower growth rate could facilitate the transition, highlighting the need for further research on post-growth scenarios.

Espagne and Nguyen (2024) develop an empirical SFC model to evaluate the effects of climate change on the Vietnamese economy. The findings show that the Vietnamese economy might struggle to meet its goal of around 7% annual GDP growth between 2021 and 2030, which is crucial for becoming an industrialized nation by 2045. This situation highlights the need for the Vietnamese economy to enhance its climate change adaptation strategy to strengthen resilience, reduce potential negative impacts, and achieve its development objectives.

Yan et al. (2024) propose the SERENE model, which integrates the SFC model in post-Keynesian economics (e.g., Godley and Lavoie, 2006; Lavoie, 2022; Caverzasi and Godin, 2015) with the substantive advancements of the EIRIN flow of funds behavioral model (Monasterolo and Raberto, 2018). They simulate and calibrate the Chinese economy by considering several factors such as pension systems, public expectations, long-term risk, policies, and environmental constraints. The findings point out the non-linear amplification of losses caused by compound risks, which can reduce economic resilience. Furthermore, three green transition policies show differing levels of

effectiveness in guiding the economy through long-term risk scenarios. It also observed that encouraging green investment via pension funds can advance the green transition both in scope and depth, while simultaneously mitigating poverty and addressing income and distribution inequalities.

Reissl et al. (2024) present an enhanced version of the Dystopian Schumpeter meeting Keynes (DSK) model (Dosi et al. 2010, 2017) by integrating it with an agent-based SFC methodology. This upgrade allows for precise tracking of balance sheet items and financial flows, improving the analysis of climate change and policy impacts on financial stability and balance sheet dynamics. The new combined framework supports future developments, including dynamic credit networks, multi-period loans, and a more detailed household sector. Expanding the energy sector to cover a wider range of technologies is also a key focus for future work.

Finally, Carnevali et al. (2024) develop a formal model that captures the key interactions between the economy, the financial sector, the ecosystem, and society. Their research is grounded in four theoretical bases: recent advancements in ecological macroeconomics, the Schumpeterian framework of evolutionary economics highlighting the entrepreneurial role of the state, the SFC modeling approach, and the Sraffian super-multiplier approach. They evaluate the impacts of various fiscal policies and find that mission-oriented innovation policies are, in principle, the most effective way in promoting innovation and growth while decreasing income inequality. However, without a ‘green’ and progressive taxation system, these policies are unlikely to reverse the current trend in atmospheric temperature.

3.2.5 The COVID19 pandemic

Employing SFC modeling, the effects of the COVID-19 pandemic are investigated. The health and economic crises of 2020–21 have reignited the debate over the use of fiscal policy as a key tool for stabilization and achieving long-term objectives. The significant rise in unemployment due to COVID-19 related lockdowns has led to increased interest in policies that directly target employment, rather than relying on general demand stimulation. One such proposal under discussion is the job guarantee, where the

government would serve as the employer of last resort, offering jobs to all individuals who are willing and able to work but cannot secure employment in the private sector. Yajima (2021) argues that a well-designed program of direct employment and public services by the state, catering to both low- and high-skill workers, can have permanent impacts and drive structural economic transformation, particularly by promoting energy transition and reducing carbon emissions. To explore this, Yajima employs SFC modeling and examines the long-term effects of implementing a job guarantee.

The Vietnamese government implemented monetary and fiscal policies to mitigate the economic damage of COVID-19 and foster recovery. Nguyen et al. (2023) examines the implications of such interventions on both the real and financial sectors of the Vietnamese economy using an empirical SFC model. The findings suggest that while stimulus packages can be effective in the short term despite increasing public debt, long-term fiscal sustainability will require a shift towards enhancing government revenues through taxation and prudent spending policies to ensure resilient and inclusive growth. Khandoker and Juniper (2022) introduce a SFC model to understand the root causes of macroeconomic and financial instability, particularly in the context of the 2007-2008 Global Financial Crisis and the COVID-19 pandemic. They use US statistics to calibrate the model. The findings demonstrate that a decline in the wage share of national income has weakened financial and macroeconomic stability in the U.S., aligning with observations from the COVID-19-induced economic crisis.

Lastly, Raza et al. (2023) build a SFC model of the Danish economy, using sectoral data and replicating inflationary conditions experienced by Denmark and other countries following the COVID-19 crisis. By considering monetary tightening as a necessary response for a small open economy with a fixed exchange rate, they examine various policies that might mitigate inflationary impacts within the existing institutional and legal framework. The findings indicate that closely coordinating fiscal and income policies can alleviate the impact of adverse shocks on income without exacerbating inflation. Additionally, they point out that among all the policies assessed, monetary policy significantly affects public debt sustainability

3.2.6 Studies related to distribution, inequality, and conflict

Kim and Lavoie (2016) developed a generalized two-sector Kaleckian growth model to examine long-term dynamics. Using a SFC framework, they integrate labor and firm income distribution conflict and endogenous labor-saving technological advances. The simulation results demonstrate that both the paradox of thrift and the paradox of cost hold, implying that lower saving rates lead to higher growth, while higher real wages boost profit rates. However, the magnitude of the effect varies based on initial income distribution and monetary policy. Additionally, shifts in autonomous labor-saving innovations may account for the New Economy phenomenon of the late 1990s within this alternative model. The simulations of the two-sector model align with findings from a one-sector Kaleckian model but incorporate path dependence.

Dafermos and Papatheodorou (2018) investigate the impact of monetary policy on income and wealth inequality using an AB-SFC model. The model examines the behavior and financial positions of heterogeneous households within a dynamic framework, where the financial decisions of firms and banks influence distribution. The household balance sheet structure is calibrated, benefiting from the micro dataset of the Survey of Consumer Finances. The study focuses on four distribution channels of monetary policy: the interest-earning channel, the macroeconomic activity channel, the portfolio reallocation channel, and the indebtedness channel. The findings suggest that the distributional effects of monetary policy are influenced by various behavioral and institutional factors, such as investment sensitivity to profitability, wage responsiveness to unemployment, household emulation motives, banks' credit provision behavior, and the sensitivity of consumption propensity to interest rate changes. Understanding these factors is crucial to determining whether a monetary policy shock will have a significant impact on inequality.

Using a SFC model, Detzer (2018) illustrates how increasing inequality impacts growth differently depending on a country's institutional structure and regulatory framework, thereby explaining the emergence of these two growth regimes: debt-led private-demand booms and export-led mercantilist economies. The former depends primarily on credit-financed household consumption to counteract insufficient demand caused by financialization, while the latter relies on net exports to drive aggregate demand. The

main finding of this study is that increasing income inequality in financialized economies affects growth differently depending on the economic regime. More specifically, in debt-led private-demand boom countries, rising inequality leads to higher household debt and consumption, boosting growth but increasing financial instability and trade deficits. In contrast, export-led mercantilist economies see improved trade balances with higher inequality, as it reduces domestic consumption. The study also shows that financial constraints can moderate the effects of inequality, potentially shifting economies from a debt-led to an export-led growth model.

Carnevali et al. (2024) developed a full-fledged SFC model to examine income and wealth distribution in an open economy. They argue that exchange rates and the stock of foreign debt are crucial factors, playing a significant role in rising inequality both between and within countries. By applying the relative income hypothesis, this paper demonstrates how debt-financed consumption by low-income households can influence overall income and the disposable income of high-income households over the medium term. Moreover, the findings suggest that while increased inequality harms the domestic economy, it may benefit trading partners.

3.2.7 Effects of monetary and fiscal policies

Since the Great Recession, central banks have expanded their traditional policy of setting short-term interest rates by implementing large-scale asset purchases to boost credit and stimulate demand. These new attempts have sparked mixed reactions among economists: some praise quantitative easing for its ability to spur economic growth, while others warn that it could lead to asset overvaluation, economic instability, and financial bubbles. To explore these concerns, Haas and Young-Taft (2017) develop a SFC model using a framework designed by Godley and Lavoie (2006), adding equations for quantitative easing and endogenous bubbles. They examine the connection between quantitative easing assets and overvaluation, questioning overall economic performance. The findings indicate that quantitative easing may function more as a phase shift over time, rather than being strictly pro- or countercyclical.

Meijers, Muysken and Sleijpen present an open economy SFC macroeconomic model for the Dutch economy. The model has been applied to analyze various characteristics of the Dutch economy, such as the deposit financing gap (Meijers, Muysken and Sleipen, 2015), the excessive trade surplus, firms' accumulation of financial assets (Meijers, Muysken and Sleipen, 2016), and the effects of quantitative easing (Meijers and Muysken, 2016). However, the stylized facts were gathered in an ad hoc manner, and the model's parameters were sourced from international literature without specific reference to Dutch data.

Subsequently, Muysken et al. (2017) suggest a new SFC model for the Dutch economy from 1995 to 2015, aiming to promote further SFC research using actual data and to deepen the understanding of the Dutch economy. The dataset primarily relies on the Central Bureau of Statistics (CBS) data, consistent with AMECO data from Eurostat, but also incorporates data from the Dutch Central Bank (DNB) for the financial sector, where CBS data is incomplete. This study differentiates households, firms, government, the foreign sector, and within the financial sector, distinguishes between the central bank, banks, and pension funds. For each sector, simplified balance sheets and consistent flows are provided, which can be used in the SFC model.

Laina (2019) introduces a SFC model focused on full-reserve banking and examines the impacts of government spending on money creation. The study compares these impacts to scenarios where government spending is increased under full-reserve banking without money creation and the current endogenous money system. The findings show that output, employment, and inflation behave similarly across these scenarios. However, in a full-reserve banking system, money creation leads to a permanent decrease in consolidated government debt, and monetary policy is more effective as increases in central bank reserves translate nearly directly into demand deposits. Moreover, large changes in the money supply extraordinarily result in only minor and gradual shifts in interest rates. Additionally, the paper explores alternative methods of money creation through tax cuts, citizen dividends, or quantitative easing, finding that tax cuts and dividends produce similar effects on the economy as government spending, whereas quantitative easing mainly impacts monetary aggregates and interest rates without significant effects on the real economy. Although banks can meet loan demands,

temporary credit crunches may still occur under full-reserve banking, influenced by private behavior, economic policies, and banks' safety margins.

Oreiro and Santos (2020) develop a SFC growth model, incorporating real-world fiscal and monetary policies. Specifically, the model features an Inflation Targeting Regime for monetary policy, prohibits direct money financing of government deficits by law, and uses government-issued interest rate-indexed bonds for fiscal deficit financing. It investigates the impact of a one-time increase in government spending on various economic variables, including the investment-to-GDP ratio, profit share, capacity utilization, the spread between long-term and short-term interest rates, and inflation. Simulation results indicate that a permanent rise in government spending leads to a sustained decrease in the investment-to-GDP ratio, an increase in the interest rate spread, a drop in capacity utilization, and a rise in profit share, with no long-term effect on inflation dynamics.

Canelli et al. (2021) develop a SFC model for the Campania region, utilizing economic and financial data from 1995 to 2018. This model introduces a method to balance the private sector's financial account in the absence of complete financial data. Through medium-term Economic Policy Scenario Analysis, they demonstrate that a debt-financed fiscal expansion leads to permanent positive impacts on growth, with an impact multiplier exceeding one and a medium-term multiplier of 0.71. Conversely, applying a balanced-budget rule to increase government spending still has positive impacts on growth, with a medium-term multiplier of 0.6, but results in negative impacts on the private non-financial sector.

Caiani et al. (2019) examine the alternative wage regimes using the AB-SFC multi-country model. The findings indicate that changes in wage growth patterns have significant effects on both the demand and supply sides of economies, generating Keynesian and Schumpeterian impacts. In a single country, wage increases may temporarily worsen the current account and slow down the economy in the short term. However, over the long term, higher wages enhance firms' innovation capabilities, leading to improved labor productivity and economic recovery. Conversely, a coordinated wage increase across all countries benefits real GDP, labor productivity growth and public

finance without affecting unemployment or external balances. Wage moderation produces opposite effects.

Mazier and Reyes (2022) propose a Stock-Flow Consistent (SFC) model for the French economy to explore two unconventional monetary policies: helicopter money and public debt cancellation. They assess helicopter money's impact on financing public investment and increasing social transfers to households by about 1% of GDP. Their findings indicate that while recovery without additional public debt is feasible, it leads to a reduction in the central bank's assets. Advocates argue that this is not a critical issue since the central bank can still operate despite having negative equity. In the case of increased social transfers to households using helicopter money, the findings are consistent with those observed under a recovery without public debt, but with a further deterioration in central bank wealth. They also examine the effects of canceling public debt equivalent to 15% of GDP, which, while reducing public debt, results in a proportional decline in central bank assets without affecting the real economy. Proponents believe that such debt reduction could ease constraints and boost public investment. Nonetheless, the significant deterioration in the central bank's capital raises concerns about potential consequences, such as rising interest rates. The proposed methods for restoring central bank capital are unconvincing, making this policy's acceptance within the Eurozone unlikely.

Caiani and Catullo (2024) present an AB-SFC multi-country model of a Monetary Union to evaluate the potential economic impacts of transforming the European Monetary Union into an Intergovernmental Fiscal Transfer Union with its own fiscal capacity. In such a system, countries contribute to the union based on their GDP, and funds are redistributed to countries performing below the Union's cyclical average. The simulation results demonstrate that the redistribution principle stabilizes international trade and enhances Union's GDP performance without destabilizing public finances. If the Union can borrow from capital markets, as in a Fully Fledged Fiscal Transfer Union, these stabilizing effects are enhanced, and the public debt burden moves from the national to the Union level, keeping the total debt burden nearly constant. Notably, core countries, though frequently net contributors, benefit the most from this mechanism. Additionally, while a Fully Fledged Fiscal Transfer Union with common debt can mitigate the effects of an external demand shock, it does not significantly alleviate the impact of supply shocks.

Byrialsen et al. (2024) develop an empirical SFC model for the Danish economy, using a quarterly national account data set between 2008 and 2020. They impose a permanent 2 percent increase in public spending. This shock generates that private consumption and investment increase, but exports are influenced negatively as a result of a faster increase in domestic prices than prices in the RoW that are not influenced by the shock. In addition, import increases whereas the effect of fiscal policy appears effective in stimulating the economic activity and the level of employment despite the quite higher income taxes and propensity to import in Denmark. Contrary to the mainstream model, the findings demonstrate that the effect of fiscal expansion does not generate higher inflation.

More specifically, transfer systems are investigated. Rosenbaum and Ciuffo (2017) explore the feasibility of correcting these consequences through inter-generational transfers using a SFC model. The findings indicate that such transfers are significantly constrained, making compensation payments nearly unfeasible. Additionally, they point out that implementing intergenerational transfers via a pension system to compensate for the accumulation of durable public goods faces significant limitations. While ethically justifiable, these transfers have a maximum limit, especially in non-growing economies. Designing an effective transfer system is challenging because compensation must come from the overlapping income of generations, which cannot exceed what is produced.

3.2.8 Remaining policy implications and examinations with PhD dissertations

This last part includes unclassified works where researchers explore multiple policy implications and propose SFC models for their respective countries. It also contains PhD dissertations that have not been published in academic journals. For instance, Schmelzer and Miess (2016, 2018) develop a SFC model for Austria to simulate macroeconomy policies. They introduce asset prices and endogenous portfolio decisions, including leverage. Their works aim to create a robust tool for medium to long-term forecasting and scenario-based policy evaluation, ultimately contributing to more effective policy advice.

Byrialsen and Raza (2020) develop a SFC model to understand the interconnections between the real and financial sides of the Danish economy. Based on data from 1995 to 2016, they simulate the model depending on a baseline scenario for 2017-2030, against

which the impacts of fiscal and interest rate shocks are analyzed. Despite its simplicity, the model effectively replicates key economic patterns and explains the transmission mechanisms through which real economic activities influence balance sheets and, in turn, how these balance sheets impact the real economy. The paper also presents a discussion regarding the limitations of the model. Furthermore, Byrialsen and Raza (2018) evaluate the effects of unemployment benefits in small open economies. Using an SFC model tailored to the Danish economy and focusing on labor market dynamics, they examine how a reduction in the unemployment compensation rate influences the economy. Their results show that such a decrease creates a trade-off between reduced aggregate demand and increased net exports. Consequently, the overall impact on the aggregate unemployment rate is minimal. This analysis suggests a need to reevaluate prevailing views on unemployment benefits found in much of the economic literature.

Le Heron and Yol (2019) examine the effects of migrants' remittances in Moldova, one of the leading recipients of remittances. Employing the SFC model, they show that migrants' remittances significantly influence economic growth, boosting household consumption in Moldova. However, these remittances are highly susceptible to economic conditions in the countries where migrants reside, particularly since the 2008 global financial crisis. By incorporating remittances into consumption behavior and lenders' risk assessments, they simulate how economic shocks in Europe and Russia, where are key destinations of Moldovan migrants, affect the Moldovan economy through remittance fluctuations. The results highlight two key points: first, the growing instability of remittances contributes notably to Moldova's economic volatility; second, the high level of imports in Moldova weakens the multiplier effect of remittances, resulting in an unsustainable growth pattern.

Pierros (2021) examines the effects of internal devaluation policies on real GDP, unemployment and sectoral balances. The model considers how the private sector's spending is influenced by income distribution, which is shaped by factors like minimum wage and flexible employment. The model is applied to the Greek economy and reveals that internal devaluation exacerbated destabilizing dynamics and impaired the economy's export potential by negatively impacting productivity through weak demand

Prante et al. (2023) present a two-country SFC model to illustrate the interconnectedness of three key aspects of finance-dominated capitalism: increasing international imbalances, growing financial fragility, and worsening income distribution. The model identifies two main regimes based on the institutional framework of each economy: the debt-led private demand boom regime and the export-led mercantilist regime. They explore how these regimes complement and depend on each other and demonstrate how they evolved after the crisis.

Hermitte et al. (2023) introduce the ITFIN model of the Italian economy using the SFC methodology to tackle the challenges posed by Italy's substantial government debt. This debt has led to a significant sectoral imbalance and a persistent country-risk premium that impacts both the financial and real sides of the economy. The ITFIN model, which is a quarterly econometric framework developed by Italy's Department of the Treasury, utilizes a SFC approach to analyze sectoral and macroeconomic dynamics. The model primarily concentrates on determining the sovereign risk premium in the government debt market, its effects on the financial and banking sectors, and its transmission to the real side of the Italian economy. It also derives the financial positions of various institutional sectors and models the supply and demand for financial instruments, illustrating how financial stocks influence economic decisions and real variables. The research further explores the model's properties by simulating the economy's response to different monetary policy scenarios and fiscal shocks.

In deregulated financial markets, credit rating agencies do more than just offer opinions; they influence macroeconomic dynamics. Ioannou (2018) examines the macroeconomic effects of credit rating by employing a two-country SFC model that represents the Eurozone. The paper links sovereign rating movements with financial market dynamics and fiscal policy constraints. With both fiscal expenditure and credit ratings being endogenous, the model demonstrates how, after a recessionary shock, a rating downgrade can exacerbate financial constraints on a government, driving it toward fiscal austerity and worsening the recession. The financialization of developing countries like Mexico has led to increased exchange rate volatility, rising foreign corporate debt, and a decline in private investment. Nalin and Yajima (2024) elucidate how these factors interact using a SFC model, focusing on the balance sheet effects within the non-financial corporate

sector. The findings reveal that higher levels of foreign debt, especially during periods of currency depreciation, can negatively impact private investment. Through simulations based on the commodity price cycle of the early 2000s and changes in U.S. Federal Reserve policy following the Global Financial Crisis, they identify a persistent effect on the Real Exchange Rate (RER) and an escalation in foreign debt levels.

In the literature, there are several PhD dissertations that have not been published in academic journals but developed successful SFC models. For instance, Mantes and Nikolaidi (2018) construct a SFC model of the Eurozone designed to analyze the dual impact of credit and competitiveness on the widening of current account imbalances. The model divides the Eurozone into a Northern region, characterized by strong export capacity and a large tradable sector, and a Southern region with weak export capacity and a smaller tradable sector. Preliminary simulations indicate that increased credit inflows from the Northern to the Southern region led to a temporary boost in economic growth in the South. However, this growth is accompanied by rising firm leverage and a growing current account deficit, which eventually results in diminished economic growth. Similar outcomes are observed when there is a reduction in the interbank interest rate for Southern banks. The model is further utilized to evaluate the impact of wage, fiscal, and macroprudential policies on financial fragility and current account imbalances within the Eurozone.

Jackson (2019) conducted a PhD study, which introduces a SFC model combined with an input-output model to explore how capital assets in fossil fuel extraction and energy generation may become stranded in his PhD dissertation. His model includes three firm sectors (fossil fuel, renewable energy, and non-energy goods) and two household sectors (ethical and normal) and investigates the macroeconomic and financial impacts of various transitions to a low-carbon economy. Simulations reveal that faster and unanticipated transitions are more likely to strand assets and disrupt financial markets compared to slower and anticipated transitions. Additionally, changes in market conditions influencing the real economy have more significant impacts on demand and asset stranding than those affecting borrowing costs. The findings also suggest that shifts in market conditions will not substantially influence energy demand or asset stranding unless renewable energy closely substitutes for fossil fuels.

Karlewicz (2019) develops a SFC model to analyze the effects of trade liberalization on Ghana, with a particular focus on the country's tariff policies. The dissertation incorporates Marxist, Structuralist, and Post-Keynesian perspectives to examine the impact of trade liberalization on developing countries using various assumptions and methods. The main conclusion is that both historical and theoretical evidence suggest that protectionist policies can enhance the sectoral development of a nation's industries. The dissertation also recommends further improvements in modeling and research, highlighting the need for more advanced open economy macro-modeling in the context of economic development.

The 2008 financial crisis, driven by banking excesses and deregulation, led to significant economic and social fallout. In response, Basel III reforms were introduced to enhance financial stability through stricter capital requirements and leverage rules. Despite extensive research, the effectiveness of Basel III in creating a stable and growth-supportive financial system remains controversial. Huaccha (2020) aims to provide new insights by examining Basel III's direct and indirect effects on a complex, interconnected economy using a dynamic SFC model. The dissertation finds that Basel III reforms, while increasing capital requirements, have not sufficiently restored financial stability or accelerated economic recovery. The inclusion of Keynesian uncertainty in the model shows that such uncertainty weakens Basel III's effectiveness and impedes economic activity. Empirical analysis further reveals that while banks support growth in stable periods, they hinder it during times of heightened uncertainty, underscoring the need for financial regulations that address the inherent instability of financial systems.

Sers (2021) develops a dynamic SFC model, encompassing input-output structure, to analyze energy and climate change impacts at the macroeconomic level. The dissertation addresses integrating physical quantities with macroeconomic variables, creating investment equations based on physical principles, modeling endogenous prices, and calibrating the model using a life-cycle net energy approach. It then explores energy transition scenarios, focusing on the shift from fossil fuels to renewables and the electrification of end-use. The findings suggest that, without large-scale negative emissions technologies, achieving emissions targets consistent with a 1.5-degree Celsius

increase requires substantial initial investment in renewables, rapid replacement of non-electrified capital, and degrowth to reduce the scale of necessary changes.

Grothe (2022) develops SFC model to examine how Germany's wage moderation impacts other Eurozone economies. The dissertation demonstrates that Germany's high saving rates and the decoupling of productivity and real wage growth are supported by internal and external debt. Also, this thesis explores how income inequality in Germany diminishes domestic aggregate demand, which is offset by increased net exports. The study draws broader conclusions about the links between income inequality, secular stagnation, and financial instability, suggesting that without changes to the Economic and Monetary Union's institutional structure, Germany will continue to benefit from the aggregate demand generated by debt-driven growth in peripheral Eurozone countries.

3.3 UK-SFC model of the Bank of England

The Bank of England introduced a dynamic model of financial balances for the UK in 2016. This model, developed by Burgess et al. (2016), represents the first SFC model for the UK economy, and it is briefly summarized in the following subsection. More recently, George and Dafermos (2023) have conducted research on green fiscal policy using an empirical UK-SFC model, which, as far as I know, is the second SFC model developed for the UK economy. This model examines green fiscal tools but remains ongoing and incomplete and is therefore not summarized here.

Burgess et al. (2016) introduce the BoE paper, which is the first SFC model for the UK economy and highlight key macroeconomic imbalances such as the widening current account deficit, declining household saving rates, and significant debt growth. Traditional Dynamic Stochastic General Equilibrium (DSGE) models, commonly relied upon by policymakers, largely neglected the role of financial flows in the emergence of crises and failed to track them from onset to aftermath. As a result, during the financial crisis, these models offered little insight into the role financial flows played or how they might evolve post-crisis. Following the 2008 Global Financial Crisis, the shortcomings of DSGE models were heavily criticized (Linde 2018; Reis 2018; Stiglitz 2018; Blanchard 2018). Therefore, Burgess et al. (2016) suggest a comprehensive SFC model to better understand

the contribution of financial flows to crises and their behavior afterward. Their model aims to fill the gap in modeling imbalances by examining how economic and financial imbalances may evolve over time and whether these trends are sustainable for the UK economy. Additionally, the model explores financial balance developments under different scenarios, assessing their implications for monetary and macro-prudential policies in the medium term.

