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Essays on Financial Liberalisation and Entrepreneurial Occupational Choice

Thesis by
Maksym Solodarenko

Submitted
in partial fulfilment of the requirements
for the degree of Doctor of Philosophy in Economics



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University of Glasgow
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ABSTRACT

This thesis examines the effects of financial liberalisation on entrepreneurial occupational choice, inequality and productivity. Moreover, the thesis considers both short- and long-run consequences of financial liberalisation by studying the dynamics of the economy post-financial liberalisation. I complement the study with a discussion on occupational mobility's importance for the outcome of financial liberalisation.

The first chapter employs a version of a heterogeneous agents dynamic stochastic general equilibrium model in the style of [Allub and Erosa \(2018\)](#) to study the effects of financial liberalisation on occupational choice, inequality and productivity. The model introduces the problem of occupational choice to households such that the distribution of households across occupations becomes an endogenous part of the model. Calibrating the model to Italy over the period from 2000 to 2018, which experienced a large decrease in the share of sole proprietors that coincided with increased financial liberalisation, allows me to study the effects of financial liberalisation on a developed economy with high occupational mobility. This first chapter sets the scene by comparing the stationary equilibria of economies with different levels of financial liberalisation. The comparison uncovers the relationship between the level of financial liberalisation and corresponding equilibrium levels of income and wealth inequality across and within occupations. The results show that financial liberalisation leads to positive outcomes for the economy, and notably to decreasing both income and wealth inequality across occupations. In contrast, there is an increase in both income and wealth inequality among workers as a result of financial liberalisation. Financial liberalisation is connected to improved productivity through an increase in the marginal product of labour. Interestingly, these gains come alongside a substantial reduction in the share of households that choose to be sole proprietors.

The second chapter expands the discussion and analysis of financial liberalisation by

focusing on the short-run effects and on the transition dynamics that take place after a financial liberalisation has occurred. To discuss the short-run dynamics of the economy post-financial liberalisation, I extend the model studied in the first chapter with the transition from pre- to post-liberalised economy. The dynamics are investigated in the style of [Ríos-Rull \(1994\)](#) and [Krusell and Smith \(2006\)](#). This second chapter shows that most sole proprietors become workers or employers in the short run, which implies an increase in occupational mobility. Furthermore, the majority of changes to the allocation of households across occupations occur within the first five years, indicating that financial liberalisation has a strong, quick and long-lasting effect on the labour market. The findings highlight that a sudden financial liberalisation increases the costs of entrepreneurship hurting the income of entrepreneurs. However, a sudden financial liberalisation also leads to a higher share of workers benefiting from increased wages. Thus, the surprising result is that workers are the primary beneficiaries of the sudden removal of borrowing constraints for entrepreneurs. Moreover, there are larger reductions in both income and wealth inequalities among workers, compared to the changes in inequalities among employers.

The third chapter investigates the significance of occupational mobility for the outcome of financial liberalisation. For this purpose, I extend the model analysed in the previous chapters with a mechanism to enable or disable occupational mobility for counterfactual exercises. Therefore, the importance of occupational mobility is measured by comparing the outcomes of a sudden financial liberalisation with and without occupational mobility. This chapter finds that the presence of occupational mobility during financial liberalisation leads to higher equilibrium wage rates while minimally affecting interest rates. This result is attributed to occupational mobility enabling efficient skills-matching and, as a result, increasing labour demand. Moreover, I show that the presence of occupational mobility contributes up to half of the total effects of financial liberalisation, influencing outcomes such as reduced income and wealth inequality and increased aggregate output. Notably, improved occupational mobility is identified as a key factor contributing up to half of the total rise in productivity following financial liberalisation. Overall, this chapter shows that households' ability to choose their occupation has a large positive effect on the outcome of financial liberalisation.

Bibliography

Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.

Krusell, P. and Smith, A. A. (2006). Quantitative macroeconomic models with heterogeneous agents. Econometric Society Monographs, 41:298.

Ríos-Rull, J.-V. (1994). On the quantitative importance of market completeness. Journal of Monetary Economics, 34(3):463–496.

ALTERNATIVE THESIS FORMAT

This is an alternative format PhD Thesis and includes three papers. The papers are presented in the following order:

1. Financial liberalisation and its effects on occupational choice and inequality
2. Transitional dynamics of financial liberalisation and their effects on the aggregate economy, occupational choice and inequality
3. The interplay of occupational mobility and financial liberalisation - Implications for the inequality and productivity

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Maksym Solodarenko

Glasgow, December 23, 2023.

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*For my Dad, who taught me that everything is figureoutable
and for my Mom, who taught me that everything has its worth.*

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MOTIVATION

Overview

Financial markets play a crucial role in the efficient allocation of resources, see [Allen \(1993\)](#). The existence of financial markets allows savers to invest in productive activities that require funding. At the same time, financial markets enable borrowers to access the funds they need to expand their businesses or begin projects. According to [King and Levine \(1993\)](#), inefficient financial markets and financial frictions can lead to severe economic and social consequences.

Among the various economic consequences of inefficient financial markets, economic productivity has been historically tied to the level of financial market development, see [Heath \(2015\)](#). Economic productivity coupled with financial development, or financial liberalisation, causes economic expansion through better utilisation of financial resources, as shown by [Bekaert et al. \(2005\)](#).

The central economic actors who utilise financial resources are entrepreneurs. Moreover, the number of entrepreneurs who own large firms in the economy is associated with a degree of economic development, see [Hsieh and Klenow \(2014\)](#). Meaning that one of the signs of high financial development in an economy is a higher share of medium- to large-sized firms, or employers, and a smaller share of small-sized firms, or sole proprietors. Therefore, important literature, for example, [Shaw \(1973\)](#) and [Allub and Erosa \(2018\)](#), studies the intricate relationship between financial reform and the capacity for individuals to transition between entrepreneurial and non-entrepreneurial roles within an economy.

Among the social consequences, [Cornia \(2003\)](#) has observed that low financial liberalisation leads to a high level of income inequality among workers. Moreover, according

to [Cornia \(2003\)](#), the presence of borrowing constraints leads to a higher concentration of wealth among entrepreneurs. The high concentration of wealth creates a self-selection feedback loop where only rich households can become entrepreneurs and, *ceteris paribus*, entrepreneurs become richer due to higher savings rates than workers, as in [Evans \(1989\)](#).

This thesis focuses on the impact of financial liberalisation through the lens of occupational mobility and how it affects economic opportunities. The main objective is to provide a comprehensive understanding of the changes in occupational choice and in the distribution of income and wealth that result from financial liberalisation. Moreover, this thesis aims to uncover the dynamics of the economy in the aftermath of a financial liberalisation so that both long-term and short-term effects are analysed.

Another reason to study financial liberalisation in the context of occupational mobility is to uncover the mechanisms behind the improvement in aggregate productivity that results from the liberalisation. In particular, this thesis explores the main channels for improved productivity, such as increased capital efficiency, increased labour productivity, improved utilisation of production technology, increased occupational mobility, etc.

Most of the literature on financial reform has focused on investigating the effects of financial liberalisation in the context of large developing countries, see [Shaw \(1973\)](#) and [Allub and Erosa \(2018\)](#). Thus, this thesis investigates the financial liberalisation effects in the context of developed countries such as Italy. Italy was chosen because of the wide availability of data on occupations and inequality and for the following two reasons. The first reason is that, as reported by [Moretti \(2014\)](#), Italy underwent a liberalisation of its financial markets during the 2000s. The second reason is connected with the preliminary finding at the calibration stage of the model: financial liberalisation leads to a reduction in the share of entrepreneurs. The same result is observed in the International Labour Organisation dataset: Italy's financial liberalisation coincided with a significant reduction in the share of entrepreneurs in Italy during the 2000s.

For my analysis, I employ quantitative economic models with heterogeneity, so that inequality is an endogenous outcome of agents' decisions. In particular, in this thesis, I build on the occupational choice and financial liberalisation model from [Allub and Erosa \(2018\)](#), which is part of the [Lucas Jr \(1978\)](#) and [Roy \(1951\)](#) class of models. More specifically, each chapter extends or adapts this model in three distinctive ways: i) The study of general equilibrium effects following the modelling approaches of [Aiyagari \(1994\)](#), [Bewley \(1986\)](#) and [Huggett \(1993\)](#); ii) The study of post-financial liberalisation dynamics following the methodologies of [Buera \(2008\)](#), [Heer and Maussner \(2005\)](#); iii) The study of occupational mobility's interaction with the outcomes of financial liberalisation inspired by [Lester \(1947\)](#). The specific modelling frameworks and the contributions are provided

in more detail below and in the specific chapters.

To calibrate the quantitative model, I use detailed household panels and surveys to estimate the underlying dynamic processes and to evaluate the model's fit with the data. Amongst the data sources, I use World Bank Open Data and ILOEST datasets, as well as estimates from IGEM by the Italian Ministry of the Economy and Finance, see [Annicchiarico et al. \(2013\)](#).

Overall, I find that financial liberalisation leads to a decrease in the number of sole proprietors, most of whom become workers. Similarly, I find that workers benefit the most from financial liberalisation both in the short- and long-run due to the increase in income. Moreover, financial liberalisation leads to a reduction in inequality among occupations. Finally, I show that occupational mobility, the ability for households to freely switch their occupation between being a worker, a sole proprietor or an entrepreneur, has a significant impact on the outcome of financial liberalisation.

In what follows, I provide a review of three chapters, where I expand on the methodology and describe the main results for each chapter.

Review of Chapters

The first chapter explores the relationship between financial frictions and entrepreneurial occupational choice in the context of income and wealth inequality by investigating general equilibrium effects for different levels of financial intermediation. Wealth and income inequality have always been important issues among researchers of developed and developing economies. There has been an accepted sentiment since [Smith \(1776\)](#) and [Ricardo et al. \(1817\)](#) that wealth and income are interconnected and feed on each other. In particular, higher levels of wealth provide a stronger base for receiving higher income, which facilitates higher investment, leading to, *ceteris paribus*, even higher levels of wealth. The described dynamic is especially prominent in economies with underdeveloped financial markets. One way to restrain and democratise this dynamic is to develop financial markets. Developed financial markets allow households with low wealth to borrow funds for productive entrepreneurial pursuits that lead to increased income.

These facts lead to the importance of studying inequality through the combined lens of financial liberalisation and entrepreneurial occupational choice. The baseline methodology, which combines the notions of financial frictions and entrepreneurial occupational choice, is developed in [Allub and Erosa \(2018\)](#) in partial equilibrium. Their model extended the classic [Lucas Jr \(1978\)](#) model to study the distortion to productivity for workers, sole proprietors and employers as a result of financial frictions. Meanwhile, fi-

nancial frictions are modelled as a collateral constraint, which limits the amount of capital entrepreneurs can borrow, as in [Buera and Shin \(2013\)](#) and [Moll \(2014\)](#). However, the partial equilibrium setup omits any feedback effect via prices.

Therefore, I develop a version of the [Allub and Erosa \(2018\)](#) model to explore the stationary equilibrium effects of a given level of financial liberalisation. To this end, I add capital and labour market clearing conditions akin to [Moll \(2014\)](#). In the model, a household's income depends not only on their skill set and wealth holdings but also on the occupational choice between being a worker, a sole proprietor or an employer. At the same time, the return to working and to managerial skills depends on the supply and demand for capital and labour in general equilibrium.

The study of general equilibrium effects allows me to capture the feedback from capital and labour markets via prices and, thus, to compare the long-term outcomes for the economy across various levels of financial intermediation. The comparison uncovers the relationship between the level of financial intermediation and the corresponding equilibrium levels of income and wealth inequality. Moreover, the described approach helps me to understand the equilibrium effect of financial liberalisation on occupational choice and subsequently on productivity.

Three main results are discussed in this chapter. First, the decrease in the number of entrepreneurs following a financial liberalisation is explained by the decrease in the number of sole proprietors. For the financial liberalisation that I consider the share of households that are sole proprietors falls from eleven percent to less than two percent. Second, financial liberalisation leads to a decrease in income and wealth inequality among occupations. However, income and wealth inequality among workers increases as a result of financial liberalisation. Third, financial liberalisation leads to an increase in the marginal productivity of labour. The marginal productivity of labour rises due to improved self-sorting of households into occupations.

The second chapter dives deeper into the effects of financial liberalisation. I study the transitional dynamics that arise following a financial liberalisation. [Quadrini \(2000\)](#) and [Boháček and Zubrický \(2012\)](#) argue that the dynamics for occupational choice and inequality measures after a financial liberalisation are crucial for assessing the benefits and costs of financial reform. Overall, existing studies suggest that financial liberalisation leads to a decline in entrepreneurship, see [Baldwin et al. \(2011\)](#). However, these studies do not specify what happens to the households when they stop being entrepreneurs.

The focus on transition dynamics allows me to investigate the most immediate effects on occupational choice, which might be different from the long-term effects. In particular, I specifically study the short- and long-term effects of financial liberalisation on

occupational choice, as well as on a range of inequality measures. This chapter employs the DSGE version of the model by [Allub and Erosa \(2018\)](#). I extend the model with the dynamics of the transition from pre- to post-liberalisation economy and investigate them in the style of [Krusell and Smith \(2006\)](#). The study of dynamics allows me to track the households' occupation on the transition path and, thus, evaluate the “winners” and “losers” of financial liberalisation.

In particular, I find that most sole proprietors become workers in the short run, which implies an increase in occupational mobility. Financial liberalisation leads to the increased cost of being an entrepreneur since the wage rate and the interest rate rise. This increased cost leads to a larger share of workers who benefit from the higher wage rate. Furthermore, the majority of the changes in occupations occur within the first five years, indicating that financial liberalisation has a strong, quick and long-lasting effect on the labour market. In this chapter, I further analyse the so-called “winners” and “losers” of financial liberalisation, in the context of which occupation group gains more in terms of consumption, income and wealth as a result of the financial liberalisation. I find that workers benefit the most out of the three occupation groups. In particular, I observe that financial liberalisation decreases both income and wealth inequality among occupations by one and nine gini percentage points respectively. I find that these decreases in inequality happen due to the redistribution of wealth from employers to workers. This is a novel finding, because, generally, the removal of financial frictions in entrepreneurial financial markets is assumed to lead to improved income for entrepreneurs, as in [Giné and Townsend \(2004\)](#). However, in my model, financial liberalisation seems to benefit the workers more at the expense of entrepreneurs due to the general equilibrium effects operating through price changes.

The third chapter investigates the effect of occupational mobility on financial liberalisation by comparing the outcomes of financial liberalisation with occupational mobility to those without occupational mobility. According to [Stiglitz \(2000\)](#) and [Eichengreen \(2001\)](#), the capacity for individuals to transition between entrepreneurial and non-entrepreneurial roles within an economy plays a significant role in the mechanism of financial liberalisation. The study of occupational mobility during a financial reform expands our understanding of the efficiency improvements of both financial and non-financial resources, including such non-financial resources as labour and entrepreneurial management. Furthermore, this lens of occupational mobility addresses the equity implications of financial reform. For example, [Atkinson and Morelli \(2011\)](#) report that income distribution is considered to be a pivotal aspect of financial liberalisation's consequences. Thus, [Martin et al. \(2016\)](#) argue that it is important to understand whether occupational mobility mitigates income

inequality across the economy or whether it potentially exacerbates disparities in income and wealth for particular subsets of the population, depending on their occupation over short and/or long periods.

The analysis of occupational mobility's contribution to the effects on the aggregate economy, inequality and productivity after financial liberalisation is split into three parts. The first part of the analysis is concerned with occupational mobility's long-term impact on the outcome of financial liberalisation. In particular, I am interested in how the presence or absence of occupational mobility affects the aggregate outcomes of a financial reform where the financial friction is largely eliminated. More specifically, I am concerned with the impact on the economy's outcomes on the aggregate level and across occupations. For this part of the analysis, stationary equilibria are computed for two models — with and without occupational mobility — for different levels of financial liberalisation and then the results are compared to identify the long-term effects of occupational mobility's presence/absence on the economy's equilibrium outcomes.

The second part of the analysis describes the mechanism behind the financial reform and decomposes the short- and long-term effects on the welfare measures among occupations. Specifically, the effect of financial liberalisation is split into two interconnected parts: the direct and indirect effects. The direct effect is the effect of increased capital available to entrepreneurs after the borrowing constraint is relaxed, as in [Shaw \(1973\)](#). In contrast, the indirect effect emerges when households are allowed to change occupation. Thus, as a consequence, the removal of financial frictions improves the efficient self-allocation of households towards providing more labour, and more management as well as improved efficient use of production technology. To disentangle these two effects, the following experiment, akin to [Antunes et al. \(2008\)](#), is conducted: the dynamics of two economies are simulated from the same starting distribution of assets and skills, where the simulation of the economy with occupational mobility gives the total effect of financial liberalisation and the simulation of the economy without mobility has by definition only the direct component of the reform. By comparing these two dynamic paths, it is possible to estimate the indirect effect of financial liberalisation.

Finally, the third part of the analysis focuses on the dissection of output's increase as a result of financial liberalisation. Particularly, I consider and evaluate the changes in productivity measurements, as well as resource accumulation efforts. I utilise a decomposition procedure akin to the Solow decomposition, see [Kumar and Russell \(2002\)](#), breaking the change in aggregate output post-financial reform into components coming from Multi-Factor Productivity, aggregate management, capital, and labour. Also, the marginal products of capital and labour are analysed and, as a result, the main driver

of the output change is identified as the change in the allocation of skills to particular occupations. In particular, the presence of occupational mobility allows households with high working skills to self-select into being workers, which results in increased aggregate labour. At the same time, households with high managerial skills are allowed to self-select into being employers, which increases aggregate management. Financial liberalisation amplifies these effects because it removes the constraint on borrowing that interferes with this self-selection process.

In the third chapter, I find that the presence of occupational mobility during a financial liberalisation leads to higher equilibrium wage rates while minimally affecting interest rates. This is attributed to occupational mobility enabling efficient skills-matching and, as a result, increasing labour demand. The presence of occupational mobility significantly improves economic outcomes, including higher aggregate output, consumption, income, and capital, driven by skill-allocation and entrepreneurship.

Additionally, I find that occupational mobility plays a crucial role in shaping the outcomes of financial reform, enhancing the benefits for workers and sole proprietors while mitigating the negative consequences for employers. In particular, I find that the presence of occupational mobility contributes up to half of the total effect of financial liberalisation on the reduction in both income and wealth inequality both between and within occupations. These findings underscore the importance of considering occupational mobility when designing and evaluating economic reforms to achieve more equitable and efficient outcomes.

Lastly, a variant of the Solow decomposition method is utilised, breaking down the change in output into distinct components, including Multi-Factor Productivity. The analysis reveals that one-half of the rise in productivity is attributed to increased capital in the economy as the direct result of financial liberalisation. Whereas, the second half of the rise in productivity is attributed to improved occupational mobility occurring through increased MFP and other non-direct effects resulting from the financial liberalisation.

Bibliography

- Aiyagari, S. R. A. O. (1994). UNINSURED IDIOSYNCRATIC RISK AND AGGREGATE SAVING. The Quarterly Journal of Economics, 109(August):659–684.
- Allen, F. (1993). Strategic management and financial markets. Strategic Management Journal, 14(S2):11–22.

- Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.
- Annicchiarico, B., Di Dio, F., Felici, F., and Monteforte, L. (2013). IGEM: A Dynamic General Equilibrium Model for Italy. Working Paper, Department of the Treasury, Italian Ministry of the Economy and of Finance, 4(April):1–54.
- Antunes, A., Cavalcanti, T., and Villamil, A. (2008). Computing general equilibrium models with occupational choice and financial frictions. Journal of Mathematical Economics, 44(7-8):553–568.
- Atkinson, A. B. and Morelli, S. (2011). Economic crises and inequality. UNDP-HDRO occasional papers, (2011/6).
- Baldwin, J. R., Leung, D., and Rispoli, L. (2011). Labour productivity of unincorporated sole proprietorships and partnerships: Impact on the canada-united states productivity gap. Available at SSRN 1918854.
- Bekaert, G., Harvey, C. R., and Lundblad, C. (2005). Does financial liberalization spur growth? Journal of Financial economics, 77(1):3–55.
- Bewley, T. (1986). Stationary monetary equilibrium with a continuum of independently fluctuating consumers. Contributions to mathematical economics in honor of Gérard Debreu, 79.
- Boháček, R. and Zubrický, J. (2012). A flat tax reform in an economy with occupational choice and financial frictions. The Economic Journal, 122(565):1313–1345.
- Buera, F. J. (2008). Persistency of poverty, financial frictions, and entrepreneurship. Unpublished Manuscript, University of California at Los Angeles.
- Buera, F. J. and Shin, Y. (2013). Financial Frictions and the Persistence of History: A Quantitative Exploration. Journal of Political Economy, 121(2):221–272.
- Cornia, G. A. (2003). The impact of liberalisation and globalisation on income inequality in developing and transitional economies. Available at SSRN 380347.
- Eichengreen, B. (2001). Capital account liberalization: What do cross-country studies tell us? The world bank economic review, 15(3):341–365.
- Evans, D. S. (1989). An Estimated Model of Entrepreneurial Choice under Liquidity Constraints Author (s): David S . Evans and Boyan Jovanovic Source : Journal of

- Political Economy , Vol . 97 , No . 4 (Aug . , 1989), pp . 808-827 Published by : The University of Chicago Pre. Journal of Political Economy, 97(4):808–827.
- Giné, X. and Townsend, R. M. (2004). Evaluation of financial liberalization: a general equilibrium model with constrained occupation choice. Journal of development Economics, 74(2):269–307.
- Heath, M. R. M. (2015). What has Capital Liberalization Meant for Economic and Financial Statistics. International Monetary Fund.
- Heer, B. and Maussner, A. (2005). Dynamic General Equilibrium Modeling.
- Hsieh, C.-T. and Klenow, P. J. (2014). The life cycle of plants in india and mexico. The Quarterly Journal of Economics, 129(3):1035–1084.
- Huggett, M. (1993). The risk-free rate in heterogeneous-agent incomplete-insurance economies. Journal of economic Dynamics and Control, 17(5-6):953–969.
- King, R. G. and Levine, R. (1993). Finance and growth: Schumpeter might be right. The quarterly journal of economics, 108(3):717–737.
- Krusell, P. and Smith, A. A. (2006). Quantitative macroeconomic models with heterogeneous agents. Econometric Society Monographs, 41:298.
- Kumar, S. and Russell, R. R. (2002). Technological change, technological catch-up, and capital deepening: Relative contributions to growth and convergence. American Economic Review, 92(3):527–548.
- Lester, R. A. (1947). Marginalism, minimum wages, and labor markets. The American Economic Review, 37(1):135–148.
- Lucas Jr, R. E. (1978). On the size distribution of business firms. The Bell Journal of Economics, pages 508–523.
- Martin, R., Sunley, P., Gardiner, B., and Tyler, P. (2016). How regions react to recessions: Resilience and the role of economic structure. Regional studies, 50(4):561–585.
- Moll, B. (2014). Productivity Losses from Financial Frictions. American Economic Review, 104(10):3186–3221.
- Moretti, L. (2014). Local financial development, socio-institutional environment, and firm productivity: Evidence from italy. European Journal of Political Economy, 35:38–51.

- Quadrini, V. (2000). Entrepreneurship, Saving, and Social Mobility. Review of Economic Dynamics, 3(1):1–40.
- Ricardo, D. et al. (1817). On the Principles of Political Economy, and Taxation. John Murray.
- Roy, A. D. (1951). Some thoughts on the distribution of earnings. Oxford economic papers, 3(2):135–146.
- Shaw, E. S. (1973). Financial deepening in economic development.
- Smith, A. (1776). An Inquiry Into the Nature and Causes of the Wealth of Nations: By Adam Smith,....., volume 1. William Porter.
- Stiglitz, J. E. (2000). Capital market liberalization, economic growth, and instability. World development, 28(6):1075–1086.

CHAPTER 1

FINANCIAL LIBERALISATION AND ITS EFFECTS ON OCCUPATIONAL CHOICE AND INEQUALITY

1 Introduction

Entrepreneurs are central actors in modern economies. The number of entrepreneurs who own large firms in the economy is associated with a degree of economic development, see [Hsieh and Klenow \(2014\)](#). Meaning that one of the signs of high development is a higher share of medium- to large-sized firms or employers, and a smaller share of small-sized firms, or sole proprietors.¹ At the same time, the success of a given entrepreneur is tied to the level of liberalisation of financial markets, i.e. how open the access is to formal financial services, such as saving accounts or bank loans. Countries with low levels of financial liberalisation have measures of external finance to output an order of magnitude smaller than those with high levels of financial liberalisation, see [King and Levine \(1993\)](#) and [Banerjee and Duflo \(2005\)](#). Moreover, low financial liberalisation goes hand in hand with a high-income inequality among workers, see [Cornia \(2003\)](#).

Most of the literature has been focused on investigating the occupational distribution effects of financial development, or financial liberalisation, in the context of large developing countries, see [Shaw \(1973\)](#) and [Allub and Erosa \(2018\)](#). Thus, this chapter

¹It is reasonable to assume that the size of a firm depends on the size of the hired labour. Therefore, the number of medium- to large-sized firms can be approximated by the number of employers. The number of small-sized firms can be approximated by the number of sole proprietors.

investigates the effects of financial liberalisation in the context of developed countries such as Italy. Italy has been chosen because there has been the liberalisation of financial markets during the 2000s that has coincided with the significant reduction in the share of entrepreneurs in their economy, according to the International Labour Organisation dataset.

There are three main results that are discussed in this chapter. Firstly, the decrease in the number of entrepreneurs after financial liberalisation is explained by the decrease in the number of sole proprietors. Secondly, financial liberalisation corresponds to a decrease in income and wealth inequality among the whole population. However, income and wealth inequality among workers increase as a result of financial liberalisation. Thirdly, an increase in productivity resulting from the liberalisation of financial markets is achieved by increased marginal product of labour. In particular, productivity is increased due to an improved self-sorting of households into occupations. However, these gains come at the expense of a substantial reduction in the share of sole proprietors: from eleven down to less than two percent of households.

The results are obtained by a general equilibrium version of the stochastic model based on [Allub and Erosa \(2018\)](#). In the model, agents face an occupational choice between being workers, sole proprietors and employers. The endogenous occupational choice in the model is made possible by modelling households that are heterogeneous in working and managerial skills. Moreover, there is a time allocation problem for entrepreneurs:² they have to divide their time between managerial input and their labour input to the production. This setup suggests that one group of entrepreneurs will use their managerial ability and hire labour from the market and become employers, whereas another group will depend only on their own managerial and working skills and, thus, become sole proprietors.