This study offers two key contributions to literature. First, it presents the first sophisticated SFC model of the UK economy, explaining how to estimate and calibrate it, from its foundations to model validation. Second, the model is applied to several scenarios, such as sudden stops, changes in investment, fiscal expansion, increases in banks' capital ratios, and rising house prices to assess its effectiveness as a tool for medium-term scenario analysis.

3.3.1 Features of the model

The model consists of 89 behavioral equations and covers six key sectors: households, non-financial corporations, the government, the insurance companies and pension funds (ICPF) sector, banks including the Bank of England, and a simplified rest of the world sector. Behavioral equations rely on key assumptions that determine the model's characteristics.

For the household sector, the authors assume a Haig-Simons consumption function, where individuals consume based on their expected disposable income and past accumulated net wealth. This wealth consists of deposits, housing wealth (minus mortgage debt), and pension wealth. The model assumes that the housing stock grows at a constant exogenous rate, and housing transactions are determined by house prices. New mortgages are not perpetual, meaning households repay mortgage debt over time.

The non-financial corporate sector operates under the assumption of a flexible labor market and a Cobb-Douglas production function. The non-financial corporations determine their production, investment, employment, and financing needs, with a constant labor share. Investment depends on the capital utilization and cost of finance

charged by banks. They are assumed to hold deposits that grow in parallel with GDP and use intermediate commodities from the rest of the world. They assume that output and the exchange rate determine the import demand. Non-financial corporations are also assumed to retain part of their profits, distribute dividends, and meet most of their financing needs through external finance supplied by banks, with a smaller portion financed through equity issuance.

Government expenditures are assumed to be exogenously determined, with deficits covered by issuing bonds. These bonds are purchased by the ICPF sector, the rest of the world, and the central bank. Government transfers to households are assumed to grow in parallel with nominal GDP.

The ICPF sector holds a variety of assets, including government bonds, bank-issued bonds, foreign bonds, and domestic and foreign equities. This sector distributes dividends depending on the returns on investments. It faces market risk and has a portfolio allocation problem. They assume that portfolio allocation decisions are made by the relative rate of returns of different asset types.

The banking sector is responsible for lending. They issue bonds based on their balance sheets. The ICPF and the rest of the world demand these bonds. Banks also issue short-term non-interest-bearing bills for further borrowing when bond prices are revealed. They maintain a risk-weighted capital ratio and distribute dividends to ensure stable returns. The model assumes banks adjust their markups based on deviations of actual capital from the targeted capital levels.

The rest of the world sector's growth in equity value (dividends) is assumed to be constant and tied to its dividend payments. The allocation of assets held by the rest of the world is influenced by the relative rates of return of each asset class. The supply of liabilities is exogenous, and a flexible exchange rate system is assumed.

Finally, the central bank holds government bonds, with its liabilities considered assets of the banking sector. Its demand for government bonds is exogenous, and monetary policy

follows a nominal GDP targeting rule, ensuring interest rates do not fall below zero. Expectations in the model are adaptive.

3.3.2 The model results

To solve the model, the authors use calibration methods, benefiting from ONS data between 1987 and 2014. They simulate various scenarios, including sudden stops in the current account, changes in capital requirements, increases in house prices, fiscal expansions, and shifts in investment, while tracking the evolution of economic flows and imbalances.

For instance, the fiscal expansion scenario is implemented by a 10 percent increase in government expenditure over three years. The findings demonstrate that firms' revenues grow and this translates into higher wages, leading to increases in both consumption and investment. A portion of the additional demand is absorbed by higher imports. Overall, the fiscal multiplier in this model is around 1. While the economy improves and tax revenues increase, the expansion is not self-financing in the model: the government runs a larger deficit, and public debt rises, though only moderately. Gilt prices drop, and yields increase by approximately 50 basis points, raising the government's borrowing costs and further expanding the deficit. Their portfolio equations suggest that most of the additional gilt issuance is purchased by foreign investors rather than institutional investors, helping to cover the larger current account deficit caused by increased imports. The GDP growth prompts the monetary authority to raise the bank rate, while the exchange rate gradually declines.

4. THE ANALYTICAL MODEL

This chapter presents the analytical SFC model representing a closed economy with six sectors: 1. worker households, 2. rentier households, 3. non-financial sector, 4. financial sector, 5. central bank, 6. public sector. This model includes 49 behavioral equations and examines the conflicting claims as a driver of inflation and its distributional consequences. In this section, the seventh subsection presents behavioral equations for conflicting claims and inflation. This explains income and inflation formations. Then, the eighth subsection includes all parameters introduced to the model to derive steady-state results. This toy model is the ground of Chapter 5.

For the analytical model, the economy's balance sheet and transaction flow matrices, encompassing comprehensive information pertaining to sectors, stocks, and flows are below.

Table 4.1: The economy's balance sheet of the analytical model

	Workers	Rentiers	Non-Financial Sectors	Financial Sectors	Public Sector	Central Bank	Σ
<i>Capital</i>			$+K$				$+K$
<i>Producer Credit</i>			$-L_{pro}$	$+L_{pro}$			0
<i>Consumer Credit</i>	$-L_{con}$			$+L_{con}$			0
<i>Deposit</i>		$+D_R$		$-D_R$			0
<i>Advances</i>				$-A$		$+A$	0
<i>Reserves</i>				$+RES$		$-RES$	0
<i>Bonds</i>		$+B_R$			$-B_R$		0
<i>Equity</i>		$+E_R$	$-E_{NFS}$	$-E_{FS}$			0
<i>Net worth (Total)</i>	V_W	V_R	V_{NFC}	V_{FC}	V_{PS}	V_{CB}	$+K$

Table 4.2: Initial values of the analytical model

	Workers	Rentiers	Non-Financial Sectors	Financial Sectors	Public Sector	Central Bank	Σ
<i>Capital</i>			+1000				+1000
<i>Producer Credit</i>			-500	+500			0
<i>Consumer Credit</i>	-300			+300			0
<i>Deposit</i>		+500		-500			0
<i>Advances</i>				-100		+100	0
<i>Reserves</i>				+100		-100	0
<i>Bonds</i>		+300			-300		0
<i>Equity</i>		+800	-500	-300			0
<i>Net worth (Total)</i>	-300	+1600	+0	+0	-300	+0	+1000

Table 4.3: Transaction flow matrices of the analytical model

Transaction flow matrices	Workers	Rentiers	Non-Financial Sectors		Financial Sectors		Public Sector		Central bank		Σ
			Current	Capital	Current	Capital	Current	Capital	Current	Capital	
Consumption	$-C_w$	$-C_R$	$+C_{w+R}$	$-I$			$+G_{exp}$	$-G_{exp}$			0
Investment			$+I$								0
Government Spending											0
GDP											M
Wage Payment	$+WP_w$	$+WP_R$	$-WP_{w+R}$								0
Depreciation Allowance			$-DA$	$+DA$							0
NGOS			$+NGOS$								[NGOS]
Producer Credit			$-i.L_{pro}$		$+i.L_{pro}$						0
Consumer Credit	$-i.L_{con}$	$+i.D$			$+i.L_{con}$						0
Deposit					$-i.D$						0
Reserve Deposit					$-i.A$				$+i.A$		0
Advances							$-i.B$				0
Bonds		$+i.B$									0
Dividends (MFS)		$+DM_{FS}$	$-DM_{FS}$								0
Dividends (FS)		$+DM_{FS}$			$-DM_{FS}$						0
Taxation	$-T_w$	$-T_R$					$+T_{w+R}$	$-G_{exp}$			0
Welfare Spending	$+G_{wexp}$								$-CB_p$		0
Central Bank Profit											0
Disposable Income	YD_w	YD_R		YD_{FS}			$+CB_p$				1000
NLP	$[NLP_w]$	$[NLP_R]$	$[NLP_{FS}]$		$[NLP_{FS}]$		$[NLP_{pub}]$		$[NLP_d]$		0
ΔD		$-D$				$+D$					0
$\Delta Reserves$						$-M.RES$			$+M.RES$		0
ΔL_{pro}				$+L_{pro}$		$-L_{pro}$					0
ΔL_{con}	$+L_{con}$					$-L_{con}$					0
ΔA						$+A$				$-A$	0
ΔB		$-B$						$+B$			0
Net worth [Total]	V_p	V_R		V_{FS}		V_{FS}		V_G			0
Σ	0	0	0	0	0	0	0	0			0

4.1. Behavioral equations and identities

This section provides behavioral equations of each sector in the analytical model, including theoretical assumptions. Some equations represent accounting identities. I also present parameters used in the simulations illustrated in the next part.

4.1.1 Worker households

Within the Kaleckian framework, I assume that workers neither save money nor accumulate savings; instead, they spend the remaining income after settling income tax and meeting interest payments on credit debt. Initially, I posit that workers are debted and they make only interest payments for their consumer credit granted by the bank rather than repayment of credit debt. Additionally, I start with a scenario in which workers face limitations on further borrowing. Subsequently, I will delve into dynamics of consumption, including worker access to additional consumer credit.

Furthermore, I assume that the government institutes a welfare spending program, resulting in workers receiving supplementary income provided by the government.

Hence, workers' consumption is equal to worker disposable income.

$$C_t^W = YD_t^W \quad (4.1)$$

Their disposable income, derived after accounting for tax and interest payments, is further augmented by the support of welfare spending.

$$YD_t^W = (1 - \tau_t) * [WP_t^W - i * Lcon] + G_t^{well} \quad (4.2)$$

Wage payment constitutes the total wage income, calculated as a product of the number of workers and the average wage per worker. The determination of wages will be elucidated in subsection 1.7. Additionally, worker households cannot accumulate wealth because they spend their entire income. Consequently, their wealth must be zero.

However, due to the assumption that they utilized consumer credit in the past, their wealth is presently negative and equivalent to the outstanding consumer credit.

$$Vh_t^W = L_{con} \quad (4.3)$$

4.1.2 Rentier households

Rentiers differ from workers in their ability to save money and accumulate wealth. Unlike workers, they do not rely on government welfare spending, and they diversify their income flow. Rentiers have two options to save: depositing money into the bank and holding government bonds. As a result, their wealth comprises both bonds and deposits as well as equities of non-financial and financial sectors.²

$$Vh_t^R = B_t + D_t + E \quad (4.4)$$

Initially, I assume that they are not rational about the decision to invest. They do not base their investment decision on prevailing interest rates. Instead, if the government issues bonds, they directly acquire them, channeling the remaining income into a deposit account. While wage income is a part of their overall earnings, it does not constitute the primary source. Their disposable income consists of three flows: I. wage earnings, II. interest earnings from deposits and bonds, and III. dividend incomes sourced from both the non-financial sector and financial sector (banks' profit). Additionally, this disposable income is subject to taxation by the government.

$$YD_t^R = (1 - \tau_t) * [WP_t^W + i^D * D_t + i^B * B_t + Div_t^{NFS} + Div_t^{FS}] \quad (4.5)$$

Moreover, the wage payment of rentiers is calculated as the total wage income, representing the product of the number of rentiers and the average wage per rentier. The introduction of the determination of rentier wages will be provided in subsection 1.7.

² Furthermore, rentiers also possess ownership of the equities in both non-financial and financial corporations. It is anticipated that this assumption will be modified subsequently, introducing a delineation of equities owned by workers in a certain proportion.

The consumption of rentiers is a linear function of their disposable income and past accumulated wealth. Rentiers allocate a portion of their disposable income and a portion of their past accumulated wealth towards consumption.

$$C_t^R = c0_t + c1 * YD_t^R + c2 * Vh_{t-1}^R \quad (4.6)$$

4.1.3 Non-financial sector

The output (Y_t) is equivalent to the total consumption of both workers (C_t^W) and rentiers (C_t^R), in addition to investment (I_t) and the sum of government expenditures, which include government expenditure (G_t^{exp}) and government welfare spending (G_t^{wel}). Government welfare spending serves as direct aid to workers, especially necessary as workers are in debt, ensuring the sustenance of their consumption spending. Furthermore, both welfare spending and government expenditure are exogenously determined.

$$Y_t = C_t^W + C_t^R + I_t + G_t^{exp} + G_t^{wel} \quad (4.7)$$

Firms undertake investments that contribute to the capital accumulation, K_t . A fraction of capital ($depr * K_t$) undergoes depreciation in each term. Therefore, firms allocate a portion of their operating surplus as depreciation allowance. Any addition investment that surpasses this depreciation allowance contributes to the expansion of the stock of capital.

$$I_t = i0_t + \gamma * (Y_t - \beta * K_{t-1}) + depr * K_{t-1} \quad (4.8)$$

However, I assume that the level of investment is equivalent to the level of depreciation of capital in the steady state condition.

$$I_t = depr * K_{t-1} \quad (4.8a)$$

The level of capital stock (K_t) is determined by subtracting the depreciation portion ($depr * K_{t-1}$) from the accumulated capital at the previous time (K_{t-1}), and then adding the present level of investment (I_t).

$$K_t = K_{t-1} * (1 - depr) + I_t \quad (4.9)$$

No change occurs in the capital stock (K_t) when it is assumed that the level of investment equals the level of depreciation in steady state. Such a result can be derived by inserting the investment equation (4.8a) into the capital equation (4.9).

$$K_t = K_{t-1} \quad (4.9a)$$

Firms disburse wage payments (WP_t) to both rentiers and workers. Consequently, the total wage payment equals worker wages (WP_t^W) and rentier wages (WP_t^R).

$$WP_t = WP_t^W + WP_t^R \quad (4.10)$$

Gross operating surplus GOS_t is obtained once the wage payment is fulfilled.

$$GOS_t = Y_t - WP_t \quad (4.11)$$

Firms allocate depreciation allowance from gross operating surplus. Therefore, the remaining portion represents the net operating surplus.

$$NOS_t = GOS_t - DA_t \quad (4.12)$$

Prior to the profit distribution, firms make interest payments for producer credit granted by banks. Subsequently, I assume that all profits are distributed to rentiers.

$$Div_t^{NFS} = \alpha * [NOS_t - i^{Lpro} * Lpro_t] \quad (4.13)$$

If firms choose to invest more than depreciation ($I_t > depr * K_{t-1}$), this necessitates additional financial resources. They have four options to address this extra financial need. Firstly, they may allocate a greater portion of their profit, generating internal finance IF_t , for the investment. Thus, α must be reduced.

$$IF_t = (1 - \alpha) * [NOS_t - i^{Lpro} * Lpro_t] \quad (4.14)$$

In scenarios where firms opt to fulfill all their financial needs using internal sources ($TFN_t = IF_t$), achieved by allocating additional resources before distributing profit, there would be no necessity to apply for business credit.

$$I_t - depr * K_{t-1} = IF_t \quad (4.15)$$

The second approach involves seeking producer credit, constituting external finance EF_t . If it is decided that all investments surpassing the depreciated capital will be funded by producer credit ($TFN_t = EF_t$), the progression of producer credit is below.

$$I_t - depr * K_{t-1} = EF_t \quad (4.15a)$$

where $EF_t = Lpro_t$

The third option is issuing new equities. This is another way to create internal finance, IF_t . Initially, all equities of non-financial sectors are held by rentiers. If workers demand some portion of new equities, distribution of firms' equity changes and firms must distribute their profit depending on the share of equities held by rentiers and workers. Thus, firm' decision to obtain financial resource from new equity causes to change worker disposable income (YD_t^W) and drives the stock of the firm's equity.

$$E_t = E_{t-1} + I_t - depr * K_{t-1} \quad (4.15b)$$

The final option for firms is to pursue a combination of both internal and external sources to meet their financial needs. Therefore, the total financial need equals the sum of internal finance and external finance ($TFN_t = IF_t + EF_t$). In this scenario, firms seek internal finance, resulting in a reduction in the level of producer credit compared to the second approach and issuing new bonds. This, in turn, would decrease the term α in equation (4.13) and increase the equity stock in the equation (4.15b).

$$I_t - depr * K_{t-1} = EF_t + IF_t \quad (4.15c)$$

I assume that rentiers aim to retain all profit, leading firms to distribute all profits, and any production exceeding the level of depreciation is financed through producer credit. Thus, I assume that firms adopt the second approach. In accordance with this option, the evolution of producer credit is sum of the previously granted producer credit by banks, plus the level of investment financed by newly created producer credit from bank, minus the depreciation of capital³.

$$Lpro_t = Lpro_{t-1} + I_t - depr * K_{t-1} \quad (4.16)$$

Furthermore, I assume that firms solely make interest payments without repaying the credit debt. This implies that loan credit serves as perpetual funds for nonfinancial corporations.

4.1.4 Financial Sector

In line with the endogenous money framework (Graziani, 2003), the role of banks is giving credit. In addition to having an active role in monetary creation, they are profit seeker firms (Rochon, 1999). They provide external finance, which is producer credit, to the non-financial sector. The level of banks' credit is determined by the demand coming from producers (Moore, 1988). Banks receive interest payment on producer credit, and in addition to this source of interest earnings from business credit, they also receive interest earnings from consumer credit, paid by worker households in each term. Consequently, the total interest earnings of banks encompass interest payments from both businesses and workers.

$$Int.earning_t^{FS} = i^{Lpro} * Lpro_t + i^{Lcon} * Lcon_t \quad (4.17)$$

Banks also pay interest to rentiers and the central bank. Rentiers deposit their money (D_t), into banks and banks pay interest for these deposits. Additionally, I assume the existence

³ The depreciated capital needs to be excluded from the level of investment in equation (4.16) because I assumed the equality between the level of investment and the level of depreciated capital in the equation (4.8a). I plan to introduce a shock by increasing term $i0t$ in the investment function (4.8) to simulate the second approach that firms follow. This shock will generate extra financial need ($I_t > depr * K_{t-1}$).

of a reserve requirement in the system. Consequently, banks are obligated to meet their financial requirements. In reality, they borrow money (A_t) from the central bank to hold them as a reserve into their central bank account. Due to the institutional setup regarding reserve requirement, banks must hold reserves (RES_t), equivalent to reserve requirement ratio (rrr) following the creation of credit and deposits. Therefore, the evolution of monetary reserves is the sum of the previous monetary reserve plus the reserve requirement ratio multiplied by the newly created deposit.

$$RES_t = RES_{t-1} + rrr * (D_t - D_{t-1}) \quad (4.18)$$

The sequence of credit, deposit and reserve is crucial; banks generate credit and deposits and subsequently seek reserves (Lavoie, 1984). At the conclusion of this process, they pay interest on the money held in their central bank account. As a result, the total interest payment of banks comprises interest payments for deposit ($i^D * D_t$) and interest payments for the money borrowed ($i^A * A_t$) from their central bank.

$$Int.payment_t^{FS} = i^D * D_t + i^A * A_t \quad (4.19)$$

The difference between interest earnings and payments in the financial sector is immediately distributed to rentiers.

$$Div_t^{FS} = Int.earning_t^{FS} - Int.payment_t^{FS} \quad (4.20)$$

Furthermore, total credit cannot be equated with total deposit, as per the assumption about rentiers' behavior of wealth accumulation through holding bonds. Hence, total credit, including both consumer and producer credits, is equivalent to the total deposits and bonds accumulated by rentiers.

$$Lpro_t + Lcon_t = D_t + B_t \quad (4.21)$$

On the liability side of the bank's balance sheet, there are deposits and advances, while on the asset side, there are producer and consumer credit and reserves. In each term, banks are obliged to maintain reserves, complying with reserve requirement by borrowing

advances -equivalent to reserves- to hold them in their central bank account. Consequently, the equality between reserves and advances represents a hidden equation (4.22).

$$A_t = RES_t \quad (4.22)$$

In the determination of interest rate, the central bank's policy rate i^{CBrate} serves as the benchmark for the interest rate charged by banks (i^{Lpro}). Banks add markup⁴ ($\varphi 2$) above the policy rate (Rochon, 1999, p.14) and this markup constitutes the profit for banks. The interest rate of deposit (i^d) is determined to fall somewhere between the central bank's policy rate and the interest rate charged by banks for credit ($i^{Lpro} > i^d > i^{CBrate}$)⁵.

$$i^{Lpro} = \varphi 2 * i^{CBrate} \quad (4.23)$$

4.1.5 Central bank

Prominent studies by post-Keynesian economists, including Rochon (1999, 9), Rochon & Rossi (2007), Graziani (2003, 63), Fontana (2009) and Lavoie (1996, 2010, 2019) emphasize two primary roles of the central bank. The first role entails ensuring the security of financial transactions and monitoring the financial system to ensure that commercial banks adhere to their financial constraints. The second role pertains to the broader financial system, addressing the potential risk of banks losing control over credit policy and precipitating a significant acceleration of credit creation. Such a scenario could spur aggregate demand, leading to the risk of inflationary pressure. Consequently, the central bank is tasked with averting the financial sector from undergoing spontaneous acceleration in credit creation. Additionally, recognizing that banks may require liquidity to meet their financial needs, the central bank assumes the responsibility of providing

⁴ This is well illustrated by Palley (1994, 1996). Palley illustrates Moore's model of horizontalism as well as other view on endogenous money theory. In actual practice, the markup added by banks is determined by factors such as competition within the banking sector and the liquidity preference of banks. However, for the purpose of this work, I assume that this markup is treated as an exogenous parameter, and I do not delve further into its intricacies.

⁵ Moreover, I assume that the interest rate (i^{Lcon}) for consumer credit is higher than the interest rate for business credit (i^{Lpro}). However, I intend to investigate the role of consumer credit in more detail at a later stage.

necessary liquidity as a lender of last resort. These dual roles are fundamentally rooted in the defensive nature of the central bank.

Consequently, the primary role of central banks is to monitor and accommodate the financial system, combating potential financial risks. In practice, they exogenously set the short-term interest rate, instead of determining the money supply, as highlighted by Moore (1988) and Rochon (1999, p.14). The responsibility for monetary creation is delegated to banks, reflecting the principles of endogenous money theory. As a result, banks play a fully active role in the process of monetary creation.

In line with these two roles, I assume that the central bank adopts a fully accommodative stance. It establishes the short-term interest rate and actively monitors the financial system.

$$i^A = \underline{i^A} \quad (4.24)$$

Furthermore, the central bank gains profit as a result of the institutional setup. Banks are mandated to maintain required reserves in their central bank account. To do this, they borrow money from the central bank. Thus, they pay interest on credit granted by the central bank. Consequently, the entirety of the central bank's profit is distributed to the public sector.

$$CBprofit_t = i^A * A_t \quad (4.25)$$

4.1.6 Public sector

I assume that the government has two types of outlays: government expenditures ($\underline{G}_t^{exp}$) and welfare spending ($\underline{G}_t^{wel}$). These spending decisions are exogenously determined by the government. Additionally, the government pays interest on bonds ($i^B * B_t$). Therefore, the total government expenditure ($G_t^{T.exp}$) is the sum of government expenditures, welfare spending to worker households, and interest expenses on bonds.

$$G_t^{T.exp} = \underline{G}_t^{exp} + \underline{G}_t^{wel} + i^B * B_t \quad (4.26)$$

There are three sources of government income. Given the fixed tax rate (τ_t), the government taxes the disposable income of worker and rentier households each term. In addition to the tax income, central bank's profit is transferred to the government. Therefore, the total government income (G_t^{Inc}) comprises tax income and profit transfers from the central bank.

$$G_t^{Inc} = TP_t^W + TP_t^R + CBprofit_t \quad (4.27)$$

$$TP_t^W = \tau_t * [WP_t^W - i * Lcon] \quad (4.28)$$

$$TP_t^R = \tau_t * [WP_t^W + i^D * D_t + i^B * B_t + Div_t^{NFS} + Div_t^{FS}] \quad (4.29)$$

Moreover, I assume that the government runs the deficit by issuing new bonds. If the government deficit is the difference between government expenditure and incomes, the evolution of government bond is as follows:

$$G_t^{Deficit} = G_t^{T.exp} - G_t^{Inc} \quad (4.30)$$

$$B_t = B_{t-1} + G_t^{Deficit} \quad (4.31)$$

For the sake of simplicity, I assume that government bonds are perpetual, and the government only pays interest on the bonds without repurchasing them.