Furthermore, the financial (under-)development is modelled as financial frictions in the form of a borrowing constraint on capital used by entrepreneurs. The financial friction in the form of borrowing constraints is typical for modelling the banking sector. In this respect, the Italian financial system is a fitting example, as financial intermediation is mainly performed by traditional banks, see [Pietrunti \(2017\)](#). This categorisation allows studying the general equilibrium effects of financial frictions on occupational choice, as well as on the efficiency of the use of capital in the economy, which can be measured as the Capital-to-Output ratio, according to [Doblin \(1991\)](#).

The main result obtained in this chapter is the revelation that the decrease in en-

²In this chapter, I define an entrepreneur as a household who has chosen to be either a sole proprietor or an employer.

entrepreneurship with financial liberalisation is explained by the decrease in the share of sole proprietors in the population rather than by a change in the share of employers. The explanation behind the reduction in the share of sole proprietors is the following: The financial liberalisation leads to the rise of real interest rates, see [Moyo and Le Roux \(2020\)](#). The increase in interest rate makes it more costly to be sole proprietor or employer. The rise in the cost of being an employer leads to employers demanding more labour to compensate for the increased cost of capital. The increase in demand for labour increases the market wage rate. The increased wage rate makes being a worker a more attractive option compared to being a sole proprietor. To sum up, financial liberalisation leads to an increase in factor prices, which reduces the profit of sole proprietors and increases the earnings of workers. These two effects lead to a decrease in the share of sole proprietors, an increase in the share of workers and no change in the share of employers.

Another important result of this chapter is that the aggregate economy benefits from a reduction in financial frictions. In particular, this is shown through the reduction of income and wealth inequality between occupations. However, the results for the inequality within occupations are different to the results between occupations. In particular, I find that workers tend to have an increase in mean income and wealth within their cohort. It is important to note that there is a rise in the workers' income and wealth inequality during low levels of financial liberalisation and a fall during high levels of financial liberalisation. Both sole proprietors and employers, on the other hand, tend to have a decrease in their mean income and wealth, but there is an increase in income equality within their respective cohorts throughout economies. On top of that, there is a decrease in wealth inequality among sole proprietors, whereas there is an increase in wealth inequality among employers in the respective economies with gradually improving financial markets.

Finally, in this chapter, I show that there is an increase in productivity resulting from the liberalisation of financial markets. The increase in productivity is achieved primarily by the increased marginal product of labour. Moreover, productivity is increased due to an improved self-sorting of households into occupations. The improved self-sorting results in an increased average working skill among workers and increased average managerial skill among employers.

Next, I would like to relate the framework of this chapter to the macroeconomic literature which investigates the effects of financial frictions on aggregate output, inequality, and entrepreneurship. [Allub and Erosa \(2018\)](#) show that in partial equilibrium occupational choices depend on the skill ratio, assets, and the absolute level of skills. My model extends their model by obtaining the general equilibrium. It is achieved by completing the financial and labour markets. The model is based on the classic [Lucas Jr \(1978\)](#)

model, which is part of the class of Roy (1951) models. In particular, this classic model is extended by Allub and Erosa (2018) to introduce heterogeneity in working skills and entrepreneurial time allocation decisions between working and managerial tasks.

Moreover, financial frictions are modelled typically with the use of collateral constraint, which limits the amount of capital for entrepreneurs to borrow from the capital market, in the same way as in Buera and Shin (2013) and Moll (2014). Specifically, the latter paper shows that self-financing undoes capital misallocation from financial frictions in the long run if idiosyncratic productivity shocks are relatively persistent. However, in this chapter, I model idiosyncratic shocks to skills in a semi-persistent way such that it would replicate the occupational structure of Italy as accurately as possible. This difference in modelling results prompts a contrary result to the authors finding: only some entrepreneurs can offset capital misallocation with self-financing.³

Furthermore, Agnello et al. (2012) show that financial reforms reduce income inequality. They find that financial reforms, in general, and removal of subsidised directed credit and excessively high reserve requirements and improvements in the securities market policy help promote a more equal distribution of income. I extend these results by investigating income and wealth inequality within occupations at different levels of financial liberalisation.

The rest of the chapter is organised in the following way. Section two describes the model and the underlying structure of the economy. Section three describes the calibration of the model. Next, section four describes the experiments and analyses the results of those experiments. Finally, the chapter is concluded by section five.

2 The Model

I consider a version of Allub and Erosa (2018)'s stochastic model of a closed economy that is in stationary equilibrium.⁴ The economy is populated by a unit continuum of infinitely-lived households that face uninsurable idiosyncratic shocks to their skills, whereas wealth is chosen endogenously by forward-looking saving decisions. In particular, households are heterogeneous with regards to wealth, and working and managerial skills, and, as a result, occupations. In each period, individuals choose either to work for a wage as a worker, to set up a business and work as a sole proprietor or to employ workers for their business and thus become an employer. Each entrepreneur (sole proprietor or employer)

³The discussion about the use of savings in the model is present in subsections about capital market and household problem in section 2 and subsection about the results on occupational choice in section 4.

⁴Note that authors of the paper have considered only partial equilibrium, whereas this chapter considers the general equilibrium version.

is facing a collateral constraint on capital rental proportional to their household’s wealth. This constraint represents the only friction in the financial market. The labour market is assumed to be perfectly competitive. In this model, all output in the economy is produced exclusively by entrepreneurs and then it is consumed solely by their respective producer — sole proprietor or employer. This means that there is no market for consumable goods and instead, households consume their income directly.

2.1 Heterogeneity and demographics

Following [Buera et al. \(2015\)](#), households are heterogeneous in their working and managerial skills, which evolve stochastically over time. There are no markets to insure households against shocks to their skills. Specifically, at the beginning of period t the household, i , observe their level of working, z_{wit} , and managerial, z_{mit} , skills, which evolve over time according to:

$$\ln z_{wit} = \alpha_{wit} + u_{wit}, \quad (1.1)$$

$$\ln z_{mit} = \alpha_{mit} + u_{mit} + \zeta_{it} \quad (1.2)$$

where α_{wit} and α_{mit} represent “fixed effects” skill component that is unlikely to change, on working and managerial productivities, u_{wit} and u_{mit} denote persistent shocks to skills, which depend on the previous time period’s value of this component, u_{wit-1} and u_{mit-1} , and ζ_{it} is a transitory shock to the managerial ability skill component, which is completely independent of the previous period’s value of this component, ζ_{it-1} .

[Allub and Erosa \(2018\)](#) argue that this structure for skills, with three types of shocks, provides the flexibility needed to better match data on occupational choices, occupational transitions, and earnings inequality between and within occupations.

2.1.1 Fixed effects

Both working and managerial skills have a fixed-effect component. The assumption here is that each period households either inherit their fixed effect without any change ($\alpha_{wit} = \alpha_{wit-1}$, $\alpha_{mit} = \alpha_{mit-1}$) with probability $1 - p_\alpha$ or they draw new skills⁵ from the invariant distribution of abilities with a small probability p_α .

Suppose U_{it} has a uniform distribution between zero and one and p_α is the probability of drawing a new independent set of skills and $F_{(\alpha_w, \alpha_m)}$ is a bivariate distribution of fixed

⁵The phrase “drawing new skills” in this model means that all components of skill structure (fixed effects, transitory and persistent shocks for both working and managerial skills) are drawn from their respective stationary distributions

effects. In particular, the managerial fixed effects, α_{mit} , is assumed to be drawn from a standard Pareto distribution with tail parameter η_m and the location shifted with a parameter μ_m . In the model, the Pareto distribution is discretised and the first grid point is set to the one that accumulates probability mass p_m , the share of the population with the lowest managerial skill. Meanwhile, the working fixed effects, α_{wit} , is drawn from a normal distribution with variance σ_α^2 and a mean value that depends on the realisation of the managerial fixed effect according to a parameter ρ_α that controls the correlation of fixed effects on working and managerial skills. Then, fixed effects are defined as follows:

$$(\alpha_{wit+1}, \alpha_{mit+1}) = \begin{cases} (\alpha_{wit}, \alpha_{mit}) & : U_{it} > p_\alpha \\ (\alpha'_w, \alpha'_m) \in F_{(\alpha_w, \alpha_m)} & : U_{it} \leq p_\alpha \end{cases}$$

Allowing the fixed effects to be redrawn is intended to replicate on some level the death of the household, where with a small probability an “old” household dies and a “new” household with completely new values of managerial and working skills is born. This intention is achieved by introducing a small probability change in fixed effects for the household.

2.1.2 Persistent shocks

The persistent shocks to working, u_{wit} , and managerial, u_{mit} , skills for individual household i at time t follow a first-order auto-regressive process:

$$u_{wit+1} = \begin{cases} \rho_w u_{wit} + \epsilon_{wit+1} & : U_{it} > p_\alpha \\ \epsilon_{wit+1} & : U_{it} \leq p_\alpha \end{cases}$$

$$u_{mit+1} = \begin{cases} \rho_m u_{mit} + \epsilon_{mit+1} & : U_{it} > p_\alpha \\ \epsilon_{mit+1} & : U_{it} \leq p_\alpha \end{cases}$$

where ρ_w is the autocorrelation for persistent component of working skill, ρ_m is the autocorrelation for persistent component of managerial skill, ϵ_{wit} and ϵ_{mit} are innovations for persistent components of working and managerial skills, respectively, which are drawn from bivariate normal distribution with mean zero, variances σ_w^2 and σ_m^2 , respectively, and correlation coefficient $\text{corr}(\epsilon_{wit}, \epsilon_{mit}) = \rho_{mw}$.

The persistent shock is intended to capture the long-term effects of skills on a single household, such as life-long learning, education and work experience; or loss in productivity due to illness or obsolescence of particular skills.

2.1.3 Transitory shocks

The transitory shock, ζ_{it} , on the managerial ability is drawn every period t from a fixed normal distribution with mean zero and variance σ_ζ^2 . Thus, the next-period value of the transitory shock is independent of the other components of skills and is independent over time:

$$\zeta_{it+1} \in N(0, \sigma_\zeta^2)$$

The transitory component of managerial skill affects managerial activity only because it represents unexpected changes in the entrepreneurial environment and therefore it is modelled to avoid any direct influence on working ability.

2.2 Production technology

Following [Lucas Jr \(1978\)](#), output is produced using a Cobb-Douglas production function with constant returns to scale in managerial, capital, and labour inputs. Sole proprietors and employers, i.e. entrepreneurs, can only use their internal managerial skills as managerial input because there is no market for managers. Therefore, the output is produced by a household supplying $z_m d$ units of managerial input, using k units of capital and $(1-d)z_w + n$ efficiency units of labour are:

$$Y(d, k, n) = (z_m d)^\gamma k^\eta ((1-d)z_w + n)^\theta, \quad (1.3)$$

where $\gamma \in [0, 1]$, $\eta \in [0, 1]$ and $\theta \in [0, 1]$ are shares of managerial, capital and labour inputs respectively, such that $\gamma + \eta + \theta = 1$; $d \in (0, 1]$ is the share of time that entrepreneurs devote to managerial activities; $(1-d)$ is the share of time that entrepreneurs devote to labour activities; $n \geq 0$ is the amount of labour hired from the labour market. Note, that for sole proprietors n is equal to zero because they employ working skills exclusively from their household; whereas, for employers n is strictly bigger than zero because they hire working skills from the labour market.

2.3 Financial and labour markets

The financial market is assumed to be perfectly competitive. Financial intermediaries take deposits from households and pay the net interest rate, r . They lend capital to entrepreneurs (sole proprietors and employers) at a rental price $r + \delta$, where δ is the depreciation rate.

Enforcement problems limit the capital lent to entrepreneurs. Following [Buera and Shin \(2013\)](#) and [Moll \(2014\)](#), entrepreneurial capital is limited by the collateral constraint

$k \leq \lambda a$, where a denotes household wealth. Each entrepreneur can borrow no more than their individual wealth multiplied by the coefficient, λ , which is identical for every entrepreneur. The parameter $\lambda \geq 1$ governs the degree of financial frictions, where the case of $\lambda = \infty$ represents perfect financial markets and $\lambda = 1$ an economy with no credit.

The capital market is assumed to clear each period, i.e. the sum of all deposits collected by financial intermediaries from households is equal to the sum of all capital lent to sole proprietors and employers.

The labour market is assumed to be perfectly competitive. Workers provide their labour in the form of working skills, z_w , or efficiency units of labour to employers in return for a wage rate per efficiency unit of labour. Employers hire n efficiency units of labour for a price w per efficiency unit. Effectively, all labour is pooled together and then distributed among employers according to their labour hiring decisions.

2.4 Household problem

The decision problem facing each household is the same for all households each period. For this reason, in what follows the subscript i denoting households i is omitted.

At the beginning of each period t , a household observes their level of assets, a_t , their working skill, z_{wt} , and their managerial skill, z_{mt} , and then decides how much to consume, c_t , and how many assets to save for next period, a_{t+1} . Moreover, they choose one of three occupations to be in this period: a worker, a sole proprietor or an employer. Households are price takers, i.e. they make all their decisions for a given interest rate r and wage w .

Therefore, the household's problem is to solve:

$$\max_{\{c_t, a_{t+1}, O_t\}_{t=0}^{\infty}} \mathbb{E}\left\{\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right\} \quad (1.4)$$

subject to the budget constraint:

$$c_t + a_{t+1} = \max_{O_t} \{\pi(O_t, a_t, z_{mt}, z_{wt}; w, r)\} + (1 + r)a_t, \quad \forall t \geq 0, \quad (1.5)$$

where $\pi(O_t, a_t, z_{mt}, z_{wt}; w, r)$ is the household's earnings function, which depends on their chosen occupation, O_t .

If a household chooses to become a worker, $O_t = W$, then they receive wage proportional to the number of efficiency units they provide:

$$\pi(W, a_t, z_{mt}, z_{wt}; w, r) = w z_{wt} \quad (1.6)$$

If a household decides to become a sole proprietor, $O_t = S$, then they need to decide how much capital k_t to rent from the capital market and how to allocate their time between managerial d_t and working $(1 - d_t)$ activities. Thus, given steady state factor prices, the sole proprietor's problem is the following:

$$\pi(S, a_t, z_{mt}, z_{wt}; w, r) \equiv \max_{d_t, k_t} \{(d_t z_{mt})^\gamma k_t^\eta ((1 - d_t) z_{wt})^\theta - (r + \delta) k_t\} \quad (1.7)$$

subject to:

$$0 < d_t < 1, \quad (1.8)$$

$$k_t \leq \lambda a_t \quad (1.9)$$

Lastly, if a household decides to become an employer, $O_t = E$, then they need to make the same decisions as sole proprietors: how much capital k_t to rent from the capital market and how to allocate their time between managerial d_t and working $(1 - d_t)$ activities. However, they also need to choose the number of efficiency units n_t to hire from the labour market. Thus, given steady state factor prices, the employer's problem is the following:

$$\pi(E, a_t, z_{mt}, z_{wt}; w, r) \equiv \max_{d_t, k_t, n_t} \{(d_t z_{mt})^\gamma k_t^\eta ((1 - d_t) z_{wt} + n_t)^\theta - w n_t - (r + \delta) k_t - c_e\} \quad (1.10)$$

subject to:

$$0 < d_t \leq 1, \quad (1.11)$$

$$k \leq \lambda a_t, \quad (1.12)$$

$$n_t > 0 \quad (1.13)$$

Employers are assumed to incur a fixed per-period operating cost of c_e . This fixed cost is introduced so that employers demand a non-trivial amount of labour (an amount bounded away from zero), thereby making the distinction between sole proprietor and employer meaningful.⁶

The max operator in the budget constraint, equation 2.12, represents the occupational choice decision between becoming a worker and an entrepreneur. After that, if a household decides to become an entrepreneur, then they choose the amount to hire from the labour

⁶The fixed cost for employing is calibrated to be a small number, so in general equilibrium, it is paid by an employer as a price for hiring labour. In this model, the aggregate cost of employment accounts only for less than half of one percent of aggregate output.

market. If an entrepreneur decides to hire no labour from the labour market, then they become a sole proprietor, otherwise, they become an employer. A household will choose to become an entrepreneur only if the profit from operating a business exceeds the labour income they would receive as a worker. Similarly, an entrepreneur will become an employer only if hiring labour from the labour market improves profit compared to a sole proprietor's decision to rely exclusively on their working skill.

2.5 Stationary equilibrium

The household's problem is solved using dynamic programming, following the method from [Heer and Maussner \(2005\)](#). To do that, the problem is reformulated as the Bellman equation. The value function has to satisfy the following equation:

$$V(a, z_m, z_w; w, r) = \max_{a'} \{ \ln(c(a', a, z_w, z_m; w, r)) + \beta \mathbb{E}V(a', z'_m, z'_w) \} \quad (1.14)$$

where

$$c(a', a, z_w, z_m; w, r) = \max_O \{ \pi(O, a, z_m, z_w; w, r) \} + (1 + r)a - a' \quad (1.15)$$

To find the maximum of the right-hand-side term, the future level of assets, a' , should be found optimally. Thus, the derivative with respect to a' of the expression in maximisation term should be equal to zero:

$$\frac{1}{\max_O \{ \pi(O, a, z_m, z_w; w, r) \} + (1 + r)a - a'} - \beta \frac{\mathbb{E}V(a'^*, z'_w, z'_m)}{da'} = 0 \quad (1.16)$$

After that, the Bellman equation can be solved by the value function iteration process and as a result, the value function $V(a, z_m, z_w; r, w)$ and the policy function for the optimal choice of the future level of assets $a'(a, z_m, z_w; r, w)$ are obtained. Moreover, the policy function for optimal consumption can be obtained from equation 1.15.

Next, let's denote $\mu(z_w, z_m)$ as the mass of households with working and managerial skills of type (z_w, z_m) in the invariant distribution. Also, I use $G_t(a, z_w, z_m)$ to denote the probability density function for the joint distribution of wealth and skills, (a, z_w, z_m) , at the beginning period of t . This joint density function satisfies:

$$\sum_{z_w, z_m} \int_a G_t(a, z_w, z_m) da = 1 \quad (1.17)$$

I now have all the components needed to define what a stationary equilibrium in this model is:

1. time invariant prices for interest rate r and wage w ,
2. a time-invariant joint distribution for assets and skills $G(a, z_m, z_w; r, w)$,
3. a value function $V(a, z_m, z_w; r, w)$,
4. individual decision rules $c(a, z_m, z_w; r, w)$ and $a'(a, z_m, z_w; r, w)$ for consumption and next period's assets,
5. entrepreneurial decision rules for capital to rent $k(a, z_m, z_w; r, w)$, for outside labour to hire $n(a, z_m, z_w; r, w)$, and time allocated towards managerial activities $d(a, z_m, z_w; r, w)$ ⁷

such that:

1. given prices $\{r, w\}$, the decision rules $a'(a, z_m, z_w; r, w)$ and $c(a, z_m, z_w; r, w)$ solve the household's problem and $V(a, z_m, z_w; r, w)$ is the associated value function for the household's problem.
2. given prices $\{r, w\}$, entrepreneurs (sole proprietors and employers) choose optimally their capital $k(a, z_m, z_w; r, w)$, their outside labour $n(a, z_m, z_w; r, w)$ and their managerial time $d(a, z_m, z_w; r, w)$.
3. the joint distribution for wealth and working and managerial skills is stationary for all values of (a', z'_w, z'_m) ⁸:

$$G(a', z'_w, z'_m; r, w) = \sum_{z_w, z_m} \int_{a: a'=a'(a, z_w, z_m)} p((z'_w, z'_m)|(z_w, z_m)) G(a, z_w, z_m; r, w) da \quad (1.18)$$

4. given prices $\{r, w\}$, when $G(a, z_w, z_m; r, w)$ describes the cross-section of households at all $t \geq 0$, the markets for capital and labour clear, in particular:

- Aggregate capital supply is defined as the integral of all capital saved by households in the form of assets for the next period.

Aggregate capital demand is defined as the integral of all capital demanded by households who choose to become entrepreneurs (sole proprietors or employers).

⁷Full derivations of the profit maximising entrepreneurial decision rules are described in Appendix 1.A.1.

⁸Full derivation of the joint distribution for wealth and skills is described in Appendix 1.A.2

The capital market clears when aggregate capital supply is equal to aggregate capital demand:

$$\begin{aligned} \int_{a_{it}, z_{wit}, z_{mit} \forall i} a_{it+1} G(a_{it}, z_{wit}, z_{mit}; r, w) &= \\ &= \int_{a_{jt}, z_{wjt}, z_{mjt} \forall j \text{ s.t. } O_{jt} \neq W} k_{jt} G(a_{jt}, z_{wjt}, z_{mjt}; r, w), \end{aligned} \quad (1.19)$$

here k_{jt} is a function that depends on the j 'th household assets and levels of skills,

- Aggregate labour supply is defined as the integral of all working skills provided by households who chose to become workers.

Aggregate labour demand is defined as the integral of all labour hired from the labour market by households who choose to become employers.

The labour market clears when aggregate labour supply is equal to aggregate labour demand:

$$\begin{aligned} \int_{a_{it}, z_{wit}, z_{mit} \forall i \text{ s.t. } O_{it} = W} z_{wit} G(a_{it}, z_{wit}, z_{mit}; r, w) &= \\ &= \int_{a_{jt}, z_{wjt}, z_{mjt} \forall j \text{ s.t. } O_{jt} = E} n_{jt} G(a_{jt}, z_{wjt}, z_{mjt}; r, w), \end{aligned} \quad (1.20)$$

here n_{jt} is a function that depends on the j 'th household assets and levels of skills,

I use the version of the algorithm from [Heer and Maussner \(2005\)](#) to compute the stationary equilibrium, see Appendix 1.A.3 for a full description of the computation procedure. Note, that aggregate capital, see equation 1.19, and labour, see equation 1.20, are constant and equal to K and L , respectively, across all time periods. Moreover, in the stationary equilibrium, the joint distribution of assets and skills is also constant. Thus, the measure of workers, sole proprietors and employers in equilibrium is constant as well. However, individual agents are not characterised by constant wealth and occupation, which means that social mobility in the form of changes among occupations is allowed.

3 Calibration

The model is calibrated to the Italian economy over the period 2000 to 2018, with the length of a period in the model set to a year. Some parameters are set using estimates from other studies. Following the calibration of the Italian economy made for the Italian General Equilibrium Model made by the Italian Ministry of the Economy and Finance, see [Annicchiarico et al. \(2013\)](#), the depreciation rate of capital, δ , is set to 0.1, the share of labour input in the production, θ , is set to 0.54, the share of managerial input in the production, γ , is set to 0.16, and share of capital in the production, η , is set to 0.3.⁹

Following the calibration strategy of [Heathcote et al. \(2005\)](#), I note two observations about the Italian household data typically made in the literature. First, wage inequality grows linearly over the life-cycle suggesting the autocorrelation of wage shocks is high.¹⁰ Thus, the autocorrelation of working-ability shocks, ρ_w , is set to 0.96. Second, the variance of log-wages at age 25 in Italy is equal to 0.12, see [Krueger et al. \(2016\)](#), which means that the variance of the working-skills fixed effect, σ_α^2 , is also set to 0.12.

Finally, as mentioned above, the fixed effects for managerial skill follow a discretised Pareto distribution and the first grid point's probability mass, p_m , is set to 0.39 to represent the 39% of Italian 25-65 year-olds who have low levels of literacy and/or numeracy proficiency.¹¹ The report by [O'Driscoll et al. \(1991\)](#) specifies that people with low levels of literacy and/or numeracy proficiency struggle with typical managerial activities such as planning, decision making, monitoring and controlling performances, which in this model translates into having a low managerial-skill fixed effect.

The remaining parameters are estimated via a form of simulated method of moments. The loss function for the method of moments estimation consists of the sum of square percentage deviations between key moments in the model and those in the Italian data.¹²

⁹IGEM differentiates households into five categories: self-employed, skilled workers, unskilled workers, and atypical workers. Therefore, the parameters that they report are: share of labour input to the production, θ , to 0.35; share of managerial input, γ , to 0.35; and share of capital input to the production, η , to 0.3. Whereas, the model differentiates households into three categories: workers, sole proprietors and employers. In essence, skilled and unskilled workers from IGEM translate perfectly into the workers' category from my model; self-employed from IGEM translates to employers and sole proprietors. However, atypical workers should be translated to the sole proprietors' category instead of workers, according to the description of these households in IGEM. Therefore, I recalculate the share of managerial and working abilities to the production to reflect this change. As a result, the model increases the labour share of output at the cost of managerial share, because atypical workers from IGEM provide more labour and less managerial input when they are translated to the sole proprietors category in my model.

¹⁰See [Biagi \(2012\)](#)

¹¹See [OECD Report \(2017\)](#)

¹²At the same time, I simultaneously look for the two equilibrium prices (wage and interest rate), which allows for important efficiency gains in the estimation of the parameters. This is done by adding to the loss function: the labour market clearing and capital market clearing conditions. Intuitively, relative to the standard procedure of finding the equilibrium prices before computing equilibrium statistics, this

The 12 parameters in the stochastic processes are estimated to minimise the total distance between 14 moments from the model and the corresponding moments from the data. While the targeted moments are jointly determined by all 12 parameters, in presenting the estimation procedure it is useful to associate each target with a specific parameter.

The estimation procedure targets the following data for Italy:

- The fixed cost of hiring workers, c_e , and the lower bound on the domain of managerial skill's fixed effect, μ_α , are chosen to match the occupational choice structure with 70.2% of workers, 8.5% of sole proprietors and 21.4% of employers (International Labour Organisation dataset) (two targets);
- The probability of receiving a new draw for skills, p_α , and the Pareto tail of managerial skill, η_α , are chosen to match the variance of log-consumption (Jappelli and Pistaferri (2009)) and the Gini coefficient for entrepreneurial income (Ballarino et al. (2012)). (two targets).
- The variance of innovation of managerial persistent shocks, σ_m^2 , the correlation between innovations of persistent shocks, ρ_{mw} , the autocorrelation of managerial skill, ρ_m , and variance of a transitory shock to managerial skill, σ_ζ^2 , are chosen to match yearly transition rates across occupations¹³ (Borella and Belloni (2018) and Schivardi and Torrini (2005)) (six independent targets);
- The correlation between fixed effects of managerial and working skills, ρ_α is chosen to match the variance of log-earnings (Jappelli and Pistaferri (2009)) (one target);
- The variance of a persistent shock to the working ability, σ_w^2 is chosen to match Gini coefficient on workers income (Ballarino et al. (2012)) (one target);
- The parameter on the collateral constraint, λ , is chosen to match the credit to annual output ratio (World Bank Open Data) (one target);
- The utility discount factor, β , is chosen to match the capital-to-output ratio (World Bank Open Data) (one target).