4.1.7 Conflicting claims and inflation

In the post-Keynesian economics, inflation is seen as a result of distributional conflict among social classes. The market is imperfect and oligopolistic. In such a market structure, firms possess market power, enabling them to determine prices. This implies that firms incorporate a markup above their cost when determining unit prices. Therefore, unit prices are influenced by two primary factors: the markup ($\phi 1_t$) and the average unit cost (UC_t).

$$P_t = (1 + \varphi 1_t) * UC_t \quad (4.32)$$

Although the degree of markup is influenced by various factors such as monopoly power (Kalecki 1971), I assume that the markup is exogenously determined, aligning with the post-Keynesian closure (Lavoie, 2022, p.172). I denote the exogenous factors affecting the markup by the term theta (θ), and I plan to use it to introduce shocks to the model.

$$\varphi 1_t = \theta * \varphi 1_{t-1} \quad (4.33)$$

$$\theta = \underline{\theta} \quad (4.34)$$

The average unit cost is calculated by dividing the total wage payments (WP_t^{Total}) by the gross domestic product (GDP_t). In the model, we have two distinct average unit costs corresponding to two different social groups. Consequently, the sum of unit costs for rentiers and workers equals the average unit cost for the entire economy.

$$UC_t = \frac{WP_t^{Total}}{GDP_t} \quad (4.35)$$

$$UC_t^R = \frac{WP_t^R}{GDP_t} \quad (4.36)$$

$$UC_t^W = \frac{WP_t^W}{GDP_t} \quad (4.37)$$

I assume that there is one rentier for every four workers in the economy. Therefore, the number of workers (N_t^W) is equal to four times the rentier population (N_t^R). The total population is the sum of the number of workers and the number of rentiers. I also assume that the population (N_t) is fixed. There are unemployed individuals among both rentiers and workers. However, I further assume that the actual levels ($\underline{N}_t^{Act}$) and full employment levels ($\underline{N}_t^{Ful}$), as well as the productivity of worker ($\underline{pr}_t^W$) and the productivity of rentier ($\underline{pr}_t^R$), are fixed and exogenously determined.

$$N_t = N_t^W + N_t^R \quad (4.38)$$

$$N_t^{Act} = \underline{N}_t^{Act} \quad (4.39)$$

$$N_t^{Ful} = \underline{N}_t^{Ful} \quad (4.40)$$

$$pr_t^W = \underline{pr}_t^W \quad (4.41)$$

$$pr_t^R = \underline{pr}_t^R \quad (4.42)$$

The total wage payment includes the aggregate wage incomes of both rentiers (WP_t^W) and workers (WP_t^R). Workers' wages are determined by multiplying the number of workers (N_t^W) by the average wage per worker (W_t^W). Similarly, the rentier wages are calculated by multiplying the number of rentiers (N_t^R) by the average rentier wage, (W_t^R).

$$WP_t^{Total} = WP_t^W + WP_t^R \quad (4.43)$$

$$WP_t^W = N_t^W * W_t^W \quad (4.44)$$

$$WP_t^R = N_t^R * W_t^R \quad (4.45)$$

I follow the wage targeting formula outlined in chapter 9 of Godley Lavoie (2007, p.313). In this framework, workers exert influence in setting wages, whereas firms wield the power to determine markups and subsequently, prices. Workers aim to achieve a target average wage income (W_t^{Tar}). The labor income target is positively influenced by both labor productivity (pr_t^W) and aggregate demand. I employ the ratio of actual employment to full employment as a proxy for aggregate demand. Notably, all the remaining factors are considered exogenous and encompassed in first parameter (ω_0) of wage targeting formula (4.46).

$$W_t^{Tar} = \omega_0 + \omega_1 * pr_t^W + \omega_2 * \left(\frac{N_t^{Act}}{N_t^{Ful}} \right) \quad (4.46)$$

Hence, the average wage for worker (W_t^W) is determined as the sum of the average worker wage in previous year (W_{t-1}^W) augmented by a fraction ($\omega 3_t$) of the targeted worker wages (W_t^{Tar}) subtracted by real wages, expressed as ($\frac{W_t^W}{P_t}$). The term ($\omega 3_t$) signifies the influence of the worker power derived from unions and labor organizations. A higher value for ($\omega 3_t$), suggests a stronger impact, on the speed of adjustment. Consequently, workers are more adept at promptly attaining their targeted wages when the power of unions and labor organizations is robust.

$$W_t^W = W_{t-1}^W + \omega 3_t * \left[W_t^{Tar} - \left(\frac{W_t^W}{P_t} \right) \right] \quad (4.47)$$

For instance, when firms raise markups, inflation increases and real wages decline. In response, workers shift their target towards attaining higher real wages, seeking to recover lost ground. The pace of this adjustment, however, varies country to country owing to different labor market structures. Moreover, government spending has the potential to elevate aggregate demand. While government expenditures increase, unions adjust their wage targeting upwards, leading to an increase in the average worker wage.

The procedure mirrors that of rentier wage income, although the parameters and the rate of adjustment differ. Similar to the dynamics observed with workers, shifts in economic conditions trigger adaptations in rentier wage income. Nevertheless, the specific parameters dictating these adjustments and the pace at which they unfold are distinct within the rentier context. The unique set of parameters and the characteristic speed of adjustments associated with rentiers distinguish their wage income dynamics from those of workers.

$$W_t^{Tar} = \rho 0_t + \rho 1_t * pr_t^R + \rho 2_t * \left(\frac{N_t^{Act}}{N_t^{Ful}} \right) \quad (4.48)$$

$$W_t^R = W_{t-1}^R + \rho 3_t * \left[W_t^{Tar} - \left(\frac{W_t^R}{P_t} \right) \right] \quad (4.49)$$

While markups and wages changes, the shifts in profit and labor shares (WP_t^W/GDP_t) lead to changes in income distribution. Therefore, inflation is a consequence of distributional claims of both workers and firms.



4.1.8 Parameters and exogenous variables

Parameter	Value	Description
τ_t	0.2	Tax rate on disposable incomes
$c0_t$	152.47	Autonomous consumption spending
$c1$	0.2	Share of consumption out of disposable income of rentiers
$c2$	0.001	Share of consumption out of wealth of rentiers
L_{CON}	290	Consumer credit
i^L	0.04	Interest rate on consumer credit (somewhere above central bank rate)
G_t^{exp}	150	Government expenditure
G_t^{well}	15	Government welfare spending
$i0_t$	25.56	Autonomous Investment
γ	0.25	Adjustment parameter of difference between GDP and capital
β	0.9	Share of capital used in production
$depr$	0.153	Depreciation rate of capital
α	1	Share of firm profit distributed to rentiers
rrr	0.2	Required reserve ratio
i^A	0.025	Interest rate charged by Central bank
$\phi2$	0.015	Markup charged by banks above central bank interest rate
i^B	0.02	Interest rate of bonds charged by government (somewhere above central bank rate)
$\phi1_t$	0.4285	Pricing markup
N_t	0.04	Total Population
N_t^W	0.03	Number of worker households
N_t^R	0.01	Number of rentier households
N_t^{Act}	0.04	Actual employment
N_t^{Full}	0.044	Full employment
pr_t^W	1	Worker productivity
pr_t^R	1	Rentier productivity
$\omega0_t$	10000	Autonomous wages of worker households
$\omega1_t$	5000	Parameter for labor productivity
$\omega2_t$	18333.337	Parameter for aggregate demand
$\omega3_t$	0.25	Adjustment parameter for the difference between targeted and real wages
$\rho0_t$	9000	Autonomous wages of rentier households
$\rho1_t$	6000	Parameter for rentier productivity
$\rho2_t$	5500	Parameter for aggregate demand
$\rho3_t$	0.5	Adjustment parameter for the difference between targeted and real wages

4.2. Implications and policy analysis

This section includes applications of the basic model. The transition to a steady state is represented in the appendix. The following section simulates two scenarios: wage and markup shocks. I evaluate the connection between changes in distribution and inflation. Finally, I conclude the model by indicating to transform the analytical model into two household UK-SFC model.

4.2.1 Distributional consequences of inflation

I simulate the initial scenario wherein firms abruptly raise their markup 10 percent (from 0.42 to 0.47). Figure 4.1 shows this simulation. This markup increase causes an increase in consumption and subsequently boosts GDP. The fourth and fifth graphs in Figure 4.1 demonstrate the escalation in disposable income (%GDP). Additionally, the sixth graph indicates that firms require more producer credit as a result of the markup hike. While the public sector was nearly balanced before, it now reflects a positive shift as an outcome of this scenario. Moving on to the graphs in the fourth row, they depict changes in wage and profit shares. Worker and rentier wage shares increase while profit share falls. Working on to the graphs in the fourth row, they depict changes in wage and profit shares. Worker and rentier wage shares increase while profit share falls.

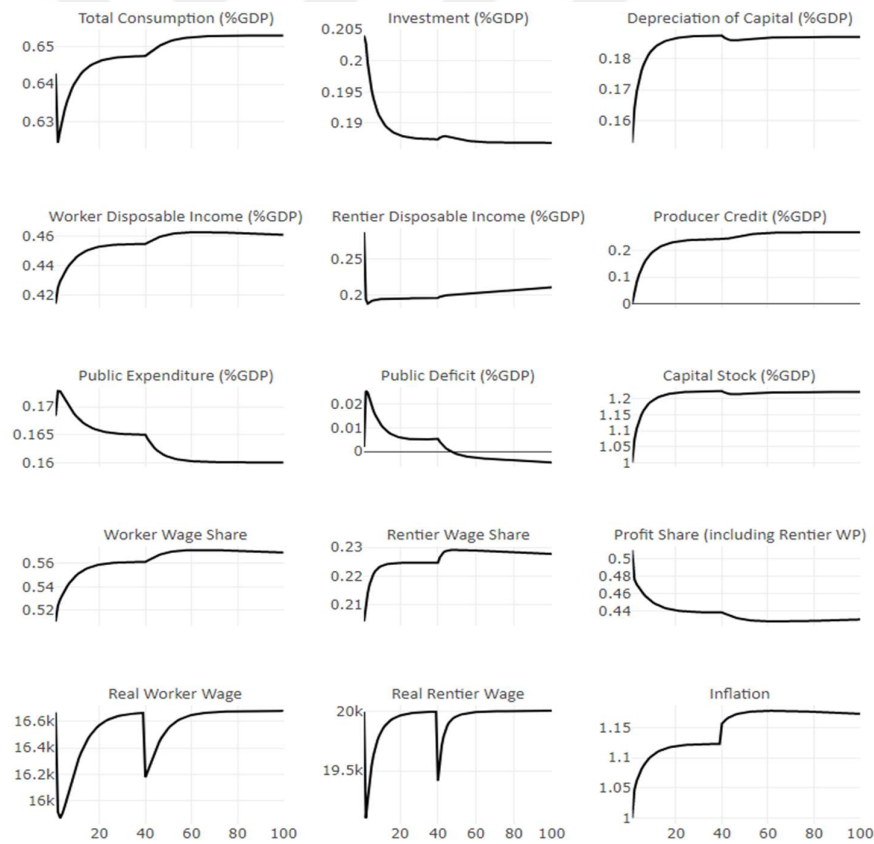


Figure 4.1: The impact of 10 percent increase in markup

The 10 percent increase in markup results in a decline in real wages. In response, workers and rentiers immediately act to recover their losses. Notably, rentiers exhibit a faster

speed of adjustment compared to workers. The combined effects of the markup increase, and households wage bargaining contribute to inflation.

In the second scenario, worker wages suddenly increase by 20 percent. This is illustrated in Figure 4.2. This prompts a short-term decrease in rentier wages, leading to an uptick in inflation. Concurrently, the wage share experiences an increase, while both rentier wage share and profit share decline. As a result of wage gain, the total consumption substantially increases due to the assumption that workers spend what they earn.

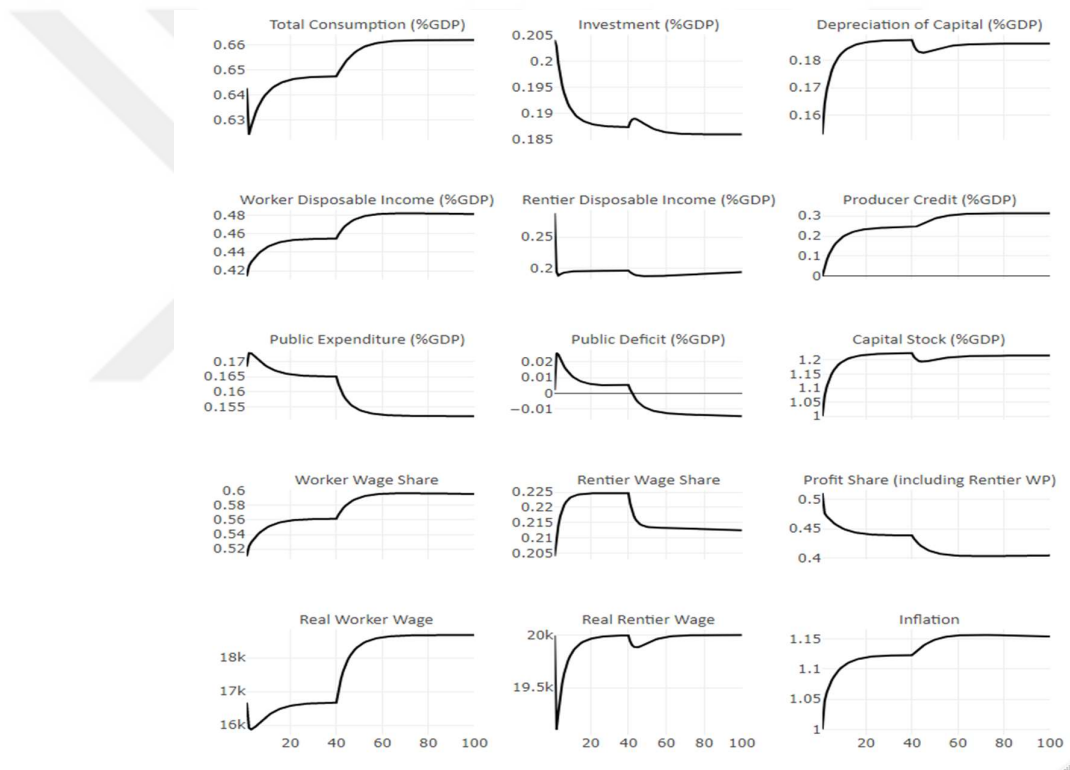


Figure 4.2: The scenario of worker wage recovery by 20 percent

4.2.2. Conclusion

In this section, the analytical model is presented with behavioral equations and identities. Using this toy model, two scenarios regarding conflicting claims are simulated. The first one simulates that firms hike their markup, while the second one simulates the scenario in which worker wages suddenly increase 20 percent. Both scenarios influence wage and

profit shares. In the next sections, I extend the analytical model to evaluate these scenarios with the UK real data. Additionally, post-COVID19 inflationary dynamics are simulated in the following section.



5. TWO HOUSEHOLD SFC MODEL OF THE UK ECONOMY

This chapter extends the previous analytical model and presents its policy implications to the UK economy by providing a detailed overview of its sectoral balance sheet and presenting the essential behavioral equations of the model. The chapter commences with the derivation of the accounting structure of the model, including how to set sectors and obtain stocks and flows in section 5.1. Doing this, it explains data sources with detailed interpretations, regarding how to derive sectoral data and distribute stocks and flows into the sectors. Then, section 5.2 presents behavioral equations, including theoretical assumptions of the model. Behavioral equations encompass various sectors of the UK economy, including the household sector, which comprises workers (W) and rentiers (R), the non-financial sector (NFC), monetary financial institutions (MFI), insurance corporations and pension funds (ICPF), the general government (GOV), and the rest of the world (RoW).

Additionally, the housing market and conflicting claims are addressed separately. These two parts are crucial to understanding inequality dynamics because they build and also explain the housing sector, which is one of the key sectors in the UK economy, and inflation dynamics, which is crucial to distributional trends across the household sector. Following the behavioral equations, section 5.3 consists of three sub-sections. The first one explains the inequality trend in the post-COVID era by defining how rentiers drive inequality by expanding their income sources and accumulating their wealth stocks. The second one evaluates incomes policies to rehabilitate income inequality and to reverse inequality trends in wealth accumulation. The third one presents scenario analyses. Finally, the chapter is closed with the conclusion part.

5.1 The derivation of the model

The accounting structure of the extended analytical model is based on the UK economy, derived directly from UK economic account data sourced from the ONS Blue Book (ONS 2022). The guiding principle here is to accurately reflect the UK economy to the greatest extent possible, employing theoretical assumptions at the most minimal level feasible.

There are various sectors in the UK economy such as non-financial corporations (S.11), financial corporations (S.12), which include monetary central bank (S.121), deposit-taking corporations except the central bank (S.122) and MMF (S.123), non-monetary financial institutions (S.124), other financial intermediaries, except insurance corporations and pension funds (S.125), financial auxiliaries (S.126), captive financial institutions and money lenders (S.127), insurance corporations (S.128), pension funds (S.129), general government (S.13), households (S.14), non-profit institutions serving households (S.15), and the Rest of the world (S.2).

5.1.1 Stocks

The UK economic account includes sectoral account of the United Kingdom. In this study, the model focuses on the sectors which have high shares on the asset and liabilities in the sectoral account. Applying for the UK economic account, Table 5.1 demonstrates the shares of real and financial assets and liabilities of the UK sectors such as households and NPISH (S.14 +S.15), non-financial corporations (S.11), monetary financial corporations (S.121+S.122+S.123), non-monetary financial corporations (S.124+S.125+S.126+S.127), insurance corporations and pension funds (S.128+S.129), general government (S.13), and the Rest of the world (S.2).

Table 5.1: Stock and flows contributions of sectors

Sector	Real Asset (C+H)	Financial Asset	Financial Liability
Households and NPISH	%15	%17.78	%5.68
Non-financial corporations	%69	%7.61	%15.50
Monetary financial corporation		%39.26	%38.82
Non-monetary financial corporation		%22.07	%21.89
Insurance companies and pension funds		%11.02	%11.34
General government	%15.9	%2.26	%6.78
Total	100	100	100
Rest of the world		%27.18	%26.48

Table 5.1 clearly shows that households (and NPISH) are at net lender positions, while non-financial corporations and general government are at net borrower positions due to financial asset and liabilities they hold. On the other hand, monetary financial corporations and non-monetary financial corporations have a relatively close balance between their asset and liability.

Due to the scope of the study, non-monetary financial corporation sector is excluded even if the UK economy is highly financialized economy and even if they have significant contributions to the UK economy. It is excluded because the extended model concentrates primarily on households, particularly inequality dynamics among them. While focusing on inequality dynamics among households, it focuses on sectors whose stocks and flows are directly related to these dynamics. Thus, the model encompasses seven sectors: workers and rentiers as sub-sectors for households (and NPISH), non-financial corporations, monetary financial institutions, insurance corporations, and pension funds, the general government, and the rest of the world.

For the determination of stocks in the balance sheet matrix, stocks which have a higher share over the total stock associated with each sector are selected. Table 5.2 shows list of financial stocks in the UK economy. Currency and deposits (F.2), debt securities (F.3), loans (F.4) generate interest flows across sectors, while equity and investment fund shares/units (F.5) provide dividend flows for sectors which hold equity. Insurance, pensions, and standardized guarantee schemes (F.6) are extensively held by households, and these generate pension flows. All remaining stocks such as monetary gold and special drawing rights (F.1), financial derivatives and employee stock options (F.7), and other accounts receivable (F.8) are eliminated because F.1 and F.8 are not significant contributors of the balance sheet and F.7 is excluded because non-monetary financial corporations are out the scope of this study.

Table 5.2: Types of financial stocks

Code	Financial Stocks
F.1	Monetary gold and special drawing rights
F.2	Currency and Deposits
F.3	Debt Securities
F.4	Loans
F.5	Equity and investment fund shares/units
F.6	Insurance, pensions, and standardized guarantee schemes
F.7	Financial derivatives and employee stock options
F.8	Other account receivable

These stocks are collected from the sectoral accounts in the UK economic account and distributed to the seven sectors in the balance sheet shown in Table 5.4. Aside from the UK economic account dataset, specifically, additional data sources are required to split household sector into two. For this reason, the latest version of Wealth in Great Britain dataset supplied by ONS is used to separate household stocks and distribute property and financial stocks between workers and rentiers. While doing this, I assume that top 20th percent of the population is rentier households, while remaining 80th percent is worker households. Therefore, I use dataset providing stocks by quintiles. For instance, I use dwelling stock estimates (March 2022) supplied by the UK Government for property wealth. To split the stock, I resort to property wealth series in Wealth in Great Britain dataset. For financial assets and wealth such as deposits, loan, pensions and equity, observations of financial wealth, private pension wealth, financial debt are used to distribute these stocks to workers and rentiers. For instance, consumer loan stock is distributed depending on Table 7.4 in Household Debt statistics in the Wealth in Great Britain dataset. According to Table 7.4, 40 percent of total debt belongs to the top 20 percentile, and the remaining 60 percent of total debt is debt of the remaining 80 percentile of the population. These values are multiplied by total loan stock data available in the household sectoral account and then distributed to rentier and worker households.

According to Wealth in Great Britain dataset, wealth distribution by wealth types among households is shown Table 5.3.

Table 5.3: Wealth distribution among household in March 2020

Type of Wealth	Workers	Rentiers
Property Wealth	%42.5	%57.5
Financial Wealth	%23.5	%76.5
Private Pension Wealth	%31.3	%68.7

Table 5.4 shows the balance sheet of the model. Capital and houses on the top are real assets. Then there are financial stocks, from household deposits to equity. On the bottom, there are residuals and net lending positions.

Table 5.4: Balance sheet of the extended model

	Workers		Rentiers		Non-Financial Corporations	Monetary Financial Institutions	Insurance Corporations and Pension Funds	Government	ROW	Total
	Assets/Liabilities		Assets/Liabilities		Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	
Capital			C_R		C_W			C_G		C_T
Houses	H_W		H_R							H_T
Household Deposit	$+D_W$		$+D_R$			$-D_{W+R}$				
Household Loans		$-L_W$		$-L_R$		$+L_{W+R}$				
Pensions	$+P_W$		$+P_R$				$+P_{W+R}$			
NFC Deposit					$+D_{NFC}$					
NFC Loan					$-L_{NFC}$	$+L_{NFC}$				
Bonds						$+G_{MFI}$	$+G_{ICPF}$	$-G_T$	$+G_{ROW}$	
Row Deposit						$-D_{ROW}$			$+D_{ROW}$	
Row Loan										$-L_{ROW}$
MFI Dep in Row						$+D_{MFI}$				$-D_{MFI}$
Equity	$+E_W$		$+E_R$		$+E_{NFC}$	$-E_{NFC}$	$+E_{MFI}$	$-E_{MFI}$	$+E_{ICPF}$	$-E_{ICPF}$
Residuals	$+Res_W$	$+Res_W$	$+Res_R$	$+Res_R$	$+Res_{NFC}$	$+Res_{MFI}$	$+Res_{ICPF}$	$+Res_G$	$+Res_G$	$+Res_T$
New Worth	$+NW_W$		$+NW_R$		$-NW_{NFC}$	$+NW_{MFI}$	$-NW_{ICPF}$	$-NW_G$	$+NW_{ROW}$	$+NW_T$

5.1.2 Flows

The UK economic account includes aggregate national account. It contains expenditure and income components of GDP such as consumption, investment, wages, taxes. Allocation of primary income account of each sector provides most of flows such as interest payments and interest received, dividend payments and dividend received and annuity income, while the secondary distribution of income account supplies some other flows such as pension contribution made by households and taxes collected by government. There are several additional flows but only related ones, which have significant volume are included.

The crucial issue in the distribution of flows is that income accounts provide aggregate flows, thus necessitating the need for them to be split. For instance, sectoral accounts of monetary financial institutions encompass interest flow. However, this flow represents an aggregate flow, which includes interest payments to multiple sectors. To decompose aggregate flows, a possible solution followed in this study is to distribute aggregate flow to sectors, depending on relevant asset of each sector. That is, deposit accounts of sectors are checked, while distributing total interest payments of monetary financial institutions. On the other hand, dividend flows are much more complicated because multiple sectors issue equity and a sector can hold equities issued by banks and firms. For instance, sectoral account of non-financial corporations contains aggregate dividend payment. However, households may hold not only NFC equity, which complicates the determination of the proportion of NFC dividend payments allocated to the household sector. For this reason, to address the issue of distributing dividend flows, the equity assets and liabilities of each sector are summed up. This yields net equity, allowing for the distribution of dividend flows from the total dividend income, based on the net equity of each sector. Consequently, a link is established between sectors, following their respective assets.

Transaction flow matrix consists of various components as demonstrated in Table 5.5. On the top from consumption to GDP, there are components of expenditure side of GDP. Then, they are followed by income side components and financial wealth flows. Only significant flows are defined, while insignificant flows, which do not affect stock

variation significantly are excluded. The distribution of flow in household sector is crucial process and it need additional dataset just like in the distribution of stocks. Of the UK economic account, financial account and income account are used to obtain flows, regarding each sector. However, additional datasets are used to distribute it.

Table 5.5: Transaction flow matrix of the extended model

	Worker Households	Rentier Households	NFC	MFI	ICPF	Government	Row	Σ
Consumption	$-C_W$	$-C_R$	$+C_T$			$+I_G - I_G$		
Investment			$+I_{src} - I_{src}$			$+H_{I_G} - H_{I_G}$		
Housing Investment		$+H_{I_{H_R}} - H_{I_{H_R}}$	$+H_{I_{src}} - H_{I_{src}}$			$-G_{I_{exp}}$		
Gov. Expenditure	$+S_{PEN_W}$	$+S_{PEN_R}$	$+G_{exp}$					
Export			$+E_{src}$				$-E_{src}$	
Import			$-I_{M_{src}}$				$+I_{M_{src}}$	
[GDP]								[GDP]
Compensation of Employees	$+W_P^W$	$+W_P^R$	$-W_P^{src+8}$					
Other Income	$+M_{INC_W}$	$+M_{INC_R}$						
Taxes on Production and Imports (subsidies)			$-T_{PRO_I_{M_{src}}}$			$+T_{PRO_I_{M_{src}}}$		
Taxes on Income	$-T_{INC_W}$	$-T_{INC_R}$				$+T_{INC_W+8}$		
[GOS]	$+GOS_{H_W}$	$+GOS_{H_R}$	$+GOS_{src}$	$+GOS_{MFI}$		$+GOS_S$		[GOS]
Depreciation Allowance	$-D_{H_W}$	$-D_{H_R}$	$-D_{H_{src}}$	$-D_{H_8}$		$-D_{H_8}$		[DA]
[NOS]	$+NOS_{H_W}$	$+NOS_{H_R}$	$+NOS_{src}$			$+NOS_S$		[NOS]
Annuity Payments	$+AN_W$	$+AN_R$			$-AN_{src+8}$			
Pension Contributions	$-PEN_{CON_W}$	$-PEN_{CON_R}$			$+PEN_{CON_W+8}$			
Net Dividends	$MH_{NFS+ICPF+ROW}$	$+N_{EQ_R}$	$-N_{EQ_{src}}$	$-N_{EQ_{MFI}}$		$+N_{EQ_S}$	$-N_{EQ_{Row}}$	[N.EQ.]
Household Deposit	$+H_{DEP}^W + D_W$	$+H_{DEP}^R + D_R$		$-H_{DEP}^W + D_{W+8}$				
NFC Deposit			$+H_{src} + D_{src}$	$-H_{src} + D_{src}$				
MFI Deposit (in ROW)				$+H_{MFI} + D_{MFI}$			$-H_{MFI} + D_{MFI}$	
Row Deposit				$-H_{ROW} + D_{ROW}$			$+H_{ROW} + D_{ROW}$	
ICPF Deposit				$-H_{ICPF} + D_{ICPF}$	$+H_{ICPF} + D_{ICPF}$			
Consumer Credit	$-H_{NFC} + LOAN_W$	$-H_{NFC} + LOAN_R$	$-H_{NFC} + LOAN_{src}$	$+H_{NFC} + LOAN_{MFI}$				
Producer Credit				$+H_{NFC} + LOAN_{src}$				
ICPF Credit				$+H_{ICPF} + LOAN_{ICPF}$	$-H_{ICPF} + LOAN_{ICPF}$			
Row Credit				$+H_{ROW} + LOAN_{ROW}$			$-H_{ROW} + LOAN_{ROW}$	
Bonds				$+B_{MFI}$	$+B_{ICPF}$	$-B_G$	$+B_{ROW}$	
Net lending Position	$\mp NLP_W$	$\mp NLP_R$	$\mp NLP_{src}$	$\mp NLP_{MFI}$	$\mp NLP_{ICPF}$	$\mp NLP_G$	$\mp NLP_{Row}$	

Firstly, I commence with household flows. Consumption flow is distributed depending on Detailed household expenditure by gross income decile group, which is Table A6 in Workbook 1- Detailed Expenditure and Trends in Family Spending dataset supplied by ONS. Then, capital investment of household sector is excluded due to its insignificant level. However, housing investment is important for households. In the gross fixed capital formation of household sector, it is provided as dwellings. This is distributed depending on property wealth in Wealth in Great Britain dataset, assuming same direction between housing investment and its wealth. In the government expenditure row, state pensions are a significant proportion of the government expenditure. They are distributed to worker and rentier households depending on Table 13 in the Effects of Taxes and Benefits on Household Income dataset, which is dataset provided by ONS. Table 13 in this dataset includes components of household's income by quintile groups. Using this dataset, I distribute state pension flow as well as wage income.

Other income is taken from the UK economic account and defined as a proportion to wage income. The distribution of taxes on income to rentiers and workers is calculated by multiplying current taxes on income in the secondary income account of the household sector with the distribution of income taxes between workers and rentiers with respect to Table 13 in the Effects of Taxes and Benefits on Household Income dataset.

In the distribution of pension contributions and annuity payments, for ICPF's annuity payments, the secondary income account of the household sector is used because there is no secondary income account of the ICPF sector separately from the financial sector. On the resources side, other social insurance benefits are multiplied by the distribution of private pension wealth in Table 2.2 in the Wealth in Great Britain dataset supplied by ONS. According to Table 2.2, 69 percent of total private pension wealth belongs to rentiers. On the other hand, pension contributions are calculated using household social contributions and household social contributions supplements. These are on the uses side of the secondary income account of the household sector. These two are summed and multiplied with private pension distribution obtained from Table 2.2 in the Wealth in Great Britain dataset.

To obtain dividend flow, allocation of primary income account for each sector is used. In these accounts, the sum of columns titled “distributed income of corporations: dividends” in both resources and uses sides gives net dividend flow for each sector. According to these accounts, the main dividend flows come from nonfinancial corporations to household sectors. The remaining sectors have weak dividend flows, and these can be ignored.

For interest flows, effective rates of interest are calculated. Sectoral accounts have interest payments and earnings. Dividing these values by the total number of stocks gives effective rates of interest. Therefore, interest earnings of the household sector are distributed benefiting from household investment income data in Table 13 in the Effects of Taxes and Benefits on Household Income dataset supplied by ONS. On the other hand, interest payments are distributed based on consumer loan distribution, as defined in the previous subsection.

Secondly, NFCs have various flows. The UK economic account is the main dataset for this sector. Worker and rentier consumption flows are received by NFC sector. Investment data is collected from gross fixed capital formation. They also receive a significant portion of government expenditures. The volumes of export and import are realized by NFC and national accounts provide these values. One of the important issues in import data is that it is required to determine the share of imported commodities used in production. These are oil, capital goods, and intermediate goods in Trade in Goods series of UK balance of payment statistics. The share of these commodities in total import is an important dynamic for inflation because inflation is accelerated and conflicting claims over income exacerbates, while prices of these imported commodities are increased due to external reasons. Wages paid by NFCs are compensation of employees, which is available data in national accounts as well as taxes on production and imports less subsidies. Depreciation allowance is calculated to derive depreciation rate, which is total consumption of fixed capital divided by GDP. This rate determines how much capital is depreciated in each term. If depreciation allowance is subtracted from gross operating surplus, net operation surplus is obtained. Net dividend is negative for NFC, meaning that NFC dividend payment is higher than dividend received. These divided flows as well as interest payments and interest received are available in allocation of

primary income account of NFC sector. Bank of England statistics provides interest rates used for the payments and returns.

The rates of interest are crucial variables for the monetary financial institutions. All interest rate values are obtained from Bank of England statistics such as loan, deposit, gilt rates. MFIs hold government bonds and receive interest payment from the government. Their net equity is negative, meaning to exit higher dividend flow from this sector. Interest payments and interest received as well as dividends for MFI sector are available in the allocation of primary income account. However, I follow the assets and liabilities regarding banking sector and use exogenous interest rates supplied by Bank of England to find these values because values in the primary income account includes non-monetary financial institutions, which are excluded in this study.

The sector of insurance corporations and pension funds is simple. They received pension contributions, coming from households. These are property income and recorded on the allocation of income account of household sector. Pension contributions are provided in secondary distribution of income account. I use sum of households' actual social contribution and supplements on the uses side of the account. ICPFs earn investment income, and these are allocated to households as a proportion to actual premiums. ICPFs may invest in government bonds, equities and may hold deposits to receive interest return.

On the column of government sector, the values of government investment, government expenditure income and productions taxes are collected from the UK economic accounts. Under the expenditure side of GDP, total government expenditures are available. State pensions are subtracted from the government expenditure. Their values are written in secondary distribution of income account of government as the social security benefit in cash. Taxes on production and income less subsidies are derived from allocation of primary income account of government. The government tax received on household income is written in the secondary distribution of income account of household sector. In the primary income account of the government, there is gross operation surplus. This income is coming from the government real investment available in gross fixed capital formation by sector and type of asset in aggregate national accounts. Depreciation allowance of the government is obtained from the consumption of fixed capital in the

national accounts. Total interest payment for government bonds is available in the primary income account of the government. That value is distributed depending on bond assets of other sectors.

On the last column, there are flows of the rest of the world. Exports and imports are available in the aggregate national accounts. Export means income outflow from the RoW, while import indicates income inflow to the RoW. Both MFI and RoW have deposit accounts to hold these income transactions. It means that both sectors pay interest with each other at an interest rate charged by their banks. Besides, the RoW borrows money from the MFI's of the UK. Therefore, they pay interest for this lending to MFIs. They also earn interest income from the UK government due to their bond holding. Net equity of RoW relatively close to balance, which means that value equals zero. I follow the stocks of assets and liabilities from financial accounts. I also use relevant interest rates to multiply them to stocks to determine the volume of all these flows.

5.2 Behavioral equations and identities

In this part, I present accounting identities and behavioral equations of the extended model. While extending the analytical model, it is required to make different assumptions, depending on the observations and trends in the datasets. Also, some equations are enhanced as some are kept the same. The purpose of extended model is to reflect the UK economy realistically as much as it can. Thus, I keep theoretical assumptions at the most minimal level feasible. While making assumptions, I follow observations and trends in the datasets.

5.2.1 Worker households

In the analytical model, I follow the classical-Kaleckian tradition, assuming that workers spend what they earn after tax and interest payments on their credit debt. However, there is an uncertainty in the real world. So, they save some portion of their income to meet future uncertainties. For the realism, this model includes worker savings in terms of housing investment.

This extended model aims to represent the UK economy. The household sector consists of workers and rentiers. I assume that the bottom 80 income percentages of households comprise worker households, while top 20 percentile are rentiers. I assume that worker households save some money in forms of wealth accumulation such as pension and houses. They spend all remaining earnings, after making tax and interest payments and allocating some portion of their income to these two stocks. Therefore, the first equation represents net worker disposable income, which is net income including wage and operating incomes⁶ after pension contributions, tax payment out of wage income, and interest payment, but an income supported by state pensions as well as annuity and dividend received.

$$YD_t^W = (1 - \tau^W) * (WP_t^W) + INT.EARN_t^W - INT.PAYM_t^W + NOS_t^W + S.PEN_t^W + ANN_t^W - PEN.CON_t^W + NET.EQE_t^W \quad (5.1)$$

Workers have two main incomes. These are wage payment defined in 5.2.9 and gross operating surplus of household sectors. I have two assumptions here that gross operating surplus is some proportion (mw_{ratio}) of wage payment, while depreciation of houses is directly financed over GOS and then workers obtain remaining part as a net operating surplus (NOS_t^W).

$$GOS_t^W = mw_{ratio} * WP_t^W \quad (5.2)$$

$$NOS_t^W = GOS_t^W - \delta_H * \delta_K * K_t \quad (5.3)^7$$

Workers have additional incomes: interest earnings based on their deposit account, state pension that state supplies, annuities for their past pension contributions and equity earnings based on their equity stock. While state pension of workers is defined in 5.2.6, remaining sources of income are formalized by following equations:

⁶ This is an income, which is other income category in the household income account.

⁷ One of the components that increase capital stock is housing investment. Thus, δ_K implies total depreciation of capital. To detect housing depreciation, the formula includes a housing share (δ_H) in total depreciation. For instance, this value is 27 percent for 2020. I assume that this is not going to change over time.

$$INT.EARN_t^W = INT.DEP.HH_t^W * DEP.HH_t^W \quad (5.4)$$

$$ANN_t^W = \pi_0 + \pi_1 * PENSION_t^W \quad (5.5)$$

$$NET.EQE_t^W = \alpha_w * Div^{NFS} \quad (5.6)$$

Workers pay taxes out of wage income based on related tax rate (τ^W), which is determined exogenously by the government. They make interest payments but no repayment of their debt. I assume that the credit debt of workers is perpetual. It means that they pay only interest of them. They also make pension contributions. Except for pension contributions of workers defined in 5.2.5, the following two equations represent tax and interest payments of worker households.

$$TP^W = \tau^W * WP_t^W \quad (5.7)$$

$$INT.PAYM_t^W = INT.LOAN.HH_t^W * LOAN.HH_t^W \quad (5.8)$$

Due to the assumption that workers only save some portion of their money as a pension contribution and accumulate house stock, they spend all the remaining income. Hence, worker consumptions equal to net disposable income.

$$CON_t^W = YD_t^W \quad (5.9)$$

Additionally, even if the net lending position of worker households seems zero mathematically in the equation (5.10), it is not zero practically because pension contributions are reduced in their disposable income. If we add it to their net lending as following equation, their net lending position will be positive.

$$NLP_t^W = YD_t^W - CON_t^W + PEN.CON_t^W \quad (5.10)$$

The total financial asset of worker households consists of pensions, deposits, and equities they hold, while their liability is consumer credit, which is mortgages. They have also

housing stock as an real asset. Thus, the sum of financial assets and liability gives net financial worth of worker households.

$$ASSET_t^W = PENSION_t^W + DEP.HH_t^W + EQUITY_t^W \quad (5.11)$$

$$LIABILITY_t^W = LOAN.HH_t^W \quad (5.12)$$

$$N.WORTH_t^W = ASSET_t^W + LIABILITY_t^W \quad (5.13)$$

Additionally, if workers save money into their deposit, they save money into their bank account, leading to an increase in their interest return. Therefore, worker deposits are represented as follows:

$$DEP.HH_t^W = DEP.HH_{t-1}^W + (N.WORTH_t^W - N.WORTH_{t-1}^W) + (LOAN.HH_t^W - LOAN.HH_{t-1}^W) - (PENSION_t^W - PENSION_{t-1}^W) - (EQUITY_t^W - EQUITY_{t-1}^W) \quad (5.14)$$

If I simulate the scenario where worker changes their portfolio decision, the equation (5.14) will be used.

5.2.2 Rentier households

Rentier households are assumed top 20 income percentages of households. Their propensity to save is higher than workers. This is consistent with Pasinetti (1974, Ch.5) conclusion. Following the datasets, disposable income of rentier households almost the same with workers even if number of rentier households is a quarter of the number of worker households. They earn wage income and get state pension and annuities. They make interest payments and receive interest earnings from banks. They also receive dividends. The only difference from workers is that their stock of wealth is massive. Also, I assume that rentier do not make real investment and do not receive operating income. The following equation indicates the net rentier disposable income of rentier households. It calculates wage income after pension contributions, tax payments, and interest payments, while also incorporating income derived from state pensions, annuities, and dividends.

$$YD_t^R = (1 - \tau_t^R) * (WP_t^R) + (1 - \tau_t^F) * (INT.EARN_t^R + NET.EQE_t^R) - INT.PAYM_t^R + S.PEN_t^R + ANN_t^R - PEN.CON_t^R \quad (5.15)$$

Rentier wage payment is defined in 5.2.9. Rentiers have additional incomes: interest earnings based on their deposit account, state pension that state provides, annuities for their past pension contributions and equity earnings based on their equity stock. While state pension of rentiers is defined in 5.2.6, remaining sources of income are formalized by following equations:

$$INT.EARN_t^R = INT.DEP.HH_t^R * DEP.HH_t^R \quad (5.16)$$

$$ANN_t^R = \pi_2 + \pi_3 * PENSION_t^R \quad (5.17)$$

$$NET.EQE_t^R = \alpha_R * Div^{NFS} \quad (5.18)$$

Similar with workers, rentiers pay taxes out of wage income based on related tax rate (τ^R), which is determined exogenously by the government. They make interest payments but no repayment of their debt. I assume that the credit debt of rentiers is perpetual. It means that they pay only interest of them. They also make pension contributions. Except for pension contributions of workers defined in 5.2.5, the following two equations represent tax and interest payments of worker households.

$$TP^R = \tau_t^R * WP_t^R + \tau_t^F * (INT.EARN_t^R + NET.EQE_t^R) \quad (5.19)^8$$

$$INT.PAYM_t^R = INT.LOAN.HH_t^R * LOAN.HH_t^R \quad (5.20)$$

Rentier consumption is the function of their net disposable income and their wealth. They consume some portion ($c1$) of their disposable income and some portion ($c2$) of their wealth, which is accumulated in the past. In the following equation, $c0_t$ represents obligatory consumption to survive.

⁸ When I simulate a scenario where government implements financial income tax (τ_t^F), tax payment of rentiers grows.

$$CON_t^R = c0_t + c1 * YD_t^R + c2 * N.WORTH_{t-1}^W \quad (5.21)$$

Additionally, the rentier households are at net lender position due to their higher saving capabilities. Just like net lending position of workers, I add rentier pension contributions in the equation too.

$$NLP_t^R = YD_t^R - CON_t^R + PEN.CON_t^R \quad (5.22)$$

The categories of total financial assets and liabilities of rentiers are the same with workers. Their financial assets consist of pensions, deposits, and equities they hold, while their liability is consumer credit⁹. Thus, sum of financial assets and liability gives net worth of rentier households.

$$ASSET_t^R = PENSION_t^R + DEP.HH_t^R + EQUITY_t^R \quad (5.23)$$

$$LIABILITY_t^R = LOAN.HH_t^R \quad (5.24)$$

$$N.WORTH_t^R = ASSET_t^R + LIABILITY_t^R \quad (5.25)$$

Additionally, while rentiers accumulate pension stock directly before consumption, rentiers save their remaining income into their deposit account, the evolution of the rentier deposits is indicated below.

$$DEP.HH_t^R = DEP.HH_{t-1}^R + (N.WORTH_t^R - N.WORTH_{t-1}^R) + (LOAN.HH_t^R - LOAN.HH_{t-1}^R) - (PENSION_t^R - PENSION_{t-1}^R) \quad (5.26)$$

Furthermore, a crucial difference between the analytical and extended models, the extended model follows the real data of the UK sectoral account. For example, the rentier households accumulate the government bonds in the analytical model. However, households do not hold government bonds in the UK. For this reason, the rentiers are not assumed to hold government bonds. They accumulate deposits in their bank accounts as well as private pension. Due to their position, which is in the top 20 income percentages,

⁹ More than 90 percent of total consumer credit is consisting of mortgages according to the data.

I assume that they are rentiers, consisting of capitalists and professionals, those work for capitalists.

5.2.3 Non-financial corporations

This subsection provides the equations regarding non-financial corporations as well as equations regarding production and income sides of gross domestic product. The GDP (GDP^{EXP}) is equivalent to the household consumption (CON^H), including both workers (CON^W) and rentiers (CON^R), private investment (I^{NFC}), housing investment (I^{House}), government expenditure (G^{Exp}), including state pension, government investment (I^{GOV}), and export (EXP) minus import (IMP). I assume that export, import, and government investment are a fixed proportion to total output, defined by $\epsilon_1, \epsilon_2, \epsilon_3$. Thus, expenditure side of the GDP as well as its components are formalized as following equations:

$$GDP^{EXP} = CON^H + I^{NFC} + I^{House} + G^{Exp} + I^{INV} + EXP_t - IMP_t \quad (5.27)$$

$$CON_t^H = CON_t^W + CON_t^R \quad (5.28)$$

$$EXP_t = \epsilon_1 * GDP^{EXP} \quad (5.29)$$

$$IMP_t = \epsilon_2 * GDP^{EXP} \quad (5.30)$$

$$I^{GOV} = \epsilon_3 * GDP^{EXP} \quad (5.31)$$

Private investment (I^{NFC}) is gross fixed capital formation realized by NFCs. It is the engine of total capital stock as well as housing investment. Investment function has simple logic. I assume that the initial value of GDP is equal to total capital stock (K_t). Therefore, any distinction between GDP and total capital stock, depreciated over time (δ_K), implies new investment. The first component of the investment function represents animal spirit of the companies, while γ indicates speed of adjustment, δ_{NFC} is NFC's share of total depreciation (δ_K). Total capital stock expands while non-financial corporations (I^{NFC}_t), the government (I^{GOV}_t) and households (I^{House}_t) increase their investment.

$$I^{NFC} = i_0 + \gamma * [GDP^{EXP} - \beta * K_{t-1}] + \delta_{NFC} * \delta_K * K_{t-1} \quad (5.32)$$

$$K_t = K_{t-1} * (1 - \delta_K) + I^{NFC}_t + I^{GOV}_t + I^{House}_t \quad (5.33)$$

On the income side of the GDP, there are wage payments defined in 5.2.9, gross operating surplus, including non-financial corporations, households, and financial corporations, and government tax income, including production and import (less subsidies) tax, which is calculated by tax rate (τ_t^{PI}) imposed by the government on import.

$$GDP^{INC} = WP_t^{Total} + GOS + TAX.PRO.IMP_t^{NFC} \quad (5.34)$$

$$TAX.PRO.IMP_t^G = \tau_t^{PI} * IMP_t \quad (5.35)$$

Non-financial corporations disburse wage payments, (WP) to both rentiers and workers. According to data, rentiers earn wage income, which is almost half of total wage payments. Gross operating surplus of NFCs (GOS^{NFC}) is obtained once the total wage payment, production and import tax less subsidies, and gross operating surplus of other sectors are subtracted.

$$GOS^{NFC} = GDP^{EXP} - WP_t^{Total} - TAX.PRO.IMP_t^G - GOS^{Other} \quad (5.36)$$

Additionally, total gross operating surplus is the sum of gross operating surplus of households, non-financial corporations and government. I assumed that gross operating surplus of government is fixed proportion (ϵ_4) to gross operating surplus of the economy.

$$GOS = GOS^H + GOS^{NFC} + GOS^{GOV} + GOS^{FC} \quad (5.37)$$

$$GOS^{GOV} = \epsilon_4 * GOS \quad (5.38)$$

There may be a little accounting difference between GDP on income and expenditure sides. This is called statistical difference. In each term, this difference has to be very low to keep the model consistency.

$$STAT^{DIF} = GDP^{EXP} - GDP^{INC} \quad (5.39)$$

The primary income of non-financial corporations (YD^{NFC}) consists of gross operating surplus (GOS^{NFC}) and net interest income ($N.Int^{NFC}$). The level of interest income depends on the respective rate, ($i_t^{NFC.DEP}$), of return on total deposit of previous year (DEP_{t-1}^{NFC}), excluding the interest payment of loan calculated by multiplying respective interest rate, ($i_t^{NFC.LOAN}$) of loan and the level of NFC's loan stock of previous year ($LOAN_{t-1}^{NFC}$). Consequently, net operating surplus of non-financial corporations is obtained once depreciated capital stock of NFC is subtracted from primarily income of NFC sector. In addition, if the government imposes excess profit tax on gross operating surplus, defined by equation (5.40), this will reduce disposable income of NFC, leading to fall in net operating surplus of NFC. This tax will directly go into government tax income, equation (5.69).

$$TP_t^{EP} = \tau^{EP} * GOS^{NFC} \quad (5.40)$$

$$YD^{NFC} = GOS^{NFC} + N.Int^{NFC} - TP_t^{EP} \quad (5.41)$$

$$N.Int^{NFC} = i_t^{NFC.DEP} * DEP_{t-1}^{NFC} - i_t^{NFC.LOAN} * LOAN_{t-1}^{NFC} \quad (5.42)$$

$$NOS^{NFC} = YD^{NFC} - \delta_0 * \delta_K * GFC_{t-1} \quad (5.43)$$

NFCs undertake investments that contribute to the total capital stock, (GFC). A fraction of capital ($\delta_0 * GFC^{NFC}$) undergoes depreciation in each term. Any level of investment above the depreciated capital implies growing capital stock. Firms decide to distribute dividends out of their net operating surplus. Therefore, some portion of net operating surplus is distributed to rentiers and workers, depending on the share of equity assets.

$$Div^{NFS} = \alpha_{div} * [NOS^{NFC}] \quad (5.44)$$

In the UK economy, as expected, total investment of NFCs is higher than consumption of fixed capital of NFCs. This implies that firms invest more than their depreciated capital. Thus, capital stock must be expanded in each term. More importantly, while

investing more than depreciation ($I_t > \delta_0 * \delta_K * GFC_{t-1}$), firms require additional financial resources. Following the real dataset, I assume that they may allocate a portion of their profit, generating internal finance IF , for the investment.

$$IF^{NFS} = (1 - \alpha_{div}) * [NOS^{NFC}] \quad (5.45)$$

They pursue a combination of both internal and external sources to meet their financial needs. For this reason, the total financial need equals the sum of internal finance and external finance ($TFN^{NFS} = IF^{NFS} + EF^{NFS}$). Firms allocate internal finance. Any remaining financial needs are met by producer credit. So, the difference between NFCs investment and their depreciated capital equals to the sum of internal and external finance. Depreciated capital is subtracted because firms allocate depreciation allowance before making dividend payments.

$$I^{NFC} - \delta_0 * \delta_K * K_{t-1} = IF^{NFS} + EF^{NFS} \quad (5.46)$$

External finance is nothing but business loans or producer credit because I do not assume that firms issue equity, implying $EF^{NFS} = LOAN_t^{NFC}$. Consequently, if we put the internal finance of NFC (IF^{NFS}) on the left-hand side in equation (5.46), the evolution of producer credit is easily obtained. Hence, the producer credit of this year ($LOAN_t^{NFC}$) is the sum of the previously stock of producer credit supplied by banks ($LOAN_{t-1}^{NFC}$), plus the level of investment of this year (I^{NFC}) minus the depreciation of NFCs capital ($\delta_0 * \delta_K * GFC_{t-1}$), minus level of internal finance (IF^{NFS}). That is to say, if internal finance (IF^{NFS}) is not sufficient to cover the financing need of the value of the parentheses [$I^{NFC} - \delta_0 * \delta_K * GFC_{t-1}$], firms are granted directly producer credits by banking sector.

$$LOAN_t^{NFC} = LOAN_{t-1}^{NFC} + [I^{NFC} - \delta_0 * \delta_K * GFC_{t-1}] - IF^{NFS} \quad (5.47)$$

The net lending position of the non-financial corporations is defined as follows:

$$NLP_t^{NFC} = GOS^{NFC} + N.Int^{NFC} - I^{NFC} - Div^{NFS} - TP_t^{EP} \quad (5.48)$$

Furthermore, I assume that firms solely make interest payments without repaying the producer credit debt. This implies that producer credit serves as perpetual funds for nonfinancial corporations just like household credit.