The list of parameters obtained as a result of the calibration procedure is presented in Table 1.1.

procedure of computing statistics “out of equilibrium” has the advantage that it allows us to obtain information on how parameters affect model statistics while searching for equilibrium prices (w , r).

¹³Transition rates across occupations include Workers-to-Workers, Workers-to-Sole-Proprietors, Sole-Proprietors-to-Sole-Proprietors, Sole-Proprietors-to-Employers, Employers-to-Sole-Proprietors and Employers-to-Employers probabilities.

Table 1.1: Calibrated parameters

Panel A: Externally calibrated parameters		
δ	Depreciation rate of capital	0.10
γ	Share of managerial input to the production	0.16
η	Share of capital input to the production	0.30
θ	Share of labour input to the production	0.54
ρ_w	Autocorrelation of working skills	0.96
σ_α^2	Variance of fixed effects on working skills	0.12
p_m	Probability of first fixed effect of managerial skills	0.39
Panel B: Internally calibrated parameters		
c_e	Fixed cost of hiring employees	0.057
μ_α	Location of first fixed effect for managerial skill	-3.27
p_α	Probability of new skills draw	0.02
η_α	Pareto tail of managerial skills	5.81
σ_m^2	Variance of innovation of managerial persistent shocks	0.75
ρ_{mw}	Correlation between innovations of persistent shocks	0.22
ρ_m	Autocorrelation of managerial skills	0.95
σ_ζ^2	Variance of transitory shock of managerial skills	0.21
ρ_α	Correlation between fixed effects of managerial and working skills	0.15
σ_w^2	Variance of innovation of working persistent shocks	0.049
λ	Collateral constraint	1.67
β	Discount factor	0.93

Notes: Panel A shows parameters that are set using estimates from other studies in the literature. Panel B shows parameters that are set according to the results of the calibration of the model.

4 Results

This section covers four main sets of results. In the first set of the results, I describe the base results of calibration. In particular, I focus on the ability of the model to replicate the targeted as well as non-targeted moments from the Italian data. In the second set of results, I investigate the effect of financial liberalisation on the outcomes in the economy, in general, and on occupational choice, in particular. In the third set of results, I present the results of a change of financial frictions on earnings and wealth inequality as well as inequality in consumption within and between occupations. In the final set of results, I investigate the effects of financial liberalisation on the productivity of the economy.

4.1 Base results

Table 1.2 compares the moments implied by the model to those in the data for the Italian economy. The model replicates most of the moments from the data in a more qualitative

Table 1.2: Base results for Italy

Statistics	Data	Model
Capital-to-Output	170.40%	188.36%
Credit-to-Output	60.35%	73.81%
<i>Occupational structure</i>		
Workers.	70.20%	77.48%
Sole Proprietors	8.50%	6.49%
Employers	21.40%	16.02%
<i>Consumption inequality</i>		
Var(log(c))	0.26	0.74
<i>Occupational one period transition rates</i>		
W to W	98.53%	97.75%
W to SP	0.89%	1.99%
SP to SP	83.66%	70.34%
SP to EMP	13.49%	12.52%
EMP to SP	8.42%	2.42%
EMP to EMP	88.73%	93.65%
<i>Income inequality: Between occupations</i>		
Variance of log-earnings	0.48	0.81
<i>Income inequality: Within occupations</i>		
Gini for workers' income	0.43	0.42
Gini for entrepreneurs' income	0.25	0.25

Notes: in the table, W stands for workers, SP for sole proprietors and EMP for employers. Variance in earnings is computed using the natural logarithm of earnings. Occupational transitions from the data are computed comparing the same month of two consecutive years, keeping only households that were employed in both years.

way, rather than in a quantitative way. For example, the model successfully replicates quantitatively the values for Capital-to-Output and Credit-to-Output ratios. Moreover, the gini coefficients for worker's income and for entrepreneurial income are matched very closely to the corresponding values from the data.

The most significant difference between the model-implied moments and the data is in the occupational structure, where the model seems to underestimate the number of employers and sole proprietors and overestimate the number of workers. A possible explanation here is that the model has a closed labour market, therefore Italian employers can hire within the Italian labour force only, which pushes the occupational structure to favour being a worker instead of an entrepreneur due to increased demand compared to the data. However, this difference is not going to affect the analysis substantially, because qualitatively the model reproduces the pattern of occupational structure within the data. Workers have the biggest share out of the three categories and sole proprietors have the

smallest.

Table 1.3: Italian occupation mobility transition matrix

Occupation	Data			Model		
	Occupation in 50 years			Occupation in 50 years		
	W	SP	EMP	W	SP	EMP
W	60%	35%	5%	61%	15%	24%
SP	28%	60%	12%	16%	56%	28%
EMP	13%	55%	32%	15%	50%	35%

Notes: in the table occupational transitions are computed by comparing the occupation of children to the occupation of their parents with the difference in time between measurements being equal to 50 years, taking the occupation that accounted for the majority of household earnings.

Nevertheless, it is important to acknowledge the extent to which the model can reproduce the statistics that were not targeted during the calibration process. In particular, Table 1.3 reports the occupation mobility transition matrix estimated over a period of 50 years. The model produces accurate transition probabilities for occupations to be unchanged for 50 years, but accuracy falls when we acknowledge the probabilities of changing occupations. The latter is especially evident in rates for sole proprietors moving to the worker or employer category, where the probability is underestimated and overestimated by the model respectively. Note that the data for the occupational mobility transition matrix was taken from [Brunetti and Fiaschi \(2021\)](#), where the authors estimate intergenerational occupational mobility in Italy from 1940 to 2012.¹⁴

Table 1.4: Italian income mobility quintile transition matrix

Income Quintile	Data					Model				
	Income Quintile after 50 years					Income Quintile after 50 years				
	1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
1st	29%	25%	21%	15%	10%	39%	17%	14%	9%	21%
2nd	22%	23%	22%	19%	14%	27%	27%	15%	9%	22%
3rd	19%	20%	21%	22%	18%	23%	22%	20%	11%	24%
4th	16%	18%	20%	23%	23%	19%	18%	19%	16%	28%
5th	14%	14%	15%	21%	36%	15%	16%	17%	13%	39%

Notes: in the table, the income quintile transitions are computed comparing the income quintile of children to the income quintile of their parents with the difference in time between measurements being equal to 50 years.

¹⁴It is important to note that the definition in [Brunetti and Fiaschi \(2021\)](#) of occupation classes is the same as in this model.

Another set of results, that is interesting to compare with the data, is the income mobility quintile transition matrix, which is reported in Table 1.4. The matrix was taken from [Violante et al. \(2019\)](#) where intergenerational mobility of households in Italy across income quintiles between parents and their children is estimated. The model, in comparison to the reported statistics, seems to slightly overestimate the probabilities of moving to the 5'th quintile of the income distribution from any other point, as well as to slightly overestimate the probabilities of moving to the 1'st quintile. As a result, transition rates to the 3'rd quintile of the income distribution are slightly underestimated.

Table 1.5: Main characteristics of the model's distribution statistics

Statistics	Measure	Households	Workers	Sole Proprietors	Employers
Income	Mean	0.40	0.33	0.47	0.72
	Variance	144.38	0.39	0.33	896.09
	Varlog	0.81	0.92	1.19	0.47
	Gini	0.39	0.42	0.31	0.25
Earnings	Mean	0.39	0.33	0.46	0.67
	Variance	120.87	0.09	0.25	751.37
	Varlog	0.81	0.94	1.23	0.53
	Gini	0.39	0.42	0.31	0.25
Wealth	Mean	0.96	0.45	0.87	3.44
	Variance	6808.55	1241.45	287.84	6612.98
	Gini	0.65	0.67	0.41	0.31
Consumption	Mean	0.40	0.36	0.43	0.63
	Variance	107.56	5.63	1.52	641.39
	Gini	0.38	0.41	0.36	0.27

Notes: Varlog here represents variance of log-statistic. Mean, variance and gini coefficient measures are calculated for the main statistics of the distribution of households and occupations across the calibrated economy. Additionally, for income and earnings distributions variances of natural logarithm of these statistics are calculated.

Table 1.5 shows that there is substantial earnings heterogeneity within all occupations (workers, sole proprietors, and employers) as well as income, assets (or wealth) and earnings heterogeneity so that there are households at the top and bottom of the income distribution in all occupations. The similar simplified version of the model with heterogeneity only in one skill cannot account for these observations, see [Moll \(2014\)](#).

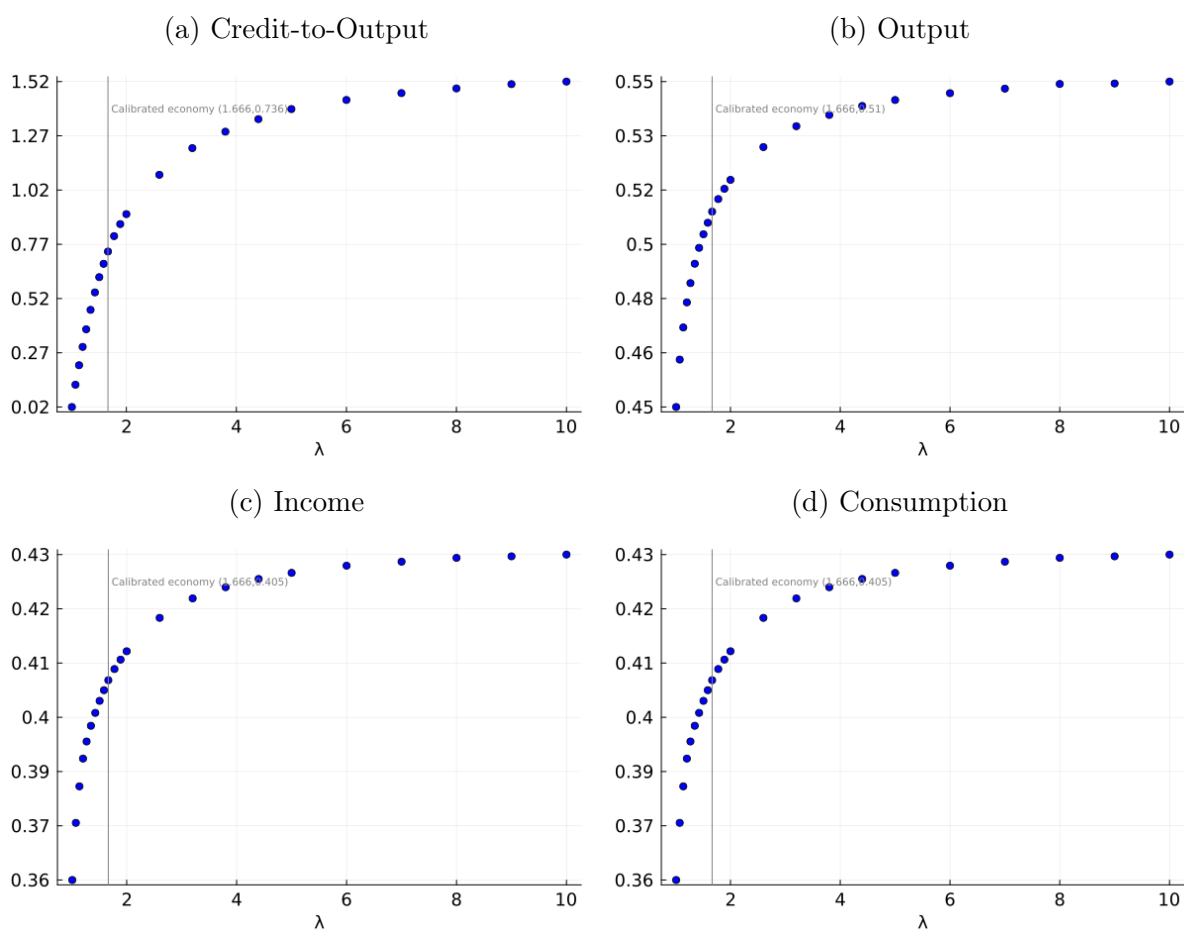
4.2 Financial frictions and occupational choice

This section looks at how changing financial frictions affects occupational choice in the long run. It is assessed by computing the equilibrium allocations for economies that

differ in their level of financial frictions, λ , and then comparing the allocations. It is important to emphasise that the only parameter that is changed in this exercise is the level of financial frictions. Specifically, the model was not re-estimated for each change in λ .

The results shown in Figure 1.1 below are generated by computing equilibrium prices and allocations of assets across households, occupational distributions and aggregate capital and labour values for different levels of λ , which is interpreted as the level of financial frictions. Those equilibrium values are computed for 20 economies with λ taken from the range (1.0, 10.0). The economy with $\lambda = 10.0$ is taken to be an economy with perfect credit markets, as in [Allub and Erosa \(2018\)](#).