5.2.4 Monetary financial corporations

Monetary financial institutions (MFIs) comprise the central bank (S.121), deposit-taking corporations except the central bank (S.122), MMF (s.123). On the asset side, MFIs have household loans ($LOAN.HH_t^{W+R}$), NFC's producer credit ($LOAN_t^{NFC}$), foreign investment or loan demanded by RoW (FI_t^{ROW}), and government bond held by MFIs (B_t^{MFI}). MFIs receive interest from their lending and government bonds they hold. Total interest received by MFIs is the sum of respective rates of interest times household loans ($LOAN_t^{HH}$) of previous year, largely consisting of mortgages, producer credit ($LOAN_{t-1}^{NFC}$) demanded by NFCs of previous year, foreign investment (FI_{t-1}^{MFI}) demanded by RoW in previous year, MFIs deposit in ROW of previous year ($DEP.ROW_{t-1}^{MFI}$) and government bonds of previous year (B_{t-1}^{MFI}).

$$MFI_t^A = LOAN.HH_t^{W+R} + LOAN_t^{NFC} + FI_t^{ROW} + B_t^{MFI} \quad (5.49)$$

$$INT.REC_{MFI} = INT.LOAN_t^{HH} * LOAN_{t-1}^{HH} + INT.LOAN_t^{NFC} * LOAN_{t-1}^{NFC} + INT.FI_t^{NFC} * FI_{t-1}^{MFI} + INT.DEP.ROW_t^{MFI} * DEP.ROW_{t-1}^{MFI} + INT_t^{GOV} * B_{t-1}^{MFI} \quad (5.50)$$

On the liability side, MFCs have household deposits $DEP.HH_t^{HH}$, NFC deposit (DEP_t^{NFC}), and deposit of the RoW (DEP_t^{ROW}). Total interest paid by MFIs is the sum of respective rates of interest times household deposit of previous year ($DEP.HH_{t-1}^{HH}$), NFC deposit of previous year (DEP_{t-1}^{NFC}), and previous year's deposit of the RoW (DEP_{t-1}^{ROW}).

$$MFI_t^L = DEP.HH_t^{HH} + DEP_t^{NFC} + DEP_t^{ROW} \quad (5.51)$$

$$INT.PAY_{MFI} = INT.DEP_t^{HH} * DEP.HH_{t-1}^{HH} + INT.DEP_t^{NFC} * DEP_{t-1}^{NFC} + INT.DEP_t^{ROW} * DEP_{t-1}^{ROW} \quad (5.52)$$

The financial net worth of MFIs is the sum of the assets and liability of MFIs and it can be negative because this sector includes the Central Bank. The total profit of MFIs, which means net lending of MFIs, is equal to difference between interest received and interest payment.

$$FNW_{MFI} = MFI_{Asset} - MFI_{Liability} \quad (5.53)$$

$$NLP_{MFI} = INT.REC_{MFI} - INT.PAY_{MFI} \quad (5.54)$$

5.2.5 Insurance companies and pension funds

Insurance corporations and pension funds (S.128 + S.129) receive pension contributions from the household sector. Pension contribution is a linear function of worker and rentier disposable incomes. Total pension contributions of the household sector are the sum of pension contributions of rentier and worker households.

$$PEN.CON_t^W = pen.coef0 + pen.coef1 * YD_t^W \quad (5.55)$$

$$PEN.CON_t^R = pen.coef2 + pen.coef3 * YD_t^R \quad (5.56)$$

$$PEN.CON_t^H = PEN.CON_t^W + PEN.CON_t^R \quad (5.57)$$

ICPFs pay annuities to households. The amount of annuity payment depends on pension stock defined by equation (5.5) and equation (5.17). Total annuity payment is sum of the annuities received by worker and rentier households.

$$ANN_t^H = ANN_t^W + ANN_t^R \quad (5.58)$$

ICPFs invest in government bonds and earn interest return. Also, they receive dividends due to their equity assets. Therefore, total profit of ICPFs is the sum of interest return on government bonds and pension contributions minus annuities. I assume that all profit is used to invest in government bonds. In reality, some portion of the ICPFs profit may be distributed as a premium above total annuity. However, it is not significant flow.

$$PROFIT_t^{ICPF} = \pi_4 * (INT_t^{GOV} * B_{t-1}^{ICPF} + PEN.CON_t^H - ANN_t^H - Div^{ROW}) \quad (5.59)$$

Therefore, the government bond stock held by ICPFs evolve with reinvestment of profit gain as follows:

$$B_t^{ICPF} = B_{t-1}^{ICPF} + PROFIT_t^{ICPF} \quad (5.60)$$

On the asset side of ICPFs, there are government bonds and equities, while pensions and equity are on the liability side. I sum the equity on both sides and put the net equity on the asset side because equity issued by ICPFs are very low. Thus, the net worth of the ICPFs is the sum of assets and liabilities of ICPFs.

$$ICPF_t^A = B_t^{ICPF} + NET.EQUITY_t^{ICPF} \quad (5.61)$$

$$ICPF_t^L = PENSION_t^H \quad (5.62)$$

$$N.WORTH_t^{ICPF} = ICPF_t^A + ICPF_t^L \quad (5.63)$$

The net lending position of the ICPF sector is determined by the π_4 . It is a rate which determines the ICPF investment on government bonds as shown in the equation (5.60). This coefficient is between 0 and 1. For instance, ICPF sector may pay 40 percent of total profit as a premium to households, while π_4 is taken by 0.6. Therefore, the net lending position of the ICPF is defined as follows:

$$NLP_{ICPF} = (1 - \pi_4) * PROFIT_t^{ICPF} \quad (5.64)$$

5.2.6 General government

The UK government has several outlays such as real investment (G_t^{Inv}) and other expenditures as state pensions ($S.PEN_t^{HH}$). Just like the analytical model, these two-spending decisions exogenously taken by government. Total government expenditure (G^{Exp}) includes all public expenditure as well as state pensions. The government

expenditures are assumed as a fixed proportion (π_5) to GDP¹⁰, while state pensions are assumed as fixed proportions (π_6 and π_7) to total government expenditure. The government provides state pension to both rentiers and workers. Therefore, some of their state pension payments give total state pension payments.

$$G_t^{Exp} = \pi_5 * GDP^{EXP} \quad (5.65)$$

$$S.PEN_t^W = \pi_6 * G_t^{Exp} \quad (5.66)$$

$$S.PEN_t^R = \pi_7 * G_t^{Exp} \quad (5.67)$$

$$S.PEN_t^{HH} = S.PEN_t^W + S.PEN_t^R \quad (5.68)$$

The government's tax income is the sum of income tax imposed on workers and rentiers and tax on production and import (less subsidies). These are defined in the first three sectors: worker, rentier and NFCs.

$$G_t^{Inc} = TP_t^W + TP_t^R + TP_t^{EP} + TAX.PRO.IMP_t^{NFC} \quad (5.69)$$

Government makes real investment, defined in equation (5.31), which is negligible, but I prefer to add for future simulations. It receives gross operating surplus defined in equation (5.70). Both are assumed as fixed proportions to GDP. Following the real data, I assume that the UK government is running a budget deficit. Thus, government deficit is the sum of government expenditures, government investments and interest payment of government bonds of previous year minus tax received and gross operating surplus of government.

$$GOS_t^{GOV} = \pi_8 * GDP^{EXP} \quad (5.70)$$

$$G_t^{DEF} = G_t^{Exp} + S.PEN_t^{HH} + G_t^{Inv} + (INT_t^{GOV} * B_{t-1}^{GOV}) - G_t^{Inc} - GOS_t^{GOV} \quad (5.71)$$

¹⁰ According to the data, this is roughly equal to six percent of GDP between 2020-2023. This implies $\pi_5 = 0.06$. In the UK-SFC app, I defined this g_0 . While manipulating g_0 , this parameter changes.

The government runs this deficit by issuing new bonds. Hence, the government bond stock increases, while running the budget deficit as follows:

$$B_t^{GOV} = B_{t-1}^{GOV} + G_t^{DEF} \quad (5.72)$$

In terms of stock by sectoral asset, total government stock is sum of government bonds held by monetary financial institutions (B_t^{MFI}), insurance corporations and pension funds (B_t^{ICPF}), and the rest of the world (B_t^{ROW}). Government pay interest these three sectors ($INT_t^{GOV} * B_t^{GOV}$) over their size of bond stock.

$$B_t^{GOV} = B_t^{MFI} + B_t^{ICPF} + B_t^{ROW} \quad (5.73)$$

The net lending position of the government is defined as follows:

$$NLP_{GOV} = G_t^{Inc} + GOS_t^{GOV} - G_t^{Exp} - G_t^{Inv} - S.PEN_t^{HH} - (INT_t^{GOV} * B_{t-1}^{GOV}) \quad (5.74)$$

5.2.7 Rest of the world

The rest of the world receives an income from imports indicated by equation (5.30), while exports represented by equation (5.29) means income outflow from the rest of the world sector. The rest of the world has a deposit account in MFIs. The total deposit of the rest of the world is the sum of previous deposit plus net export of the UK. So, the evolution of deposits of the rest of the world is represented below. According to data, the UK economy runs a trade deficit. Therefore, the volume of deposit accounts of the rest of the world is expected to increase.

$$DEP_t^{ROW} = DEP_{t-1}^{ROW} + EXP_t - IMP_t \quad (5.75)$$

The rest of the world has interest payment. It is the sum of foreign investment of the UK (FI_{t-1}^{MFI}) in previous year times respective return ($INT.FI^{MFI}$) plus MFIs deposit of previous year ($DEP.ROW_{t-1}^{MFI}$) times respective return ($INT.DEP.ROW_t^{MFI}$). Also, the rest of the world has interest received due to previous year's government bond held by ROW (B_{t-1}^{ROW}) and previous year's deposit of ROW in the UK economy (DEP_{t-1}^{ROW}).

$$INT.PAY^{ROW} = INT.FI^{MFI} * FI_{t-1}^{MFI} + INT.DEP.ROW_t^{MFI} * DEP.ROW_{t-1}^{MFI} \quad (5.76)$$

$$INT.REC^{ROW} = INT.DEP_t^{ROW} * DEP_{t-1}^{ROW} + INT_t^{GOV} * B_{t-1}^{ROW} \quad (5.77)$$

The total profit is the difference between the interest payment and interest received. I assume that the total profit is invested in the UK's government bonds.

$$PROFIT_t^{ROW} = INT.PAY_{ROW} - INT.REC_{ROW} \quad (5.78)$$

$$B_t^{ROW} = B_{t-1}^{ROW} + PROFIT_t^{ROW} \quad (5.79)$$

The net lending position of the foreign sector is defined below.

$$NLP_{ROW} = IMP_t - EXP_t + PROFIT_t^{ROW} \quad (5.80)$$

5.2.8 Housing market

The housing market is one of the crucial sectors in the UK economy. Following the work of Burgess et al. (2016), I define housing market equation with some variations. The UK population projections show the growth of the British population. Therefore, I assume that housing stock in the UK grows exogenously, depending on the average rate of population growth (σ_0).

$$H.STOCK_t = \sigma_0 * H.STOCK_{t-1} \quad (5.81)$$

Housing transaction is a linear function of change in house price.

$$H.SOLD_t = \sigma_1 + \sigma_2 * (P_t^H - P_{t-1}^H) \quad (5.82)$$

The average price of a house is a linear function of household disposable income, interest rate on mortgages, and the stock of house. The parameter σ_3 is a constant parameter, while σ_4, σ_5 , and σ_6 adjustment coefficients.

$$P_t^H = \sigma_3 + \sigma_4 * YD_t^H - \sigma_5 * INT.LOAN_t^H - \sigma_6 * H.STOCK_t \quad (5.83)$$

I assume that households apply for mortgages for all house transactions, but maintenance and all repairs, regarding buildings are realized over gross operating surplus of households. Hence, new mortgages are the average price of houses sold houses.

$$NEW.MORT_t = P_t^H * H.SOLD_t \quad (5.84)$$

So, the stock of mortgages or household loan is the sum of previous stock plus new mortgages.

$$LOAN_t^H = LOAN_{t-1}^H + NEW.MORT_t^W \quad (5.85)$$

The total stock of loans is distributed to rentiers and workers based on the real dataset. The following equations indicate the shares (σ_7, σ_8) of mortgages across the two household groups.

$$LOAN.HH_t^W = \sigma_7 * LOAN_t^H \quad (5.86)$$

$$LOAN.HH_t^R = \sigma_8 * LOAN_t^H \quad (5.87)$$

House investment is the function of lagged new mortgages and lagged average price of houses. The first parameter of the function represents the constant parameter, which is house investment as the other two variables are given. The remaining two parameters represent adjustment coefficients.

$$I^{House} = \sigma_9 + \sigma_{10} * NEW.MORT_{t-1}^{HH} + \sigma_{11} * P_{t-1}^H \quad (5.88)$$

5.2.9 Conflicting claims and inflation dynamics

In the post-Keynesian economics, the source of information is the conflicting claims over income distribution. It is assumed that the market is imperfect, and its structure is

oligopolistic. This implies that firms have market power to determine price level. They add markup above cost.

Unlike the analytical model, our price formula includes imported commodities used in production as well as labor costs. For this reason, unit prices consist of two main factors: markup, $\varphi 1_t$ and average unit cost, UC_t , including labor cost and intermediate commodities imported from abroad.

$$P_t = (1 + \varphi 1_t) * UC_t \quad (5.89)$$

I assume that markup is exogenously determined as most of post-Keynesian models (Lavoie, 2022, p.172), although its size depends on various factors as monopoly power (Kalecki, 1971). However, this model assumes that it is constant, implying that firms hold their markup constant if it is not exogenously shocked. Just like the analytical model, I continue to assume that term theta, θ , encompasses exogenous factors such as shocks or monopoly power (Kalecki, 1971) and I will use it to give shock the model.

$$\varphi 1_t = \theta * \varphi 1_{t-1} \quad (5.90)$$

$$\theta = \bar{\theta} \quad (5.91)$$

Average unit cost is the sum of total wage payments, (WP_t) and imported commodities, $(IMP.COM_t)$ ¹¹ divided by total GDP_t . The volume of imported materials is assumed as a fixed proportion (ϵ_5) to total import as indicated in equation (5.93). Besides, unit cost formula contains import prices, P_t^{IMP} . So, price levels are influenced by the change in import prices.

$$UC_t = \frac{(WP_t + P_t^{IMP} * IMP.COM_t)}{GDP_t} \quad (5.92)$$

¹¹ These commodities are used in production. These are oil, capital goods, and intermediate goods in Trade in Goods series of UK balance of payment statistics.

$$IMP.COM_t = \epsilon_5 * IMP_t \quad (5.93)$$

In the extended model, we have two different average labor costs due to two different social groups. Therefore, the sum of unit costs for rentiers and workers is equal to the average unit labor cost of whole economy.

$$UC_t^R = \frac{WP_t^R}{GDP_t} \quad (5.94)$$

$$UC_t^W = \frac{WP_t^W}{GDP_t} \quad (5.95)$$

As mentioned before, I assume that rentiers consist of the UK population of top 20 income percentage, while remaining bottom is assumed as worker households. Therefore, number of workers, N_t^W , is equal to four times rentier population, N_t^R . The total population is the sum of number of workers and number of rentiers. I also assume that population, N_t , is constant at initial and then it grows depending on population growth projections in the simulations. There are unemployed workers among both rentiers and workers. However, I also assume that actual, $\bar{N}_t^{Act}$, and full employment, $\bar{N}_t^{Ful}$, levels, productivity of worker, $\bar{pr}_t^W$, and productivity of rentier, $\bar{pr}_t^R$, are exogenously determined and fixed at the UK economic indicators.

$$N_t = N_t^W + N_t^R \quad (5.96)$$

$$N_t^{Act} = \bar{N}_t^{Act} \quad (5.97)$$

$$N_t^{Ful} = \bar{N}_t^{Ful} \quad (5.98)$$

$$pr_t^W = \bar{pr}_t^W \quad (5.99)$$

$$pr_t^R = \bar{pr}_t^R \quad (5.100)$$

The total wage payment includes the aggregate wage incomes of both rentiers (WP_t^W) and workers (WP_t^R). Workers' wages are determined by multiplying the number of workers (N_t^W) by the average wage per worker (W_t^W). Similarly, the rentier wages are calculated by multiplying the number of rentiers (N_t^R) by the average rentier wage, (W_t^R).

$$WP_t^{Total} = WP_t^W + WP_t^R \quad (5.101)$$

$$WP_t^W = N_t^W * W_t^W \quad (5.102)$$

$$WP_t^R = N_t^R * W_t^R \quad (5.103)$$

I adopt the wage targeting approach described in chapter 9 of Godley Lavoie (2007, p.313). According to this framework, workers play a role in setting wages, while firms use their market power to set markups and, consequently, prices. Workers strive to reach a target average wage income (Ww_t^{Tar}). This target for labor income is positively influenced by both labor productivity (pr_t^W) and aggregate demand. As a proxy for aggregate demand, I utilize the ratio of actual employment to full employment. It is important to note that all the other factors are considered exogenous and encompassed in first parameter (ω_0_t) of wage targeting formula (5.104). I simulate to increase worker's wage target giving shock to worker response coefficient ($W.RES_t$).

$$Ww_t^{Tar} = \omega_0_t + \omega_1_t * pr_t^W + \omega_2_t * \left(\frac{N_t^{Act}}{N_t^{Ful}} \right) \quad (5.104)$$

$$\omega_0_t = \omega_0_{t-1} * W.RES_t \quad (5.105)$$

Hence, the average wage for worker (W_t^W) is calculated by adding the average worker wage from the previous year (W_{t-1}^W) of the targeted worker wages (Ww_t^{Tar}), adjusted for real wages, which are expressed as ($\frac{W_t^W}{P_t}$). The coefficient, (ω_3_t) is adjustment coefficient, representing the influence of the worker power stemming from unions and labor organizations. A higher value for (ω_3_t), indicates a stronger impact on the speed of

adjustment. Thus, when the power of unions and labor organizations is stronger, workers are more effective in promptly reaching their targeted wages.

$$W_t^W = W_{t-1}^W + \omega 3_t * \left[W_{t-1}^{Tar} - \left(\frac{W_t^W}{P_t} \right) \right] \quad (5.106)$$

The process resembles that of rentier wage income, albeit with different parameters and adjustment rates. Like the adjustments seen with workers, changes in economic conditions prompt alterations in rentier wage income. However, the particular parameters governing these adjustments, and their rate of change are unique to the rentier context. The distinct set of parameters and the characteristic pace of adjustments attributed to rentiers differentiate their wage income dynamics from those of workers.

$$W_{t-1}^{Tar} = \rho 0_t + \rho 1_t * pr_t^R + \rho 2_t * \left(\frac{N_t^{Act}}{N_t^{Ful}} \right) \quad (5.107)$$

$$\rho 0_t = \rho 0_{t-1} * R.RES_t \quad (5.108)$$

$$W_t^R = W_{t-1}^R + \rho 3_t * \left[W_{t-1}^{Tar} - \left(\frac{W_t^R}{P_t} \right) \right] \quad (5.109)$$

As markups and wages fluctuates, the shifts in profit and labor shares (WP_t^W / GDP_t) result in changes to income distribution as well as price level. Thus, inflation emerges as a product of the distributional claims of both workers and firms.

To detect contributions of change in profit income, wage income, other income and tax income to inflation, I follow calculations of Weber and Wasner (2023). Firstly, aggregate profit received, aggregate wage received, aggregate other income received, and aggregate tax received are calculated below.

$$Profit.Receive_t = GDP^{INC} - WP - TAX.PRO.IMP_t^{NFC} - GOSH \quad (5.110)$$

$$Wage.Receive_t = WP_t^{Total} \quad (5.111)$$

$$Other.Inc.Receive_t = NOS^H \quad (5.112)$$

$$Tax.Receive_t = TAX.PRO.IMP_t^{NFC} \quad (5.113)$$

Secondly, the deflator of each received is calculated by nominal values of each one divided by real GDP value, which is base year. Therefore, sum of profit deflator, wage deflator, other income deflator, and tax deflator is equal to GDP deflator for each year.

$$Profit.DEF_t = \left(\frac{Profit.Receive_t}{GDP_{base\ year}^{INC}} \right) \quad (5.114)$$

$$WP.DEF_t = \left(\frac{Wage.Receive_t^{Unit}}{GDP_{base\ year}^{INC}} \right) \quad (5.115)$$

$$Other.Inc.DEF_t = \left(\frac{Other.Inc.Receive_t}{GDP_{base\ year}^{INC}} \right) \quad (5.116)$$

$$TAX.DEF_t = \left(\frac{Tax.Receive_t}{GDP_{base\ year}^{INC}} \right) \quad (5.117)$$

$$GDP.DEF_t = \left(\frac{GDP_t^{INC}}{GDP_{base\ year}^{INC}} \right) \quad (5.118)$$

$$G.GDP.DEF_t = 100 * \left(\frac{GDP.Def_t - GDP.Def_{t-1}}{GDP.Def_{t-1}} \right) \quad (5.119)$$

Doing this, we can track the relative change of each deflator. Therefore, how much nominal change in price associated with inflation is captured by capital in terms of a nominal rise in profit flows. Capture of inflation by profit, capture of inflation by wages, capture of inflation by other income and capture of inflation by tax are calculated as follows:

$$Profit.Capture_t = 100 * \frac{(Profit.DEF_t - Profit.DEF_{t-1})}{(GDP.DEF_t - GDP.DEF_{t-1})} \quad (5.120)$$

$$Wage.Capture_t = 100 * \frac{(WP.DEF_t - WP.DEF_{t-1})}{(GDP.DEF_t - GDP.DEF_{t-1})} \quad (5.121)$$

$$Other.Inc.Capture_t = 100 * \frac{Other.Inc.DEF_t - Other.Inc.DEF_{t-1}}{(GDP.DEF_t - GDP.DEF_{t-1})} \quad (5.122)$$

$$TAX.Capture_t = 100 * \frac{(TAX.DEF_t - TAX.DEF_{t-1})}{(GDP.DEF_t - GDP.DEF_{t-1})} \quad (5.123)$$

Lastly, the sum of four captures must be equal to 100 percent. If each capture is multiplied with growth of price deflation in equation (5.119), profit, wage, other income, and tax contributions to inflation are obtained.

$$Profit.Con_t = G.GDP.DEF_t * Profit.Capture_t \quad (5.124)$$

$$Wage.Con_t = G.GDP.DEF_t * Wage.Capture_t \quad (5.125)$$

$$Other.Inc.Con_t = G.GDP.DEF_t * Other.Inc.Capture_t \quad (5.126)$$

$$Tax.Con_t = G.GDP.DEF * TAX.Capture_t \quad (5.127)$$

The following four equations represent calculation of import price contributions to inflation. However, import price contributions are already encompassed by profit contributions. Therefore, profit contributions increase while import cost shock comes exogenously because imported materials are already included gross operating surplus of NFC.

$$Imp.Cost.Receive_t = P_t^{IMP} * IMP.COM_t \quad (5.128)$$

$$Imp.Cost.DEF_t = \left(\frac{Imp.Cost.Receive_t}{GDP_{base\ year}^{INC}} \right) \quad (5.129)$$

$$Imp.Cost.Capture_t = 100 * \frac{(Imp.Cost.DEF_t - Imp.Cost.DEF_{t-1})}{(GDP.DEF_t - GDP.DEF_{t-1})} \quad (5.130)$$

$$Imp. Cost. Con_t = G. GDP. DEF * Imp. Cost. Capture_t \quad (5.131)$$

In addition, one notable distinction between the analytical model and this extended model lies in the treatment of imported commodities. In contrast to the analytical model, in this extended model, fluctuations in the price of imported commodities have the potential to escalate distributional conflicts and inflation, even if changes in the price of imported commodities are not directly related to domestic actors such as workers, rentiers, and firms.

5.3 Combating income and wealth inequality

In this part, I present recent literature on the dynamics of income and wealth inequality in the UK economy, with a particular focus on the post-COVID era. Subsequently, I make potential scenarios linked to incomes policy and simulate the UK-SFC model from 2024 onwards. Through these simulations, I aim to refine and evaluate various types of income policies, providing a comprehensive understanding of their implications for the UK economy, particularly in addressing income and wealth inequality while reducing inflation. Specifically, we monitor and examine the impact of income policies on inflation.

5.3.1 Dynamics of income and wealth inequality in the post-COVID19 era in the UK

This subsection presents a brief literature on the U.K. Income and wealth inequality in the U.K. is significant and long-term issue, drawn attention of the researchers even before the COVID-19 pandemic. For instance, Alvaredo et al. (2016) investigate the drivers of the wealth concentration in the top 1 percent of population in post 2000s of the U.K. They focus not only on wages and earned income but also capital income, which is the main significant source of top of the distribution. They conclude that deterioration in the income distribution is not complete and there need to invest into various sources in order to give satisfactory answers to questions about the wealth concentration. Morelli and Atkinson (2015) analyze the link between either growth or level of inequality and banking

crisis. According to aggregate statistical results, they reach no statistically convincing results that either growth or level of inequality affects banking crisis. However, the hypotheses, theorizing the channel from level and growth of inequality to crisis cannot be rejected for some countries such as the US and the UK. Furthermore, some research highlights the role of income and wealth inequality in the recent crisis in literature. For instance, Goda et al. (2016) reveal that the rise in income inequality and global wealth concentration contributed to the emergence of the financial and Eurozone crisis. The higher income inequality led to balance of payment imbalances and expansion in debt levels. Increasing wealth concentration is another major factor behind the crisis due to increasing asset demand, coming from the rich. Such a demand plays an essential role in the growth of the structured credit market, which also allows access of poor and middle-income groups to accumulate debt. Authors propose that the policy response to the crisis should involve policies that reduce inequalities by raising the bargaining power of workers as well as redistributive taxation.

Inequality is also a long-term issue. There are two important studies conducted by Alverado et al. (2018) and Madsen (2019) from a long-term perspective. Alvaredo et al. (2018) provide crucial insights on the evolution of the top wealth share of the U.K between 1895 to present. Analyzing the distribution of houses left at death, they explore that applying mortality multipliers to house data to estimate wealth among the living doesn't significantly change the level of wealth concentration throughout much of the period in both the UK and US. Besides, the results show that the UK experienced constant wealth concentration within the first wave of globalization. However, the wealth concentration in the UK fell significantly between 1914-1979. Then the 1980s featured as neoliberalism signify a sharp increase in top share, particularly in the wealth distribution in which real estate is not included. On the other hand, Madsen (2019) investigates wealth and inequality in the U.K. between 1210-2013, using annual data for the private wealth-income ratio. The findings demonstrate a U-shaped wealth income path over the past two centuries, driven by the transition from preindustrial capitalism to industrialization. Moreover, the ratio increases significantly during the post 1980 era, featuring a new transition from industrial era to the post-industrial era.

The economy of the UK is characterized by a highly financial structure, generating rentiers and boosting rentier income. Christophers (2019) demonstrates that rentierism operating in the UK with its various forms is significant, even more dominant, and dynamic compared with the neoliberal period during 1980s. This article clarifies the rentierism in the U.K. under the neoliberal policies, emphasizing the essential developments in monetary and fiscal policies, particularly regarding property rights and asset ownership. The wealth concentration is a significant result of the neoliberal financial character of the UK economy.

Cauvain et al. (2020) evaluate the link between segregation and income inequality in UK cities, using experimental household income dataset sourced by the Office of National Statistics. While local income inequality is worsening, the segregation of high-income individuals at the urban and neighborhood scales over England and Wales increases. Findings show that wealthier cities have higher income inequality with less segregation but, segregation is rising in lower average income cities. Using the UK Family Resource Survey, Henseke et al. (2021) examine how income inequality determines private school access since 1997 in the UK. The findings demonstrate that housing wealth is a key factor behind private school access for families. Nevertheless, low-income families may scantily access private schools using limited family wealth and bursaries. They also find that distribution of bursaries is progressive but still most families at a low income do not access sufficient bursaries and other financial resources. Tarne et al. (2022) examine the impacts of borrower-specific credit constraints, constructing an agent-based housing market model calibrated using household survey statistics of the U.K. They highlight different loan to value caps for four types of agents: first-time buyers, second and subsequent buyers, and buy to let investors, researchers show that restrictions that depend on borrower type influence wealth inequality. For instance, limitation on investors to access to credit causes to significant fall in debt and wealth inequality, while restricting first-time buyers and subsequent buyers generates no substantial impact on household debt and wealth inequality. Therefore, this study suggests a policy approach that prioritizes macroprudential requirements for buy-to-let investors to reduce household debt and wealth inequality. Crossley et al. (2023) examine the financial inequalities and the labor market, benefiting from high quality UK panel dataset covering the period

between April 2020 and September 2021. They point out no evidence of an average divergence in labor market outcomes in terms of gender. The labor market inequalities across ethnic minorities and the young individuals initially increased, but the deteriorations substantially were reversed by March 2021. Chen et. al. (2024) analyze the evolution of wage income inequality in the U.K., using a quantile selection model with an equation of informative censored selection. The findings show a significant negative employment selection among males and a positive employment selection for females. They suggest that the gender wage differentials have remained substantially high.

Moreover, there are comparative studies in which researchers analyze the issue, comparing the UK and other countries. Smith et al. (2022) highlight the role of housing as a driver of economic inequality for the last two decades of three major countries: Australia, the USA, and the UK. The research provides empirical and conceptual investigations with detailed literature survey and tries to fill the gap in the economic inequality, by focusing on the residential property with the long run perspective. Cribb (2024) examines the income inequalities in the labour market between 1968-2021 in the UK, using microdata harmonized with 16 other advanced countries. In the period of the 80s, the UK labour market was damaged significantly, leading to rising inequalities. Since the 1980s, erosion in the labour market has been more modest. The article also provides evidence on the impact of the COVID-19 pandemic in the UK. Findings show that disposable income inequality decline slightly due to rising state benefits which support incomes of poorer individuals. Using the Wealth and Assets Survey dataset that contains detailed micro information at household level, Mumtaz and Theophilopoulou (2020) construct monthly measures of wealth inequality between 2006 and 2018 for the U.K. They examine the dynamic relation between the evolution of measures of wealth inequality and monetary policy. The results propose that the shock of expansionary monetary policy causes rising wealth inequality and triggers significantly to its fluctuations. Moreover, the shock of monetary policy expansion causes heterogenous effects on the wealth distribution, affecting the median individuals relatively larger amount than 10th and 20th percentile.

The body of literature examining the impact of the COVID-19, and policies implemented during the pandemic in the U.K has significantly enriched since the onset of the pandemic.

For instance, Witteveen (2020) analyzes the furlough scheme implemented by the UK government during COVID-19. The findings point out structural gender earning inequalities and show that individuals in lower income groups were more than twice as likely to encounter financial difficulties compared to those in the highest income groups. Blundell et al. (2022) elucidate the impact of the COVID-19 pandemic on inequalities in the labour market, standards of living, mental health, education and wealth in the UK. Lockdowns affected education, leading to the decline in learning, especially for poorer children. It caused a fall in earnings and worsening mental health. However, job support programs and expansion of welfare system led to decrease in disposable income inequality, while rising house prices caused improvement in wealth distribution for those around the middle of the wealth distribution. Montgomerie (2023) evaluates fiscal policies, responding to the effects of COVID-19 pandemic in the US and the U.K. The findings demonstrate that the size of economic relief, instead of its degree and initial success, may enlarge the inequality. The argument behind this is that monetary flows bring with rising wealth gains for the individuals at top income shares, while fiscal flows generated temporary provisions and gains for individuals at low-income shares. Macartney et al. (2022) delve into the implications of the COVID-19 pandemic on inequality in the UK. They argue that the pandemic has exacerbated the vulnerabilities within the financialized economies, where economic policies and responses to the COVID-19 pandemic have often favored the wealthier groups, thereby widening the gap between the rich and the poor. This book provides a critical examination of policy decisions during the COVID-19 pandemic and their long-term implications for social and economic justice. For instance, they criticize that the economic policy responses of the UK to COVID-19 pandemic have driven the inequalities. While a care-led and green economy policies supported by Keynesian spending incentives may address some of the worst outcomes of inequalities in the short run, redistributive taxation and spending decision may be implemented and may open a door on universal welfare ideas that contribute to mitigate some of the worst suffering and hardship.

Furthermore, there are theoretical examinations. For instance, Shin (2024) suggests new theoretical insights into the impact of the COVID-19 on income inequality. The effect of COVID-19 is evaluated through figures and animations. The results propose that change

in labor opportunities influenced wage income and exacerbated income inequality. The pandemic caused a significant fall in income for high income individuals and a much more decline in income for low-income individuals. It increased the share of net worth held by capitalists and their income flows, while workers face a sharp decline in their income shares, intensifying economic inequalities and wealth differentials.

5.3.2 Scenario analysis

In this subsection, I present the simulation results of several future scenarios using the UK-SFC app, an online web application developed with R Shiny. This app integrates the two household SFC models described in Section 5 with data science technology, offering an interactive interface for exploring policy analysis, such as tax implementation and government spending. Screenshots of the UK-SFC app are provided in the Appendix.

I design three incomes policy scenarios, which are shaped based on five primary and four secondary variables¹². Before detailing these scenarios and discussing the simulation results, I will first explain the variables and how they can be adjusted within the UK-SFC app.

When you choose incomes policy scenario in the UK-SFC app, you see nine sliders corresponding to the primary and secondary variables. The primary variables are government spending, worker wage tax, rentier wage tax, import tax, and excess profit tax. The only difference from the first slider is that the sliders of the following three do not change the value directly; instead, they add or subtract the selected value. Excess profit tax corresponds to the parameter τ^{EP} in equation (40). If the government decides to impose this tax, the gross operating surplus of NFCs directly reduces and flows into the government. Government spending can be adjusted using the parameter π_5 in equation (63). For example, when you adjust the g0 slider by selecting 0.1, this implies a 10 percent increase in government expenditure, which in turn also triggers an increase in state pensions, directing additional funds to households. Tax on Worker Wages represents

¹² Any user can see these variables when choosing incomes policy scenarios in the UK SFC app. They can manipulate these variables by making their own scenarios

worker wage tax, which is τ^W in equation (7). This is initially 0.11, which means 11 percent of worker wages. Adjusting the slider by 1 percent implies increasing tax rate from 11 to 12. Taxes on rentier wages, denoted by τ^R equation (19), is initially set at 26 percent, and the procedure for adjusting it is similar to that of the worker wage tax. The import tax, represented by τ^{PI} in equation (35), is initially set at 22 percent, and adjustments follow the same process. Excess profit tax, defined by τ^{EP} in equation (40). If the government imposes this tax, it directly reduces the gross operating surplus of NFCs, with the funds flowing into government coffers.

The secondary variables should be adjusted based on the scenario being analyzed. Private Real Investment, controlled by the slider adjusting i_0 in equation (32), is one of these secondary variables. Private housing Investment, which manipulates σ_9 in equation (89), is another. For instance, setting the slider to 10 implies a 10 billion increase in housing investment. The remaining two sliders control the rentier consumption function. The Rentier Consumption (YD) slider corresponds to c_1 in equation (21) and is initially set at 0.65, meaning that 65 percent of rentier disposable income is consumed. Adjusting this slider changes the value; for example, setting it to 0.01 increases consumption 66 percent of disposable income. The final slider controls c_2 in equation (21), affecting rentier consumption out of their net wealth. In most empirical SFC models, this parameter is typically assumed or estimated to be around 1 percent. If you adjust the slider by 0.01, this implies that the value increases to 2 percent.

All sliders include options for shock durations, with three choices available: 1 year, 3 years, and 5 years. The shock duration must be selected before running the model. For instance, if you adjust government expenditure by 10 percent and choose a 3-year shock duration, this implies a 10 percent increase in government expenditure each year between 2024 and 2026, rather than a total 10% increase over the entire period.

Based on the model framework, factors such as government expenditure, private real and housing investments, increases in rentier consumption, and any form of tax reductions that stimulate spending serve as key drivers that enhance profit contributions. Accordingly, the first scenario is constructed under several assumptions. First, the average increase in government expenditure between 2020 and 2023 is set at 6 percent,

and it is assumed that this rate of expansion will persist over the next three years. Second, all tax rates remain unchanged. Third, households and non-financial corporations (NFCs) are assumed to continue investing at levels consistent with their averages from 2020 to 2023, defined by i_0 and σ_9 . Fourth, rentier consumption out of disposable income is held constant at its baseline level of 65 percent. Lastly, it is assumed that during the COVID-19 lockdowns, households accumulated additional wealth, leading to increased spending during the recovery years. Consequently, the propensity to consume out of wealth (c_2) is assumed to rise by 1.5 percent, with a three-year duration, starting with 2024. This is implemented by applying a shock of 0.005, which raises c_2 directly to 1.5 percent for each year during the three-year span. Typically, c_2 is close to or below 1 percent, making this assumption a notable deviation to reflect post-COVID-19 spending behavior.

Figure 5.6 shows results regarding inflation decomposition for the UK economy¹³. As a consequence of the first scenario, we observe that profit contribution, marked by red, boosts significantly. More specifically, government expenditure and rentier consumption keep profits sustained and alive, leading what has been termed as, *profit-led inflation*, while real investment of NFC and housing investment of households also contribute positively to gross operating surplus. In addition, we observe a sharp decline in profit contribution, affecting negatively inflation in 2027 because of that year out of scope of shock duration.

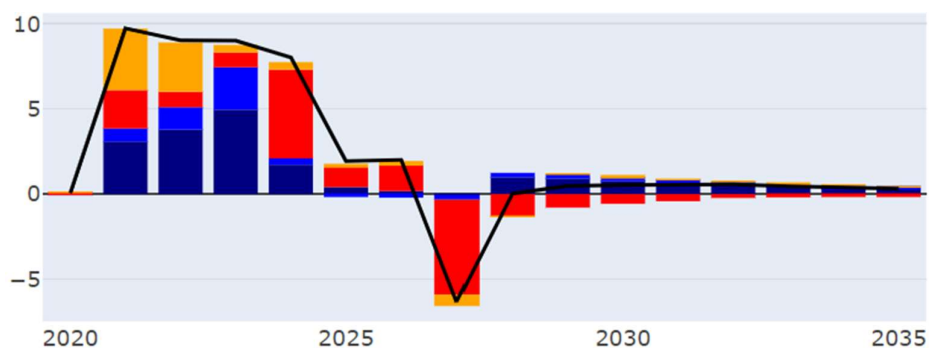


Figure 5.6: GDP deflator decomposition of the first scenario

¹³ The illustrations of scenarios, which are not included in this section, can be found in Appendix part, along with the effects of scenarios on the income distribution and income flows.

The question is how the state would conduct an incomes policy to tame profit-led inflation. There are three approaches. The first one is that it could reduce its expenditure. If the government had reduced its expenditure, while all other factors remained the same as assumed in the scenario, the outcome would have been as following two figures.

When g_0 is 0.06 percent, the growth rate of the growth of GDP deflator in 2024 is 8.01 percent, of which 5.20 percent comes from profit contribution. However, the profit contribution decreases from 5.20 percent to 4.35 percent, and the growth rate of the GDP deflator declines from 8.01 percent to 7.06 percent when g_0 is reduced to 0.04 percent. This is represented in Figure 5.7. If the state had implemented a sharper expenditure cut ($g_0 = 0.02$ percent), the growth rate of the GDP deflator would fall to 6.1 percent, while the profit contribution would decline further to 3.49 percent, as illustrated in Figure 5.8. However, a possible consequence of this cut is the sharp decline in employment, leading to low standards of public services that nobody wants. This is a hard landing scenario of incomes policy.

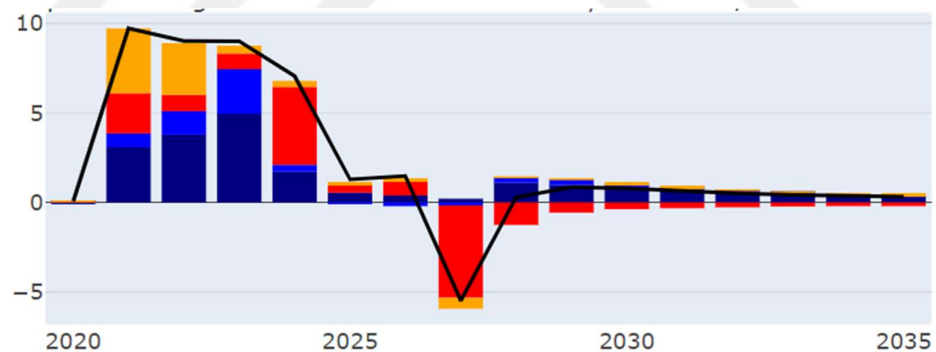


Figure 5.7: Expenditure cut scenario g_0 is 0.04 percent

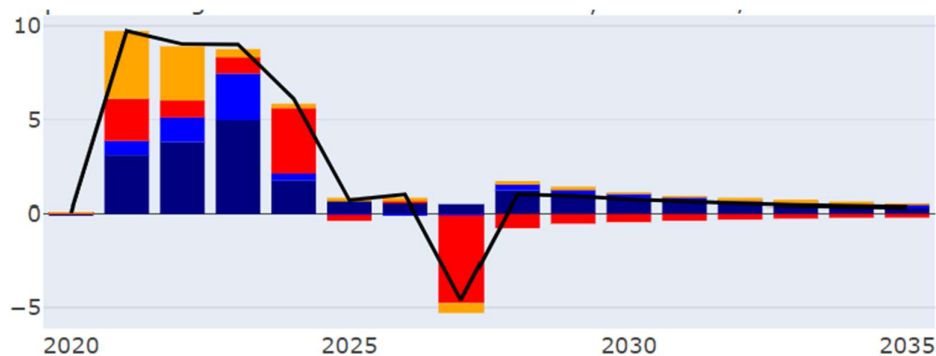


Figure 5.8: Expenditure cuto scenario g_0 is 0.02 percent

The second approach is an alternative scenario to a government spending cut, which is taxation. There are several types of taxes that the state could consider. Firstly, the state could increase the tax on rentier wages. If the government had raised this tax from the baseline level ($\tau^R = 26$) to 30 percent, while all other factors remained the same as assumed in the initial scenario, the outcome would have been as follows:

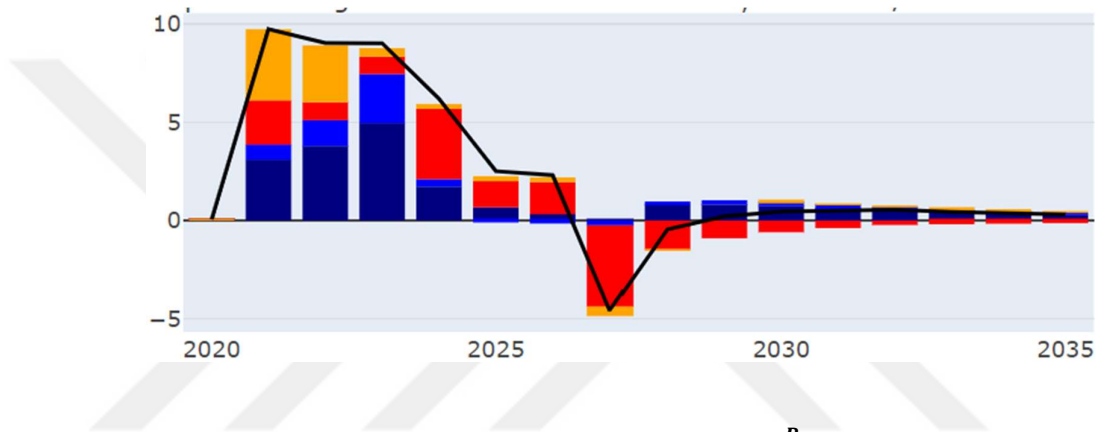


Figure 5.9: Raising rentier tax ($\tau^R = 30$)

Figure 5.9 shows that the growth rate of the GDP deflator decreases to 6.18 percent, while the profit contribution declines to 3.57 percent. This taxation absorbs a significant portion of profit, tapering off the inflation.

The second taxation alternative is raising the import tax. If the government had increased this tax from the baseline level ($\tau^{PI} = 22$) to 27 percent, while all other factors remained the same as assumed in the initial scenario, the outcome would have been a reduction in the growth rate of the GDP deflator to 5.83 percent, with a 1.13 percent profit contribution and a 2.32 percent tax contribution as illustrated by Figure 5.10. Although inflation shows a sharp decline in this scenario, increasing the import tax could trigger inflation through different channels that we have not controlled for here, considering that a significant portion of the UK imports consists of intermediate and capital goods used in production.

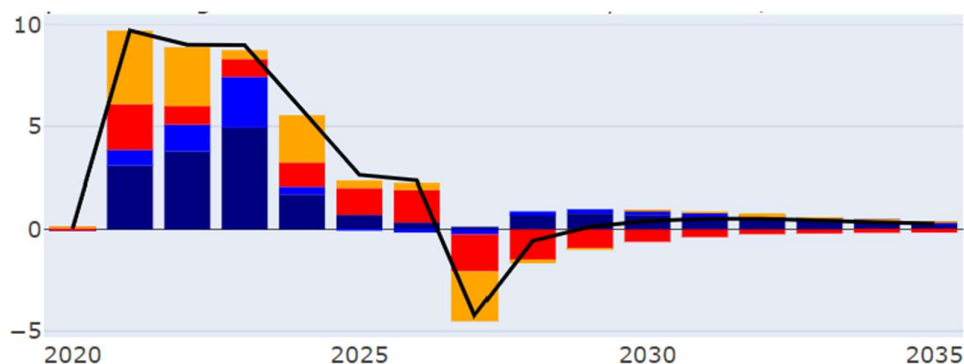


Figure 5.10: Raising import tax ($\tau^{PI} = 27$)

Rather, if the government had announced excess profit tax for just one year shock, imposing 10 percent excess profit tax over the gross operating surplus of NFC sector, while all other factors remained the same as assumed in the initial scenario, the outcome would have been a reduction in the growth rate of the GDP deflator to 6.39 percent, with a 3.77 percent profit contribution as illustrated by Figure 5.11.

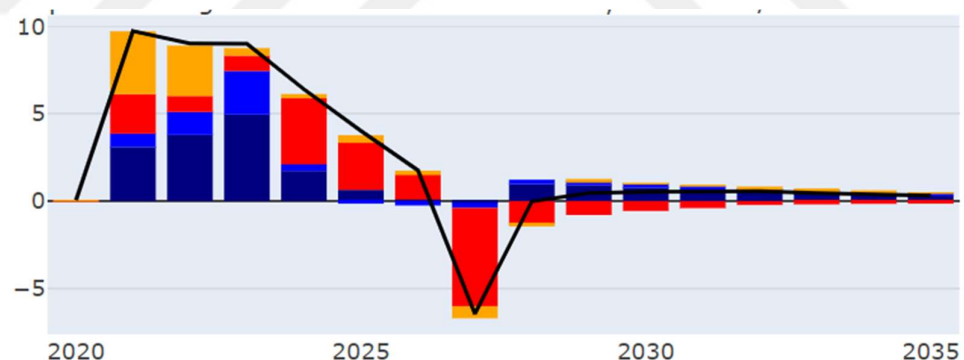


Figure 5.11: Imposing excess profit tax ($\tau^{EP} = 10$)

Fourthly, the government may announce financial income tax. This tax cuts the financial incomes of rentiers such as interest and dividends, leading to reduced disposable income of rentiers. If the state had imposed 20 percent within 1 year, while all other factors remained the same as assumed in the initial scenario, the outcome would have been a reduction in the growth rate of the GDP deflator to 7.13 percent, with a 4.43 percent profit contribution as illustrated by Figure 5.12.