Figure 1.1: Credit-to-Output ratio, Output, Income and Consumption for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

Further, throughout this section, the figures are presented with the level of the Credit-to-Output ratio instead of the level of financial frictions, λ , along the horizontal axes to provide interpretability of the results. The relationship between the level of financial

frictions and the Credit-to-Output ratio is presented in Figure 1.1a. The Credit-to-Output ratio is calculated by dividing aggregate credit and the aggregate output of the economy, where the credit is calculated as the aggregated quantity of credit used by entrepreneurs, $\max\{k - a, 0\}$, where k is the capital used in the production by the entrepreneur and a is its level of assets:

$$\sum_{z_{wj}, z_{mj}, \forall j \text{ s.t. } O_j \neq W} \int_{a_j, \forall j \text{ s.t. } O_j \neq W} \max\{k_j - a_j, 0\} \times G(a_j, z_{wj}, z_{mj}; r, w) da_j \quad (1.21)$$

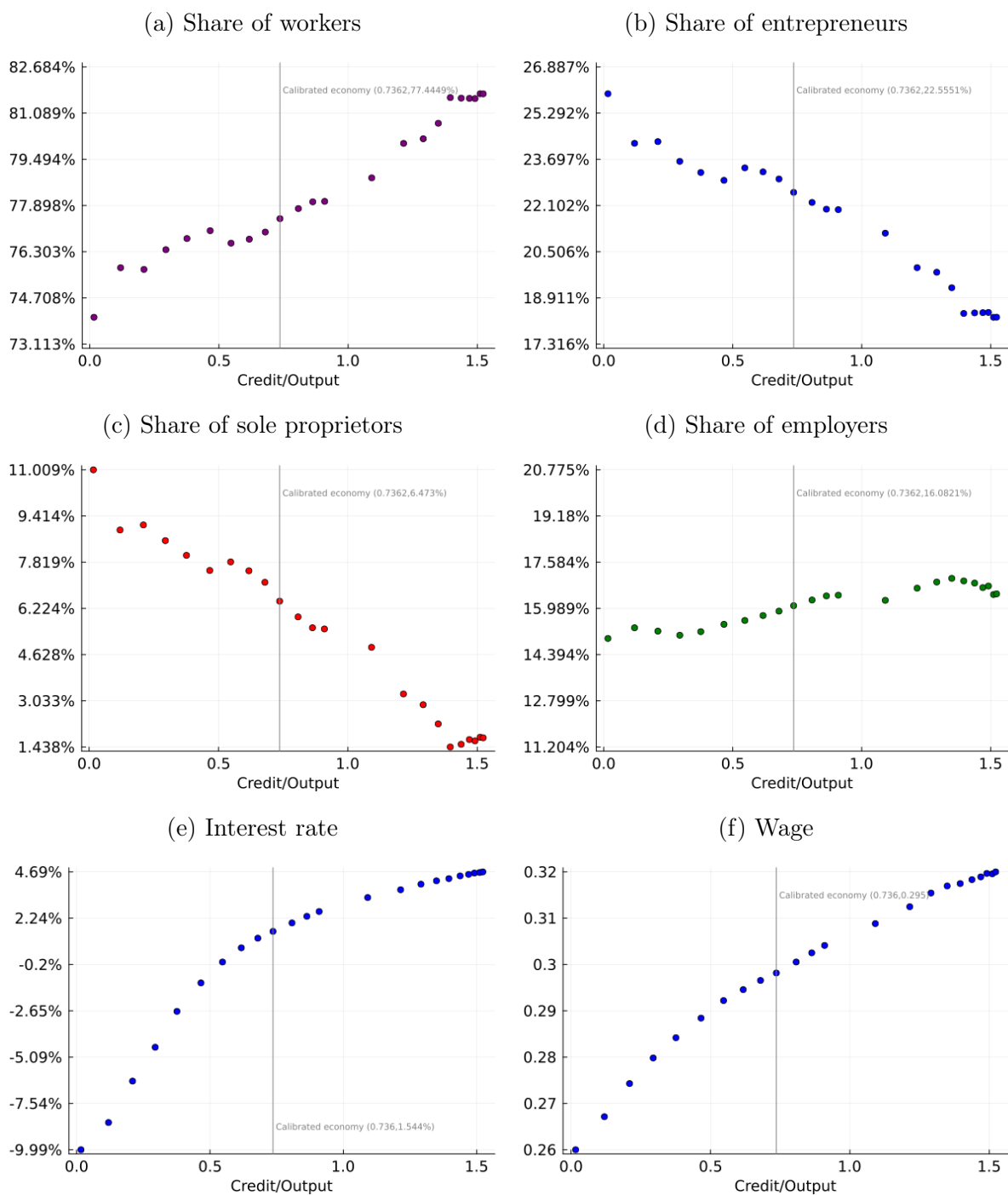
It is evident from Figure 1.1a that there is a logarithmic relationship between the level of financial frictions and the Credit-to-Output ratio. Moreover, the same relationship is present for aggregate output, see Figure 1.1b, aggregate income, see Figure 1.1c, and aggregate consumption, see Figure 1.1d. Moreover, the results suggest that macro outcomes are clearly improved by a reduction in financial frictions that relaxes the borrowing constraint. Aggregate levels of output, income and consumption all increase as a result of the removal of financial frictions, which is in line with the data reported in Brunnermeier et al. (2012).

Figures 1.2 show the relationship between the economy's occupational structure and the Credit-to-Output ratio as the level of financial frictions is changed. It has to be noted that Figure 1.2b, which shows the share of entrepreneurs, is the sum of the shares of sole proprietors and employers.

Another issue to note here is the possibility of negative interest rates, which stems from the first-order conditions for profit maximisation by entrepreneurs. In particular, the first order condition with respect to capital states that $MPK = r + \delta$ and from the properties of the Cobb-Douglas production function we know that $MPK > 0$, thus we have a lower limit on the interest rate $r > -\delta$.

As the financial friction declines and the financial market becomes increasingly developed, the effect on occupational structure is the following: there is a decrease in the share of workers, see Figure 1.2a and in the share of entrepreneurs, see Figure 1.2b. However, from Figures 1.2c and 1.2d it is evident that the majority of sole proprietors switch to become workers rather than to become employers. In other words, a large part of the decline in the number of entrepreneurs is explained by the decrease in the sole proprietor category (from 11% to 2%) which is larger than the increase in the employer category (from 15% to 17%). Indeed, Figure 1.2a shows that the share of workers is increasing with the expansion of credit in the economy. The results in this section are in line with the analysis conducted on the ILO dataset in Allub and Erosa (2018), which shows that the fraction of employers tends to slightly increase with financial liberalisation, but at the

Figure 1.2: The occupational structure, interest rate and wage for a given level of financial frictions, λ



Notes: The horizontal axis shows values for Credit-to-Output ratio and the vertical axis shows a fraction of population with particular occupation. The grey vertical line indicates the calibrated economy.

same time, the share of sole proprietors tends to decrease significantly.

The argument that might explain the reduction in the share of sole proprietors is the following. The increase in λ allows a “typical” household to borrow more capital for its entrepreneurial activity. Therefore, the demand for capital is increasing with λ , because each entrepreneur is less constrained in credit availability. Conversely, the supply of credit has not changed, thus, the interest rate should increase to clear the capital market and this effect can be seen in Figure 1.2e.

The increase in the interest rate, on the one hand, reduces the demand for capital due to the higher cost of renting capital and, on the other hand, allows households to accumulate their savings faster due to the higher return on savings. The latter effect leads to an increase in labour demand because entrepreneurs can substitute away “expensive” capital by hiring outside labour to increase their production. Moreover, the increased accumulation of assets implies that there should be an increase in the number of households that can consider an entrepreneurial route. However, as with the capital market, the labour market must clear; and if there is an increase in labour demand and relatively little change in labour supply, then there should be a wage increase, which can be seen from Figure 1.2f.

Finally, the combination of high interest rate and high wage rate puts pressure on sole proprietor households, because, on one hand, it is “expensive” to be a sole proprietor due to the high cost of capital and, on the other hand, higher wage means a higher income from being a worker. As a result, there is an increase in the number of workers, a large decrease in the number of sole proprietors and a modest increase in the number of employers, which is shown in Figure 1.2.

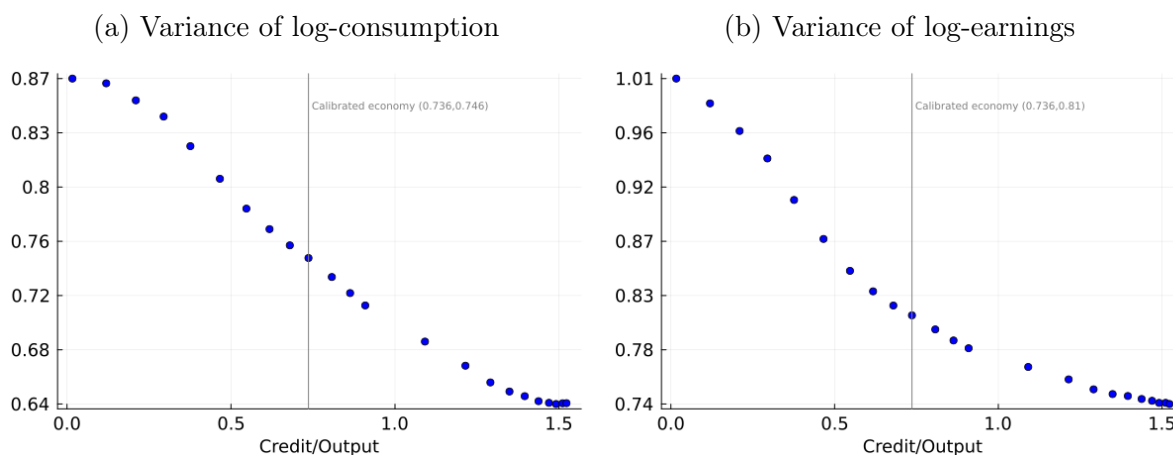
4.3 Financial frictions and inequality

This section presents the results of a change in financial frictions on earnings inequality within and between occupations and consumption inequality.

4.3.1 Consumption and earnings

Firstly, consumption inequality is measured in the model using the variance of log-consumption. Figure 1.3a shows that as the level of financial frictions is reduced the variance of log-consumption decreases, implying a decline in consumption inequality. Secondly, measuring the variance of log earnings allows me to capture earnings inequality across the whole population. Figure 1.3b shows that the reduction in financial frictions leads to a decrease in the variance of log-earnings. Both these results support the thesis

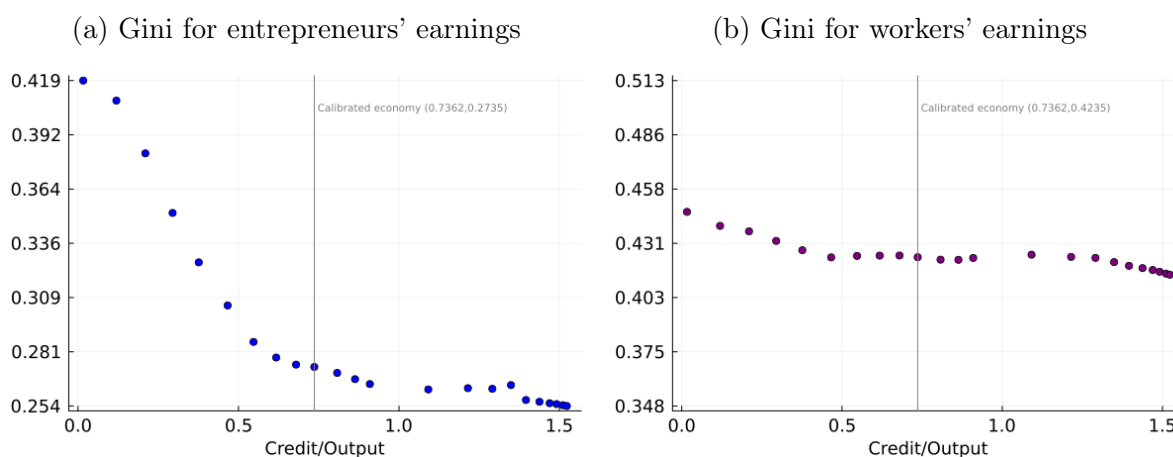
Figure 1.3: Variances of log-consumption and log-earnings, and their relationship to Credit-to-Output for a given level of financial frictions, λ



Notes: The horizontal axis shows values for the Credit-to-Output ratio and the vertical axis shows corresponding variances of log-consumption and log-earnings. Grey vertical line indicates the calibrated economy.

that the liberalisation of financial markets leads to a more equal society in terms of consumption and earnings. Moreover, this finding regarding financial frictions and wealth and earnings inequality is in line with the results from [Itskhoki and Moll \(2019\)](#) and [Allub and Erosa \(2018\)](#).

Figure 1.4: Gini coefficients for workers' and entrepreneurs' earnings, and their relationship to Credit-to-Output for a given level of financial frictions, λ



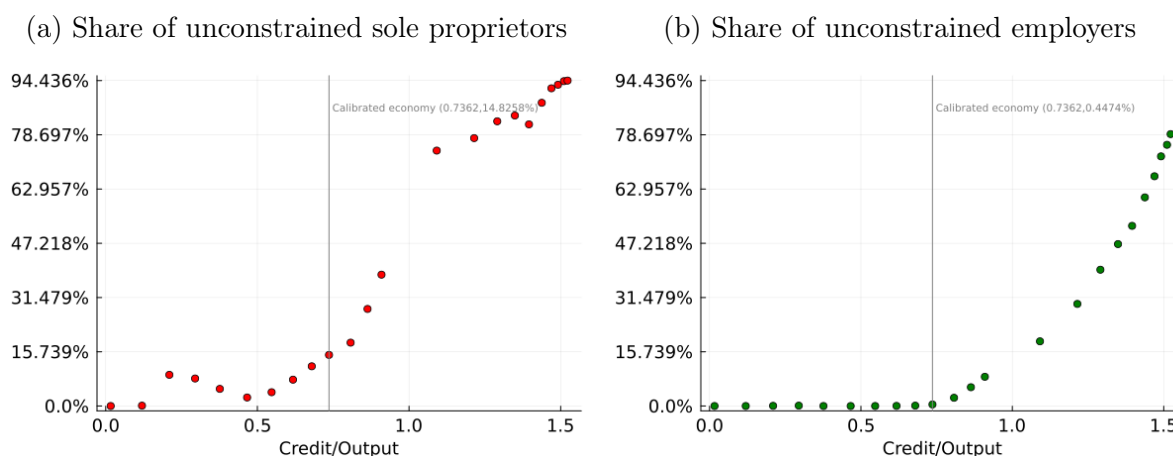
Notes: The horizontal axis shows values for the Credit-to-Output ratio and the vertical axis shows corresponding Gini coefficients for workers' and entrepreneurs' earnings. The grey vertical line indicates the calibrated economy.