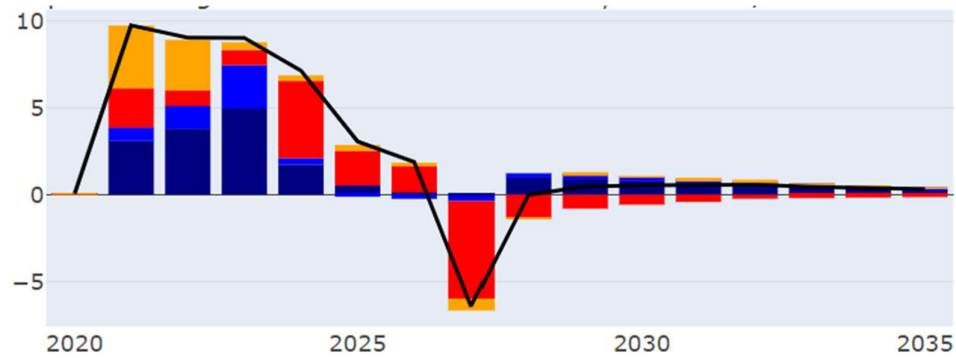


Figure 5.12: Imposing financial income tax ($\tau^F = 20$)

Fifthly, there is a neoliberal alternative. Even if workers are not significantly responsible for inflation in the initial scenario, if the government had increased tax on worker wages from the baseline level ($\tau^W = 0.11$) to 15 percent, while all other factors remained the same as assumed in the initial scenario, the outcome would have been a reduction in the growth rate of the GDP deflator to 5.33 percent, with a 2.81 percent profit contribution as illustrated by Figure 5.13.

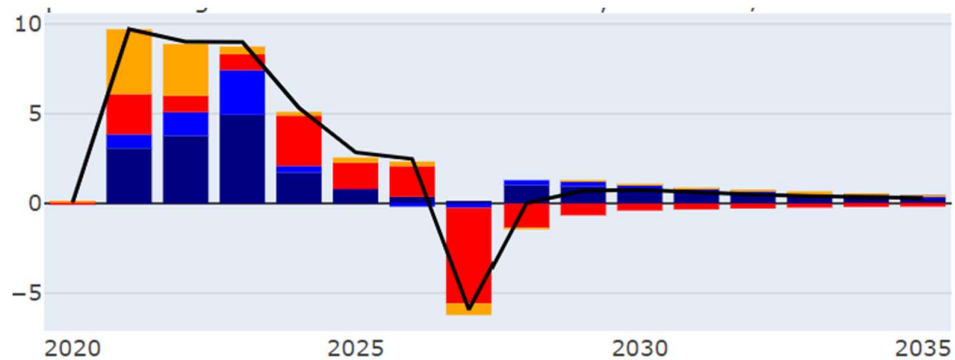


Figure 5.13: Raising worker tax ($\tau^W = 15$)

Furthermore, if the government had taken an additional step and cut its expenditure ($i_0 = 0.02$ percent) at the same time, the outcome would have been a dramatic fall in the growth rate of the GDP deflator to 3.42 percent, with a 1.1 percent profit contribution, as illustrated by Figure 5.14. However, the state would face a devastating labour market

outcome, potentially leading to unemployment of thousands of workers and a dramatic decline in the standards of public services.

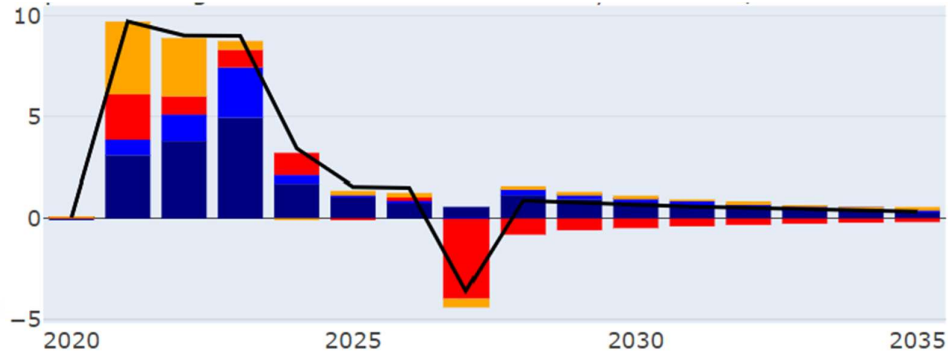


Figure 5.14: Raising worker tax ($\tau^W = 15$) with sharp expenditure cut ($g_0 = 0.02$)

The government had followed a mixed scenario, cutting expenditure ($g_0=0.5$), taxing rentiers ($\tau^R = 30$) and workers ($\tau^W = 12$), and imposing a one-year excess profit tax ($\tau^{EP} = 10$), the outcome would have been a significant fall in the growth rate of the GDP deflator to 3.61 percent, with a 1.29 percent profit contribution, as illustrated by Figure 5.15. This would have been a better outcome, with no significant loss in employment and no significant fall in the standards of public services.

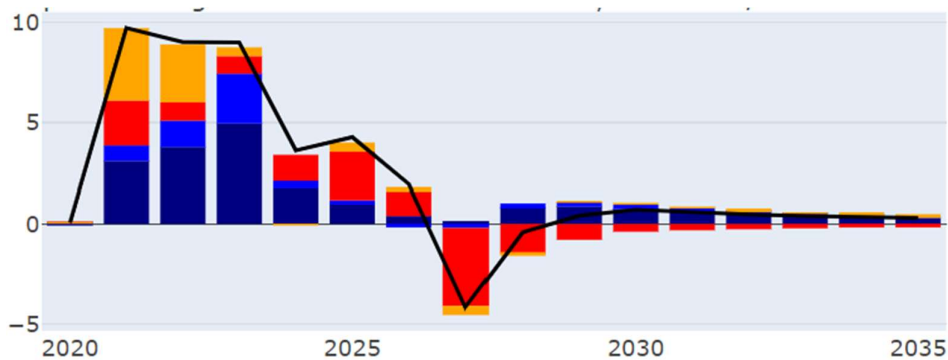


Figure 5.15: Incomes policy mix ($\tau^R = 30$, $\tau^W = 12$, $g_0 = 0.05$, and $\tau^{EP} = 10$)

The other alternative mix scenario is that the government cuts expenditure ($g_0=0.5$), tax rentier wage income with 3 year shock ($\tau^R = 30$) and rentier financial income with 3 year shock ($\tau^F = 20$), and imposes a one-year excess profit tax ($\tau^{EP} = 10$), the outcome would have been a significant fall in the growth rate of the GDP deflator to 3.78 percent, with a 1.45 percent profit contribution, as illustrated by Figure 5.16. This would have been a second better outcome, with no significant loss in employment and no significant fall in the standards of public services.

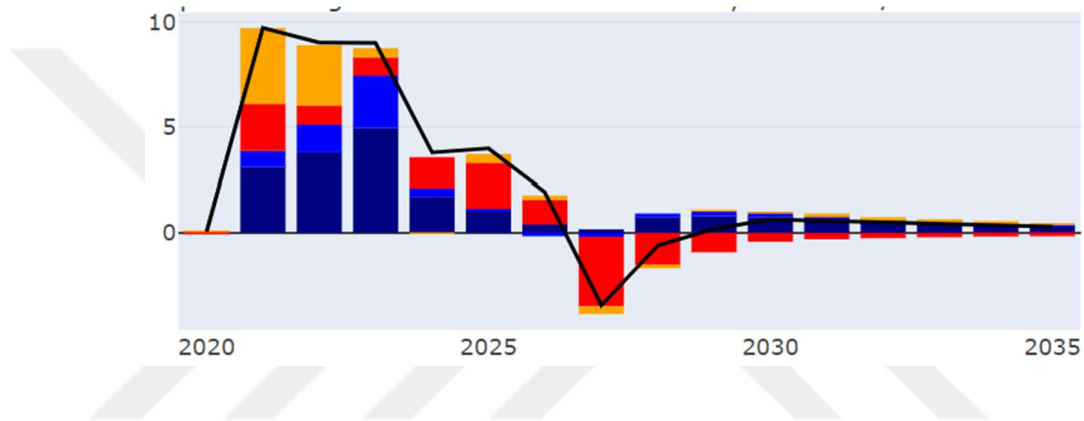


Figure 5.16: Alternative incomes policy mix ($\tau^R = 30$, $\tau^F = 20$, $\tau^{EP} = 10$, and $g_0 = 0.05$)

The scenarios illustrated in Figure 5.17 to 5.18 also have distributional consequences. Figure 5.17 demonstrates the distributional consequences of the first scenario. The top-left graph shows the worker share, defined as total worker wages divided by GDP income, while the top-right graph represents the rentier share, calculated as total rentier wages divided by GDP income. The bottom-left graph demonstrates the profit share, which includes rentier wages and is GDP income minus worker wages. Lastly, the bottom-right graph shows the rentier income share, calculated as the disposable income of rentiers divided by total disposable income of household sector.

As a result of the initial scenario, the worker share decreases from 0.236 to 0.226 in the first year and continues to decline, reaching 0.215 by 2026. Similarly, the rentier share declines from 0.274 to 0.262 in the first year and further decreases to 0.259 in 2026. On the contrary, the profit share increases from 0.763 to 0.773 in the first year and continues

to increase, reaching 0.784 by 2026. Although the rentier share falls, rentier income share increases from 0.348 to 0.362 in the first year and further increases to 0.372 by 2026.

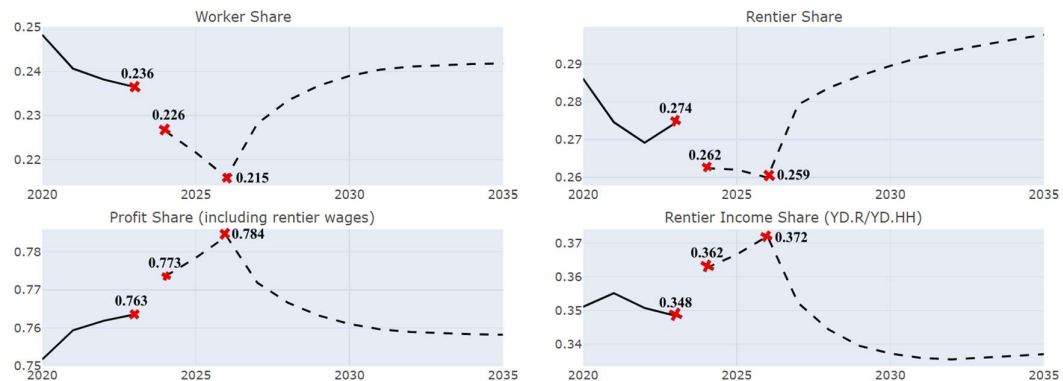


Figure 5.17 Distributional consequences of the first scenario

There is no significant distributional difference between the initial scenario illustrated in Figure 5.17 and the scenarios represented in Figure A.5.10 and Figure A.5.11, which are included in the appendix. There is slight difference that scenarios represented in Figure A.5 and A.6 reduce the distinction between values of 2023 and 2026 compared to initial scenario.

On the other hand, the scenario focusing on raising rentier tax, illustrated in Figure 5.18, demonstrates significant variability, particularly in rentier income shares. While the rentier income share still increases, the rate of increase slows by 1.4 percent in the first year, and the value for 2026 is 1.5 percent lower than the initial scenario.

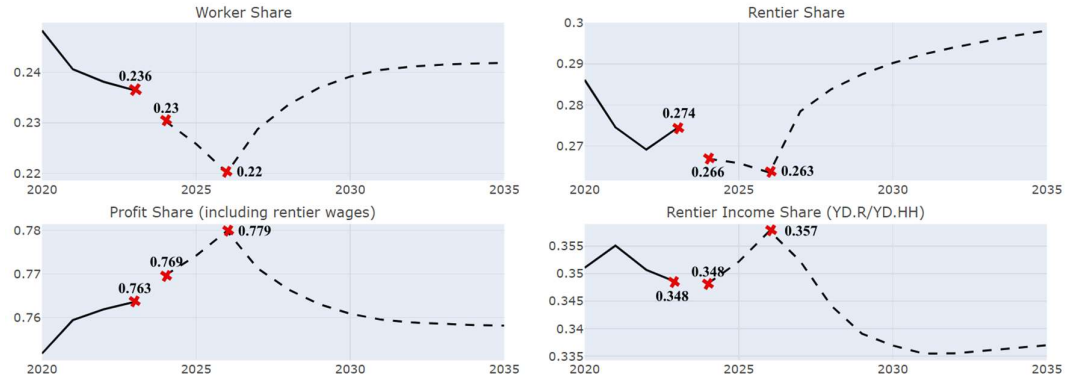


Figure 5.18: Distributional consequences of raising rentier tax ($\tau^R = 30$)

As illustrated Figure 5.19, The scenario that considers raising the import tax shows a noticeable difference, particularly in rentier income share. In the first year, there is almost no change in value, but it gradually increases to 0.358 percent. However, this is 1.4 percent lower than the initial scenario.

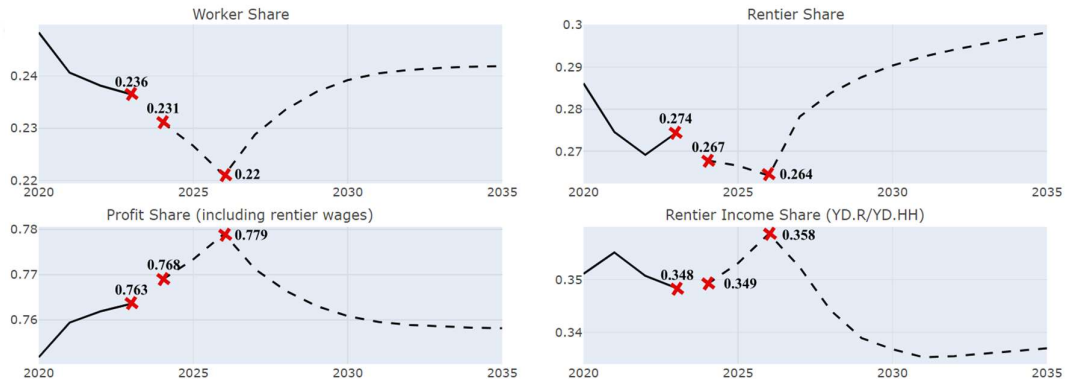


Figure 5.19: Distributional consequences of raising import tax ($\tau^{PI} = 27$)

Figure 5.20 illustrates the scenario that considers imposing a sudden excess profit tax shows a noticeable difference, particularly in rentier income share. In the first year, there is almost no change in value. However, this policy restricts the 1.1 percent decrease in the rentier income share compared to the initial scenario. Similarly, the scenario illustrated in Figure 5.12, which is 20 percent financial income tax for one year performs almost similar distributional findings. Figure A.5.11 is presented in the appendix.

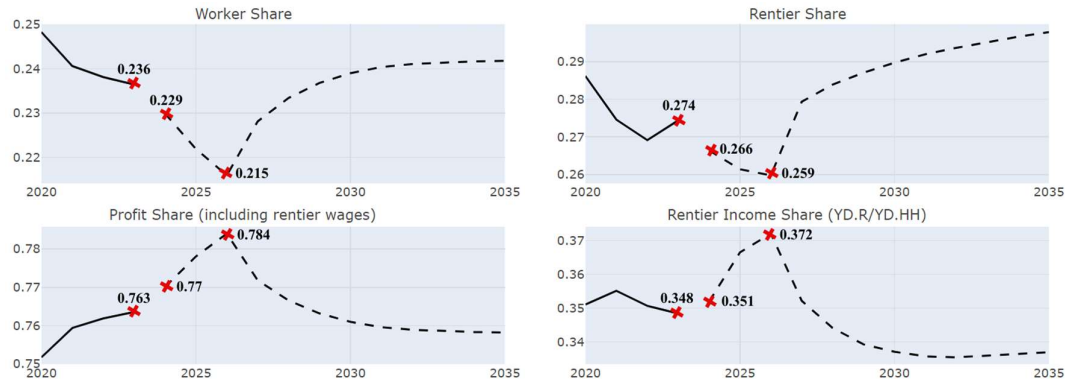


Figure 5.20: Distributional consequences of imposing excess profit tax ($\tau^{EP} = 10$)

The following two neoliberal scenarios are illustrated in Figure 5.21, where depicts a 4 percent increase in worker taxes, and Figure 5.22, which includes an additionally sharp expenditure cut. These two scenarios have significant distributional consequences. In the first one, which is a 4 percent increase in worker tax, it appears that the values for 2023 and 2024 are close to each other, leading to a smoother transition. However, the additional sharp expenditure cut brings a significant change. The worker share and the profit share including rentier wages remains almost horizontal, while the rentier share slightly increases. This suggests that significant declines in shares are mitigated, even if rentier income share continues to rise and remains stagnant between 2024 and 2026.



Figure 5.21: Distributional consequences of raising worker tax ($\tau^W = 15$)



Figure 5.22: Distributional consequences of raising worker tax ($\tau^W = 15$) with sharp expenditure cut ($g_0 = 0.02$)

The last two scenarios have significant distributional implications, generating the best distributional outcomes by mitigating income inequality. The first incomes policy mix generates a significant decline in rentier income share, from 0.348 to 0.335, before recovering to 0.352. However, this means a 2.7 percent decrease in value for 2024 and a 2 percent fall in value for 2026 compared to the initial scenario. Furthermore, if the state takes additional step by imposing a 20 percent financial income tax over 3 years, it further suppresses the recovery of rentier income between 2024 and 2026, as shown by the dashed red line in the bottom-right graph of Figure 5.23.

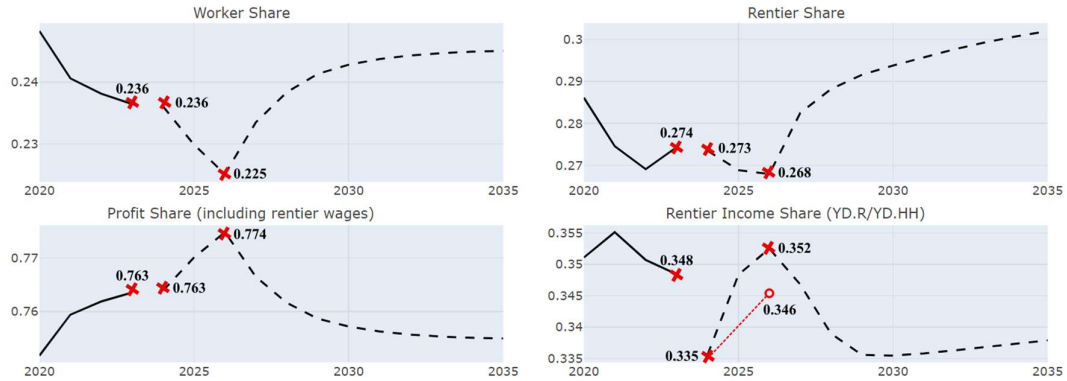


Figure 5.23: Distributional consequences of incomes policy mix ($\tau^R = 30$, $\tau^W = 12$, $g_0 = 0.05$, and $\tau^{EP} = 10$)

The second alternative income policy mix, illustrated in Figure 5.24, assumes no change in worker taxation but includes a 4 percent increase in rentier taxation, a 20 percent financial income tax over three years, a 10 percent increase in excess profit tax over one year, and a 1 percent decrease in expenditure over three years. This is the most effective scenario for mitigating income inequality. It results in a 3.2 percent reduction in the first year compared to the initial scenario and a 2.9 percent reduction in value for 2026 compared to initial scenario.



Figure 5.24: Distributional consequences of alternative incomes policy mix ($\tau^R = 30$, $\tau^F = 20$, $\tau^{EP} = 10$, and $g_0 = 0.05$)

5.4. Conclusion

This chapter introduces the behavioral equations and macroeconomic identities of the UK-SFC model, outlining the derivation of its stocks and flows while also exploring the dynamics of income and wealth inequality in the post-COVID UK economy. Using the UK-SFC model, several scenarios are simulated to explore how the economy behaves, its impact on inflation, and the resulting distributional consequences. The model is calibrated to generate stable results consistent with UK macroeconomic variables in 2020. However, the UK economy experienced a recovery between 2020 and 2023. Data from these years, provided by the Office for National Statistics, form the basis for simulations, with their averages representing key assumptions.

The initial scenario assumes a 6 percent annual growth in government expenditure between 2020 and 2023, maintaining this trend for the next three years. Tax rates are kept constant, while household and non-financial corporation investments remain at their average levels during this period. Rentier consumption is fixed at 65 percent of disposable income, and the propensity to consume out of wealth is temporarily increased by 1.5 percent to reflect post-COVID-19 spending behavior. Several policy scenarios are then explored, including expenditure cuts, increases in rentier and import taxes, and the introduction of excess profit and financial income taxes. Neoliberal scenarios involving higher worker taxes and sharp expenditure reductions are also evaluated. Lastly, mixed policy scenarios aimed at reducing income inequality are explored. Each scenario impacts inflation and generates distinct distributional consequences. Notably, the mixed policy scenarios achieve a dual objective: reducing inflation and mitigating income inequality.

In conclusion, this chapter emphasizes the critical role of incomes policy design. If the state aims to reduce inflation, it is argued that it has the means to do so. Income policies, when implemented, can address income conflicts and lower inflation. Additionally, a well-designed incomes policy can simultaneously reduce income inequality. In the next section, I discuss the policy implications of these conclusions.

5.5. The policy implications

This thesis examines the dynamics of post-COVID inflation in the UK, with a focus on income inequality. It highlights the effectiveness of incomes policy in controlling inflation. When designed to address income distribution, the income policy achieves significant results, reducing inflation by improving income equality.

In the latter part of the 21st century, economic policy in combating inflation has been heavily dominated by monetary policy, with economic authorities focusing primarily on interest rates as their main policy tool. However, this approach often inflicts significant harm on sectors, workers, and other groups that are not responsible for inflation. When economic policymakers raise interest rates to reduce inflation, the entire economy tends to suffer. In contrast, incomes policy offers a more efficient alternative, directly

addressing the sources of inflationary pressure and providing opportunities to mitigate its impact effectively.

The growth of the UK GDP deflator is expected to decline to around 5 percent in 2024. This reduction could be further enhanced with a well-designed incomes policy, particularly one resembling the policy mix proposed in this thesis. Such a strategy could effectively tame inflation while also reducing income inequality. Specifically, the findings reveal that taxing the top 20 percent of households can significantly alleviate inflationary pressure stemming from their expenditures, while also reducing government financial needs. Furthermore, the policy mix scenarios underscore the effectiveness of an excess profit tax in controlling inflationary pressures driven by profit increases. Additionally, a financial income tax emerges as a crucial tool for reducing income inequality, as the top 20 percent of households have substantially higher financial income flows compared to the remaining 80 percent.

Moreover, inflation is always and everywhere a conflict phenomenon as shown in A.5.9 for the UK economy. Incomes policy is essential for the UK, as it effectively moderates conflicting claims, reduces inflation, and improves income equality.

Policymakers should also consider other channels possibly influencing inflation that were not controlled in this research. As these channels gain prominence and contribute to inflationary pressures, incomes policy should adapt and evolve accordingly.

6. CONCLUSION

This thesis contributes to understanding the dynamics of post-COVID inflation in the UK economy by exploring the relationship between inflation and income inequality through the lens of theory of income conflict. The findings of the research demonstrate that the dynamics of income conflict play an essential role in post-COVID inflation, driven by income claims. Moreover, the thesis highlights the importance of incomes policy by invigorating a dual mechanism to mitigate both inflation and inequality.

On the analytical side, the study introduces the first two-household Stock-Flow Consistent (SFC) model specifically tailored to the UK economy, filling a critical gap in the existing literature. By integrating income inequality and inflation dynamics, this model provides an alternative perspective to policy makers. Additionally, the development of the UK-SFC App represents a pioneering effort to make SFC modeling more accessible, offering interactive tools for policy simulation and academic purposes. The findings advocate for a paradigm shift in addressing inflation and inequality rather than monetary policy tools, often employed by economic authorities. Incomes policy, as proposed, emerges as a robust and better alternative to conventional monetary tools. Policymakers are encouraged to adopt integrated approaches that tackle the root causes of income conflicts rather than focusing solely on demand suppression. The thesis emphasizes the importance of designing effective incomes policies, noting that when well-structured, they can significantly reduce both inflation and income inequality.

While the research addresses substantial contributions, it is constrained by the time limitation as a nature of a PhD dissertation. One of the main challenges of SFC modeling is the significant time cost. The UK-SFC model and its accompanying app have been under development for over two years and remain a work in progress. Consequently, the thesis leaves to explain post-COVID inflation, transitioning from directly pricing mechanism, rather than monetary aggregates. Future extension of this model will aim to incorporate more robust financial dynamics and transition to an empirical SFC framework.

In the section of policy analysis, the baseline scenario models a 6 percent annual increase in government expenditure from 2020 to 2023, with this growth rate sustained over the subsequent three years. Tax rates remain unchanged, while household and corporate investments are assumed to persist at their average levels during the observed period. Rentier consumption is fixed at 65 percent of disposable income, and the propensity to consume out of wealth is temporarily raised by 1.5 percent to account for increased post-COVID-19 spending behavior.

Various policy scenarios are then analyzed, including reductions in government spending, higher rentier and import taxes, and the implementation of excess profit and financial income taxes. Additionally, neoliberal approaches, such as increased worker taxes and substantial cuts to public expenditure, are examined. Finally, mixed policy scenarios aimed at reducing both inflation and income inequality are evaluated. Overall, the outcomes of these scenarios reveal distinct effects on inflation and income distribution. Importantly, the mixed policy scenarios stand out by achieving two critical objectives simultaneously: taming inflation and addressing income inequality.