Thirdly, to investigate the earnings inequality within occupations I calculate Gini coef-

ficients for workers' and entrepreneurs' earnings. Figure 1.4a shows that the liberalisation of financial markets leads to more equal earnings among entrepreneurs. The improvement in equality of entrepreneurial earnings is expected because individual levels of assets start to play a less significant role as a limitation to the amount of capital demanded. The reduced limitation on the capital demand allows entrepreneurs to realise their skills more freely. However, at the latter stages of financial liberalisation, there is hardly any change in the level of inequality.

Furthermore, Figure 1.4b shows that the liberalisation of financial markets leads to more equal earnings among workers as well. However, it seems that the reduction of inequality for workers is not of the same magnitude as the reduction for entrepreneurs. In particular, workers' earnings inequality decreases by a small margin in the initial stages of financial liberalisation. Whereas, at the latter stages, there is no change in the level of inequality, similar to the absence of change for the earnings inequality for entrepreneurs.

Figure 1.5: Share of unconstrained by the collateral constraint entrepreneurs, and their relationship to Credit-to-Output for a given level of financial frictions, λ



Notes: The horizontal axis shows values for the Credit-to-Output ratio and the vertical axis shows corresponding shares of unconstrained sole proprietors and employers. The grey vertical line indicates the calibrated economy.

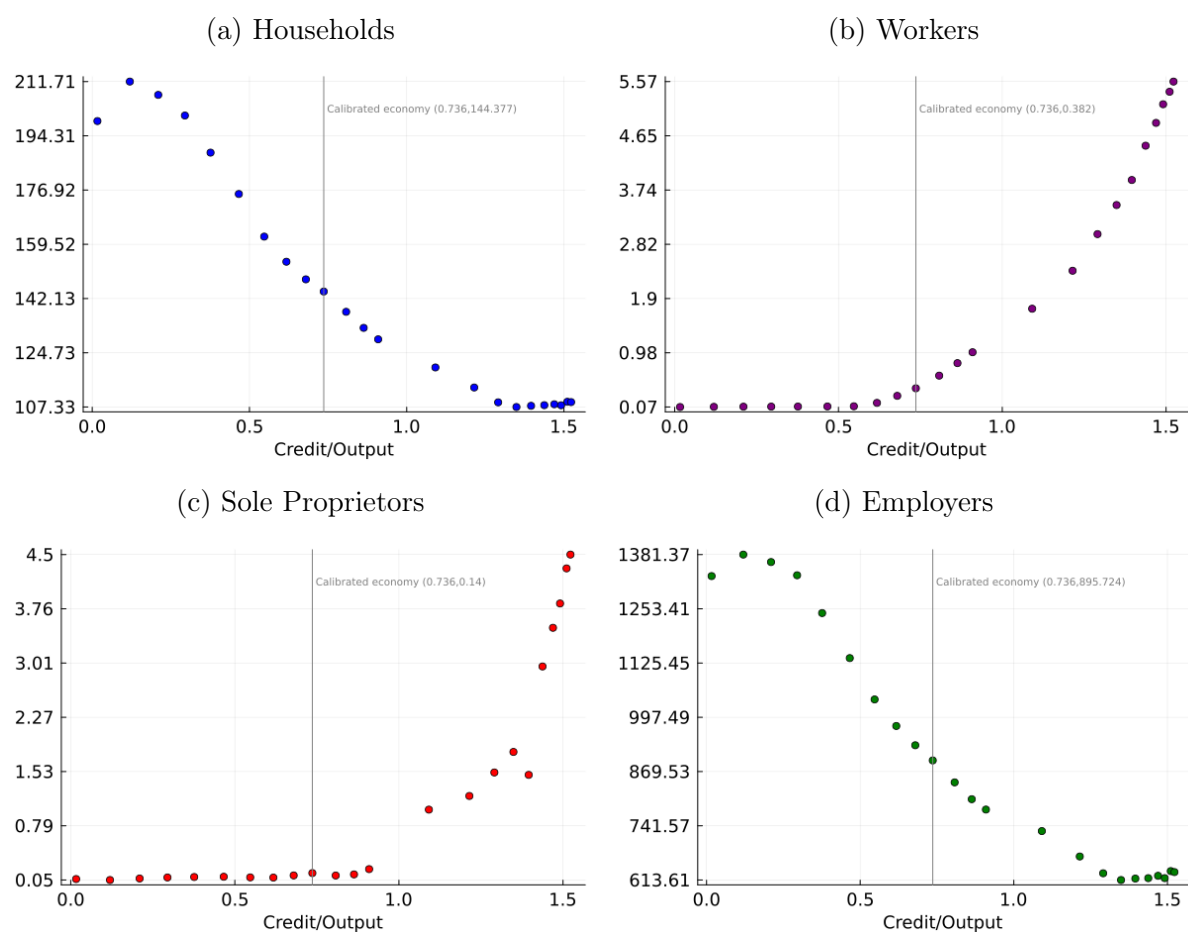
The explanation behind both of these phenomena is connected to the change of the occupational structure and share of entrepreneurs that are not financially constrained, see Figure 1.5. When the level of λ is low,¹⁵ the vast majority of entrepreneurs are financially constrained and their choice of capital is equal to their respective boundaries, thus workers with low levels of assets, low levels of working skill and high levels of managerial skill are

¹⁵The lowest level of λ implies the highest level of financial frictions — the amount of credit available is at its lowest when λ is equal to one. Higher values of λ imply lower levels of financial frictions and thus higher levels of financial liberalisation.

stuck to being workers. Therefore, these “unlucky” workers have low levels of income compared to workers with higher working skills. The situation changes only at later stages of financial liberalisation when factor prices have increased to such a level that fewer entrepreneurs are constrained by the collateral constraint and thus workers with low working and high managerial skills can switch their occupations. This possibility for unproductive workers to switch occupations leads to their removal from the workforce, which in turn improves income equality among workers.

4.3.2 Income

Figure 1.6: Variance of income across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

Figure 1.6a suggests that financial liberalisation leads to a decrease in income inequality among all households. This decrease contradicts the study of the within-country inequality over 1980-2000 by Cornia (2003). They suggest that financial liberalisation

and financial liberalisation increased income inequality. However, their measurements of households' income inequality do not account for the employers' income and include only workers and sole proprietors. Figures 1.6b and 1.6c show that there is a rise in the variances of workers' and sole proprietors' log-incomes. However, note that these increases in variances happen at the high levels of financial liberalisation. Whereas, the variances of workers' income and of sole proprietors' income do not change significantly at the low levels of financial liberalisation.¹⁶ It is important to note that the variance of employers' income is significantly reduced as a response to the rise in the Credit-to-Output ratio from the financial liberalisation, see Figure 1.6d.

Overall, financial liberalisation reduces the income inequality between occupations. However, within occupations, there is a rise in workers' and sole proprietors' income inequality alongside a fall in employers' income inequality.

4.3.3 Wealth

Lastly, to investigate wealth inequality within occupations, I present results in the form of log-means and log-variances for households' wealth across and within occupations.

From Figure 1.7a, it is evident that the mean of log-wealth among households tends to increase with the liberalisation of financial markets. The same can be said about the mean of workers' log-wealth, whereas there is a drop in the mean of employers' log-wealth and relatively no change in the mean of sole proprietors' log-wealth.

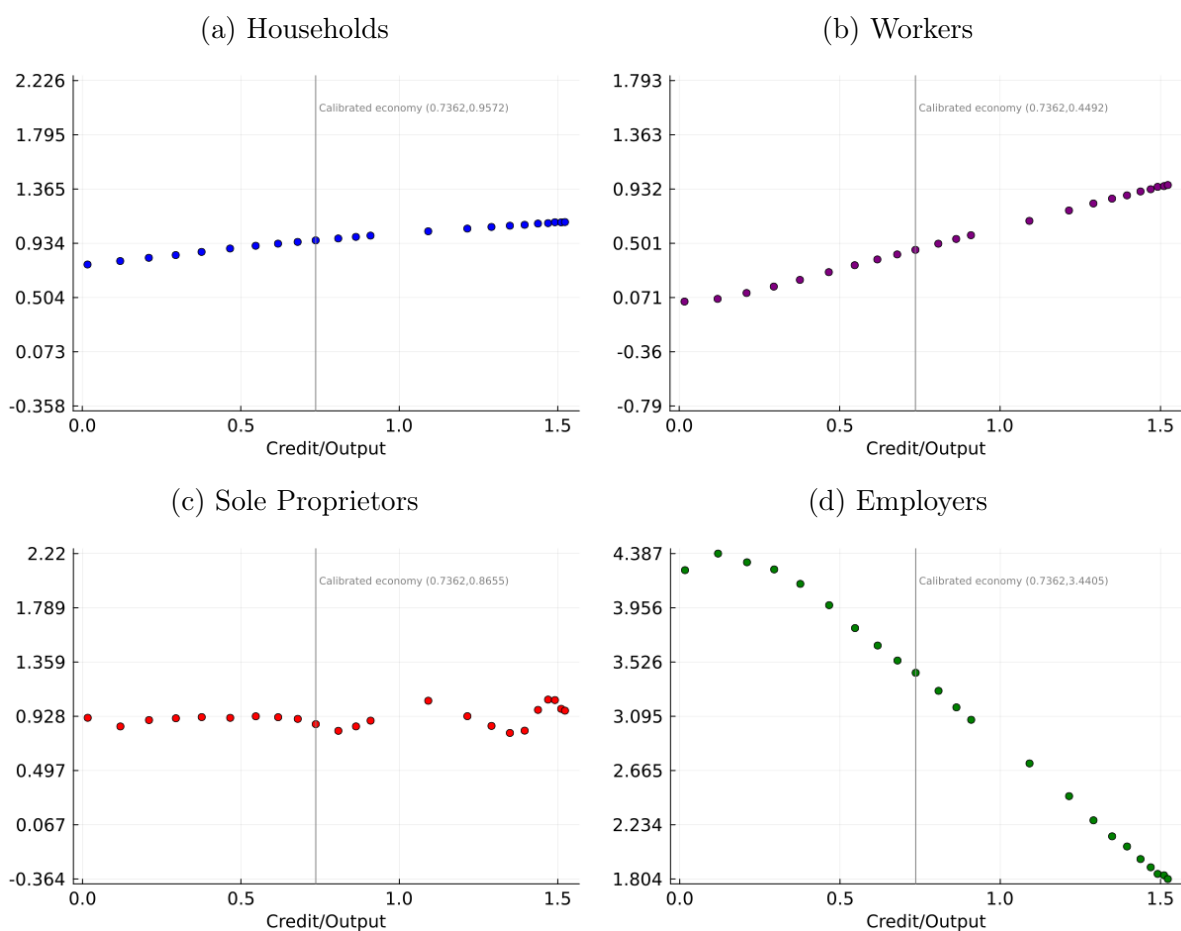
To summarise, there are wealth gains for households, in general, and for workers, in particular. Whereas, sole proprietors and employers lose on average some part of their wealth as the result of financial liberalisation. The explanation for such a reduction in average wealth is the following: the reduction in financial frictions leads to the decreased need for high levels of assets due to the greater availability of credit.

Despite all of that, from Figure 1.8, it is evident that the variance of households' log-wealth tends to decrease as a response to the decline in financial frictions. At the same time, the economies with lower liberalisation of financial markets tend to have an increase in the variances of workers' log-wealth and sole proprietors' log-wealth. Whereas, there is a fall in the variance of employers' log-wealth as a response to increased financial liberalisation.

To summarise, there is a fall in wealth inequality for all households across occupations, but the story is not the same for wealth inequality within occupations. For example, from Figure 1.9, it is evident that there is a rise in the workers' wealth inequality, see Figure

¹⁶Here, low levels of financial liberalisation are determined as values when Credit-to-Output values are less than, say, 0.5.