These findings demonstrate that an incomes policy can be highly effective in controlling conflict inflation; moreover, a well-designed incomes policy that addresses income inequality can simultaneously achieve reductions in both inflation and income inequality.

Those who utilize the findings of this thesis should take into account the institutional setup of the countries they are analyzing. Inflation dynamics are heavily influenced by each country's unique institutional structure. Moreover, while this thesis concentrates on short-term implications, there is a need to explore the long-term effects of income conflicts and distributional dynamics.

By addressing the unexplored dimensions of post-COVID inflation in the context of the UK economy, this thesis not only enriches the theoretical discussions but also provides actionable insights for policymakers. The emphasis on income conflict and the introduction of a practical, user-friendly modeling tool exemplifies the thesis's innovative contributions to the field of economics.

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APPENDIX A

Table A.5.1 Initial values of the balance sheet

	Workers	Renters	Non-Financial Sector	Monetary Financial Institutions	Insurance Corporations and Pension Funds	Government	Row	Total
	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	Assets/Liabilities	
Capital	10.723	14.477	374.786			84.642		459.428
Houses	(000s)	(000s)						25.2
Household Deposit	495.895	1.614.298		-2.110.193				(000s)
Household Loans								
Pensions	1.075.871	2.361.415	-830.822	2.077.054		-3.437.286		
NFC Deposit			815.680					
NFC Loan				-1.321.948	1.321.948			
Bonds				757.653		474.936		
Row Deposit				-3.754.920			3.754.920	
Row Loan								-1.431.173
MFI Dep in Row				1.431.173				-2.340.249
Equity	255.296	831.070	1.398.358	-3.857.158	236.272	-274.996	2.243.166	-97.408
Residuals		76.297	712.103	836.417	6.937.503	8.114.764	1530126	798188
New Worth	580.830	4.052.258	-2.570.344	1.208.560	-887.416	-1.922.013		712.748
								1.184.063

Table A.5.2 Initial values of the transaction flow matrices

	Worker Households	Rentier Households	NFC	MFI	ICPF	Government	Row	Σ
Consumption	-1,026,963	-523,303	+1,550,266			+77,593 -77,593		
Investment			+269,015 -269,015			+77,593 -77,593		
Housing Investment	$-I_H$	+119,053 -119,053	+105,771 -105,771			+7049		
Gov. Expenditure	+74,263	+47,195	+404,733			-526,192		
Export			+837,761				-837,761	
Import			-904,589				+904,589	
[GDP]								[2,469,058]
Wages	+641,826	+601,350	-1,243,176					
Other Income	+326,913	+119,053	-445,966					
Taxes on Production and Imports (subsidies)			-282,310			+282,310		
[GOS]			+432,645	+110,507		+66,271		[842,631]
Depreciation Allowance								
[MOS]								
Annuity Payments	+96,834	+61,522			-158,356			
Pension Contributions	-74,757	-117,665			+192,423			
Taxes on Income	-82,094	-171,813				+253,907		
MFI+NFS+ICPF+ROW		+125,744	-138,820	-745		+7,895	-6,902	
Household Deposit	+1934	+6,296		-8,230				
NFC Deposit			+3,671	-3,671				
MFI Deposit (in ROW)				+X			-X	
ROW Deposit				-16,897			+16,897	
ICPF Deposit				-				
Consumer Credit	-42,372	-28,248		+70,620				
Producer Credit			-49,044	+49,044				
ICPF Credit				+		-		
ROW Credit							-	
Bonds								
Net Lending Position	$-NLP_W$	$-NLP_R$	$-NLP_{NFS}$	$-NLP_S$	$-NLP_G$	$-NLP_{gov}$	$-NLP_{Row}$	



Figure A.5.3: GDP expenditure side



Figure A.5.4: Income components

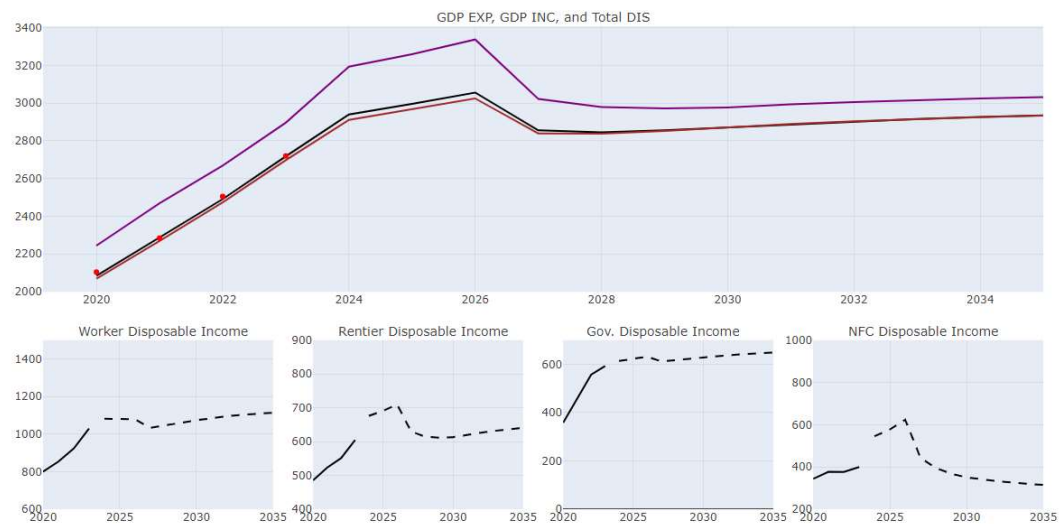


Figure A.5.5: GDP and disposables incomes

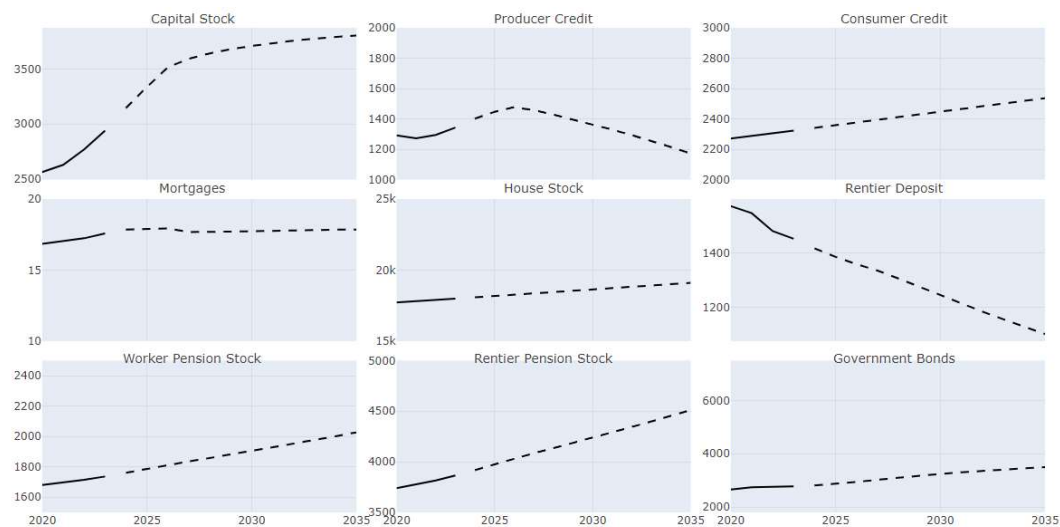


Figure A.5.6: Some stocks of the model

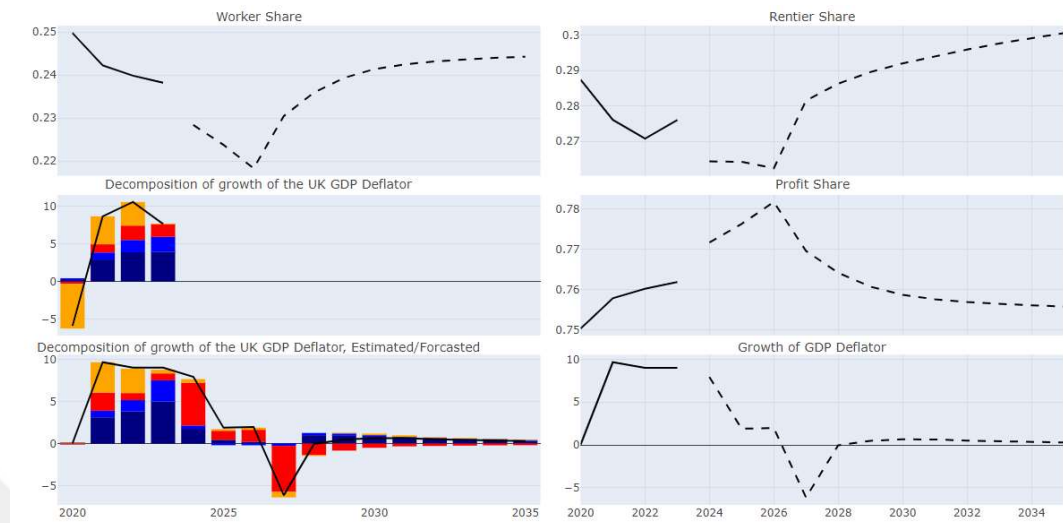


Figure A.5.7: Distribution and inflation

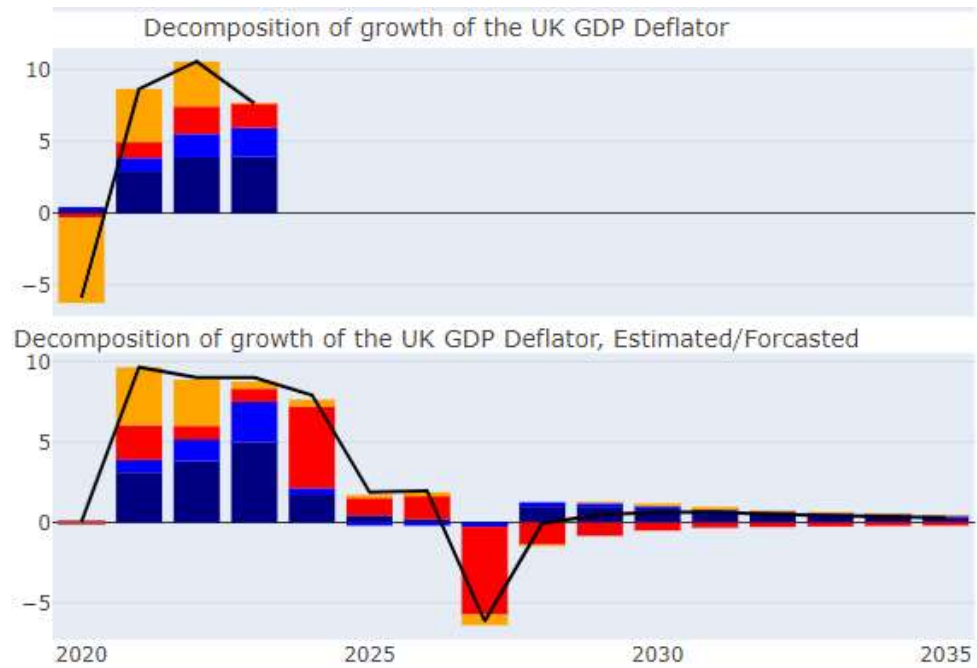


Figure A.5.8: Decomposition of the official and estimated/Forecasted UK GDP deflator

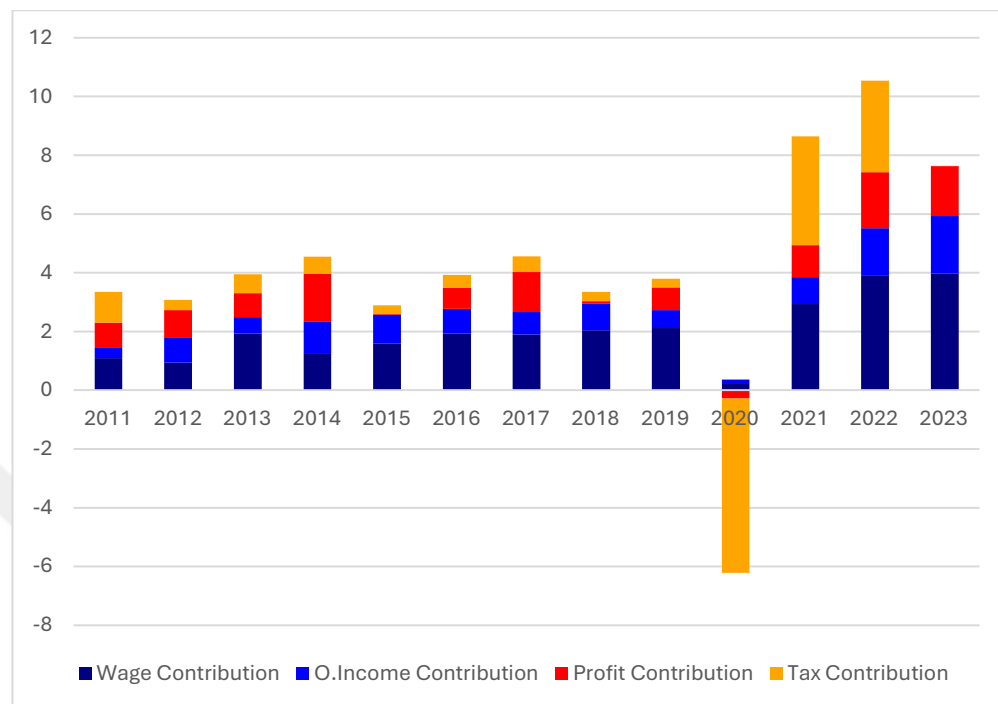


Figure A.5.9: Decomposition of the official UK GDP deflator between 2011-2023

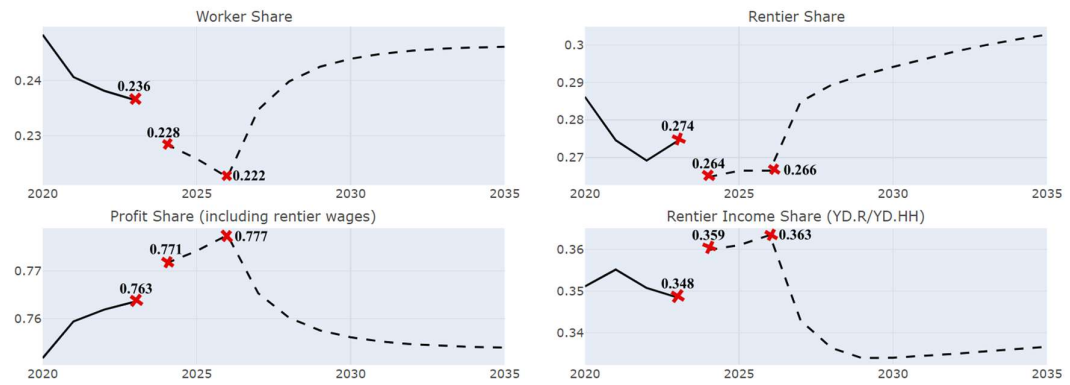


Figure A.5.10: Expenditure cut scenario g0 is 0.04 percent

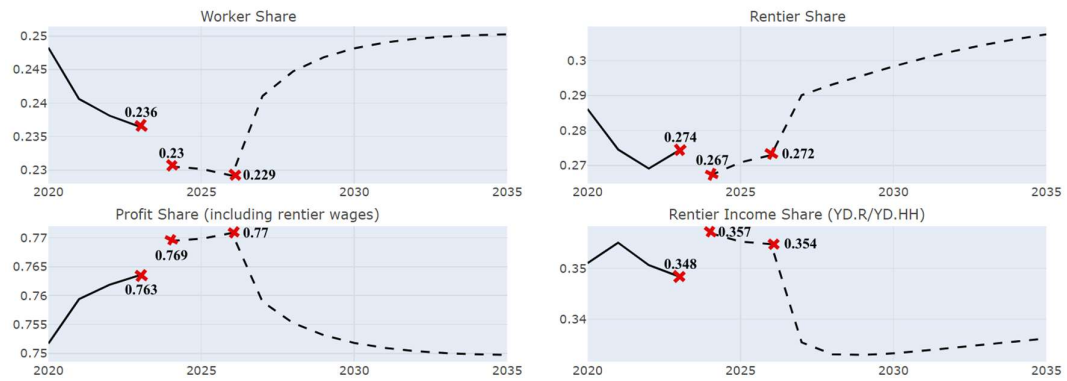


Figure A.5.11: Expenditure cut scenario g0 is 0.02 percent

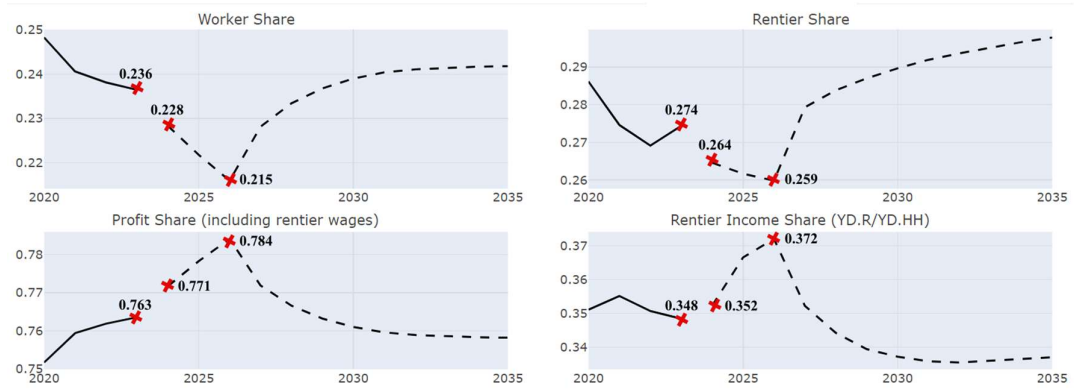


Figure A.5.12: Imposing financial income tax ($\tau^F = 20$)

CURRICULUM VITAE (January 2025)

Personal Information

Name and surname: Oktay Özden

Academic Background

2020-2025	Ph.D. in Economics, Istanbul Kadir Has University, Istanbul, Turkey
2017-2020	MA in Economics, Marmara University, Istanbul, Turkey
Thesis:	Production, Profit, and Money: Classical Theory of Inflation and Its Application to European Countries, Supervisor: Dr. Nedim Süalp
2012-2017	BA in Economics, Kemerburgaz University, Istanbul, Turkey

Work Experience

5/2020-Present	Research Assistant , Istanbul 29 Mayıs University, Department of Economics <i>Courses assisted: Intermediate Microeconomics I&II; Intermediate Macroeconomics I&II; Turkish Economy; Current Topics in Economics II; Big Data Analytics</i>
8/2019-4/2020	Data Scientist , Intellity AI Solutions, İstanbul <i>I worked on text mining methodologies, analyzing Twitter real-time data, customer suggestions, complaints, and demands data. I also developed churn data prediction-based R Shiny Web application. It generates real-time customer churn risk scores. Details of these works are presented in the following Projects part.</i>

Awards and Grants

2022, April	Best Presentation, 17 April 2022, Why R Turkey 2022
2016, Sep	Academic Achievement Awards, 15 Sep 2016, Kemerburgaz University
2016, May	Best Academic Research, 12 May 2016 Congreconomics II., Marmara University

Languages

English: (Fluent), **Turkish:** (Native)

Publications

- Özden, Oktay, Bolkol, Hakkı Kutay and Baki Demirel. 2024. The endogenous money hypothesis: empirical evidence from Türkiye (2008-2020). *PSL Quarterly Review* 77(308): 23-57.
- Ozden, Oktay and Bolkol, Hakkı Kutay. 2023. Shaikh's Theory of Inflation: Empirical Evidence from European Countries (2001-20). *Review of Political Economy* 1-21.
- Özden, Oktay. 2023. Türkiye ekonomisinin yapısı: by Özgür Orhangazi (Istanbul: İmge Kitapevi, 2020). *Rethinking Marxism* 36.1: 124-130.
- Özden, Oktay. 2023. Reglobalisation When China Meets the World Again, *Review of Keynesian Economics*.
- Özden, Oktay. 2022. The Climate Crisis and the Global Green New Deal: The Political Economy of Saving the Planet, *Trakya Üniversitesi İktisadi ve İdari Bilimler Fakültesi E-Dergi*.
- Özden, Oktay. 2017. Discouraged workers in the Turkish Labor Market: 1988-2014. *International Journal of Social Sciences and Education Research*, 3(3): 734-750.

Work in Progress

Heterodox Theories of Inflation, Book Chapter **Routledge**, (expected for publication in 2025)

Work in Progress Conference Presentations & Proceedings

Post-COVID Inflation Dynamics and Its Distributional Effects in the UK: A Two Household SFC Model, 2024;

presented at 2nd Efil Congress on Economics and Society, 2024, Tobb University of Economics & Technology, Istanbul, 19-20th December 2024

presented at the Historical Materialism 2024 Istanbul Conference, Istanbul Kadir Has University, Istanbul, 5-7th April 2024

Gelir ve Servet Eşitsizliğinin Dinamikleri: Post-Keynezyen Yaklaşımda Stok Akım Tutarlılığı Model Önerisi, 2023;

İktisadi Düşünceler Tarihi Denizli Çalıştayı'nda sunuldu, İktisadi Düşünce Girişimi, Pamukkale Üniversitesi, Denizli, 12-12 Ekim 2023

Understanding the causality among monetary aggregates: An Empirical Evidence from Turkey 2008-2020 (with Hakkı Kutay Bolkol and Baki Demirel), 2022;

presented at the 8th ICE-TEA, International Conference of Economics organized by Turkish Economic Associations Economics, in Cappadocia University, Nevşehir, Turkey, 1-4 Sep 2022

Revisiting Shaikh's Theory of Inflation: An Empirical Analysis from European Countries (with Hakkı Kutay Bolkol),

presented at the 24th Annual Conference of the Association for Heterodox Economics, in association with SOAS, the University of London, 6-8 July 2022, London, U.K.

presented at the Historical Materialism Istanbul Conference, Istanbul Kadir Has University, Istanbul, 17th April 2022

Topictisat ile İktisatçıların Twitter Verilerinin Analizi: İktisatçılar ekonomi gündemini nasıl okuyor?

presented at Why R Turkey 2022, İstanbul, Turkey

Eichner's Megacorps and Oligopoly: Post-Keynesian analysis of pricing pattern for Turkish Industries,

presented at Asos Congress – Social and Humanities Sciences, in Yıldız Technical University, Istanbul, 27th September 2018

Discouraged Workers in the Turkish Labor Market: 1988-2014,

presented at Congreconomics II, Marmara University, Istanbul, 12th May 2016;

presented at 19th International Students' Conference on Economics, Ege University, Izmir, 27-29th April 2016

Memberships

Post-Keynesian Economics Society
Association for Heterodox Economics

Computer Skills

R (Advanced), **Stata** (Advanced), **Python** (Intermediate), **Eviews** (Intermediate)

Projects

Topictisat –Twitter Shiny Dashboard -Text Mining, Wordcloud, Biagram Methodology

It is a web dashboard developed through R. In this project, the Twitter data of 102 economists, who have actively used Twitter, is analyzed. I classify two groups such as heterodox and mainstream economists. And then, I will empirically analyze the perceptive and sensorial differences in their economic agenda. Topictisat has automatically collected weekly Twitter data since January 2022. It works actively on the website below. Moreover, Topictisat was awarded by Why R Turkey 2022 committee with 250\$ book gift.

Packages: shiny, plumber, plyr, mfx, forcats, dplyr, ggplot2, plotly, etc.

Web: <https://oktayozden.shinyapps.io/topictisat/>

Spectra AI – R based Churn Data Analysis – Logistic regression, bar & pie graphs

I developed it for Istanbul based security firm. It is the most prominent firm in the market.

Its operation was conducted for 81 different provinces of Turkey. Spectra AI is a shiny app

that uses logistic regression techniques to understand the churn risk of real-time customers.

It estimates churn probability scores of each customers minutes by minutes.

Packages: shiny, plumber, plyr, mfx, forcats, dplyr, ggplot2, plotly, etc.

Git: Data is private!

R Shiny Text Mining Project – Biagram Methodology, Frequency Bar Plots, Wordcloud, Biagram

It is a Shiny web-app project completed for Istanbul Municipality. It analyses real-time data, including public complaints, suggestions, and demands. It briefly summarizes real-time daily data which have come from people who are passengers, retired, workers, etc.

Packages: shiny, forcat, igraph, ggraph, plotly, dplyr, snowballc, quanteda, plumber, etc.

Git: Data is private!

Covid19 Shiny Dashboard – Leaflet project, map visualization, web data reading, etc.

Real-time covid 19 data visualization; covid19 cases & death data. I use leaflet packages to visualize World map. It also visualizes country-specific cases and comparisons between countries.

Packages: Shiny, leaflet, ggplot2, lubridate, janitor, gdata, httr, etc.

Git: <https://github.com/oktayozden/R-shiny-COVID19Dashboard>

References

Prof. Dr. Erine Yeldan

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