Figure 1.7: Mean of log-wealth across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ

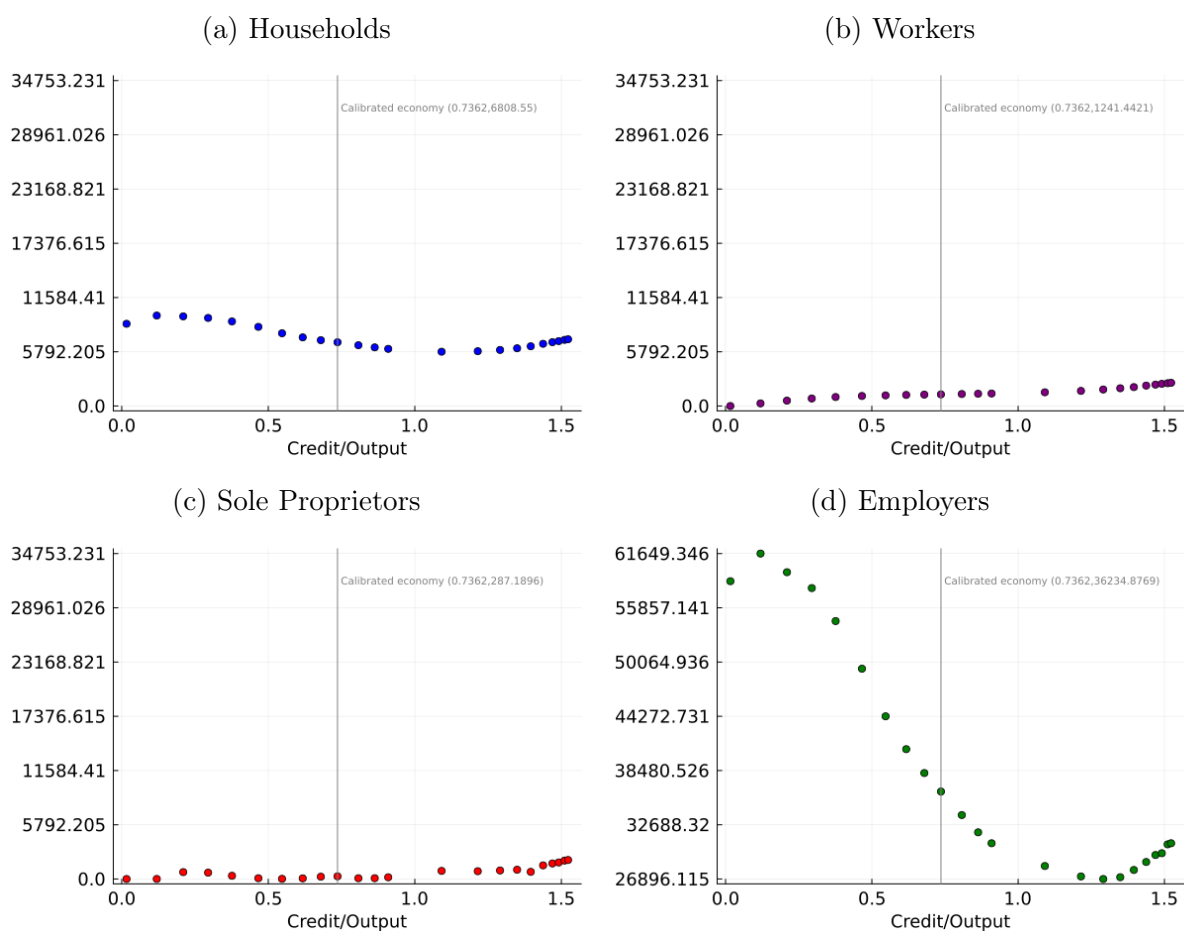


Notes: The grey vertical line indicates the calibrated economy.

1.9b, whereas, there is a decrease in employers' wealth inequality, see Figure 1.9d.

In this section of the results, I have shown that the aggregate economy benefits from a reduction in financial frictions. In particular, this is shown through the reduction of income and wealth inequality between occupations. However, the results for the inequality within occupations are different to the results between occupations. In particular, I find that workers tend to have an increase in mean income and wealth within their cohort. It is important to note that there is a rise in the workers' income and wealth inequality during low levels of financial liberalisation and a fall during high levels of financial liberalisation. Both sole proprietors and employers, on the other hand, tend to have a decrease in their mean income and wealth, but there is an increase in income equality within their respective cohorts throughout economies. On top of that, there is a decrease in wealth inequality among sole proprietors, whereas there is an increase in wealth inequality among employers in the respective economies with gradually improving financial markets.

Figure 1.8: Variance of log-wealth across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



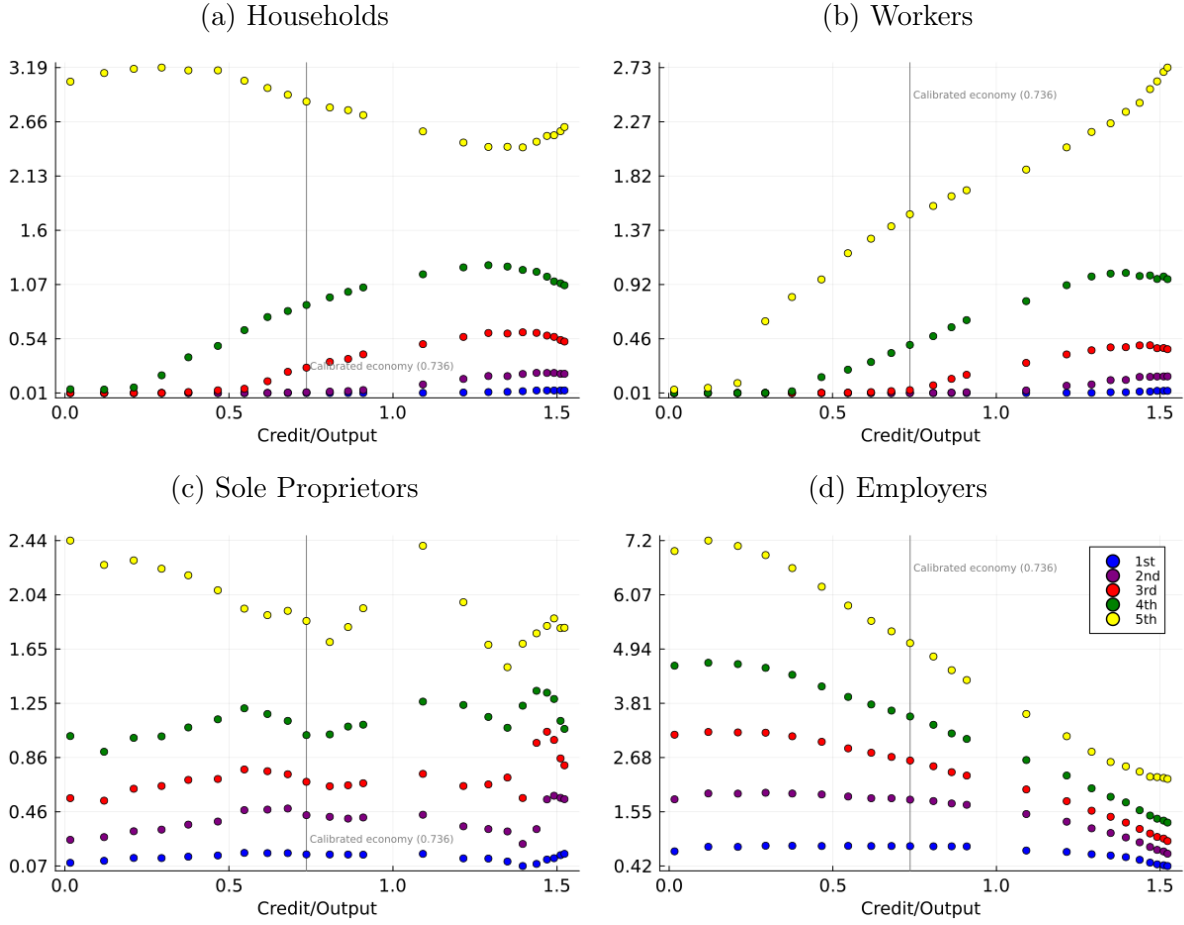
Notes: The grey vertical line indicates the calibrated economy.

4.4 Financial frictions and productivity

Financial liberalisation should lead to higher levels of productivity because capital and labour resources are used more efficiently. Moreover, according to neoclassical theory, financial liberalisation should lead to an increase in output as a result of increased productivity due to the increased funding of “better” or more productive ideas (or entrepreneurs).

Thus, in this section, I would like to explore the relationship between financial frictions and aggregate total factor productivity. First, I check whether financial liberalisation leads to an increase in overall productivity. Second, I decouple the capital and labour parts of aggregate productivity to quantify the changes in productivity coming from each part. Lastly, I check whether productivity is increased due to better sorting of the households into relevant occupations: in this model, better sorting should be represented as an increase in mean working skills for workers and an increase in mean managerial skills for

Figure 1.9: Mean of wealth of populations' quantiles across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

entrepreneurs.

4.4.1 Total Factor Productivity

Arizala et al. (2013) show from cross-country data that economies that have deeper credit markets have higher productivity levels than economies with shallower, less developed, financial markets. To showcase this data finding within this model and to investigate the change in aggregate productivity, the aggregate production function is assumed to be:

$$Y = TFP \times K^\eta N^\theta, \quad (1.22)$$

where Y is the total output of the economy, K is aggregate capital used in the production and N is the aggregate labour used in production.¹⁷ Therefore, the total factor

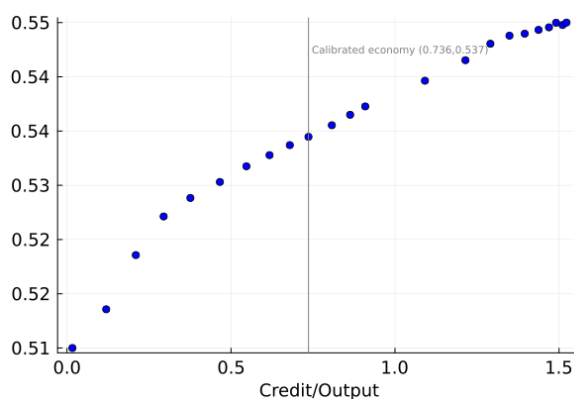
¹⁷Note that for this exercise values of η and θ are redefined scaled such that $\eta_{new} + \theta_{new} = 1$. Thus,

productivity, TFP , is calculated as

$$TFP = Y/K^\eta N^\theta. \quad (1.23)$$

This counterfactual exercise assumes that TFP should account for the effects of changes in managerial input and for the effects of financial liberalisation on the efficiency of the use of production technology — relaxing of upper bound on capital should lead to the more efficient use of capital in the production.

Figure 1.10: Total factor productivity levels for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

Figure 1.10 shows that there is an increase of TFP, calculated as above, by up to 5% solely from the act of removing financial frictions from the lowest level of financial liberalisation. In particular, the results of this counterfactual exercise suggest that the higher the liberalisation of financial markets the higher the productivity we observe for sole proprietors and employers combined. In other words, there is a strong positive relationship between Total Factor Productivity and the ratio of Credit-to-Output in the economy. To untangle the effects of financial liberalisation on Total Factor Productivity, it is useful to analyse the effects coming through labour and capital productivity separately.

4.4.2 Marginal Product of Labour

To identify the effects of financial liberalisation on labour productivity, it is useful to measure the change in the Marginal Product of Labour, MPL . MPL is calculated as the

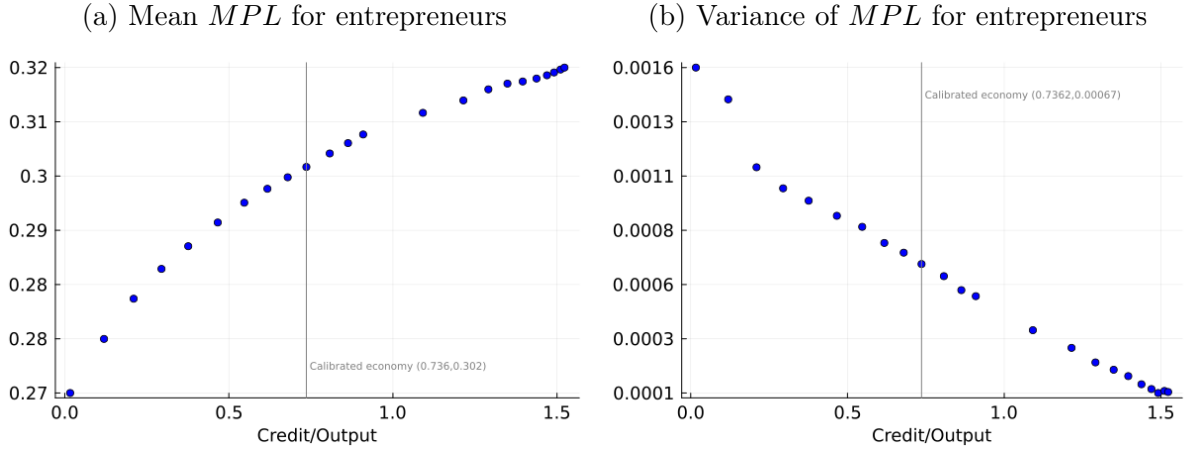
$$\eta_{new} := \frac{\eta_{old}}{\eta_{old} + \theta_{old}} \quad \text{and} \quad \theta_{new} := \frac{\theta_{old}}{\eta_{old} + \theta_{old}}.$$

mean marginal products of labour across all entrepreneurs:

$$MPL = \sum_{z_{mi}, z_{wi}, \forall i \text{ s.t. } O_i \neq W} \int_{a_i, \forall i \text{ s.t. } O_i \neq W} \frac{\theta y(a_i, z_{mi}, z_{wi}; w, r)}{l_d(a_i, z_{mi}, z_{wi}; w, r)} da_i \quad (1.24)$$

and, similarly, the variance of the MPL is calculated.

Figure 1.11: Mean and variance of marginal product of labour, MPL , for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

It has been observed in the data by [Fonseca and Van Doornik \(2019\)](#) that a credit expansion results in improved resource allocation and in particular in improved labour productivity. From Figure 1.11, we observe that the mean of the MPL for entrepreneurs tends to increase with the liberalisation of financial markets. At the same time, the variance of the MPL tends to increase as well, which explains the rise of variance of workers' income as there is more variance in entrepreneurs' ability to use the labour force efficiently.

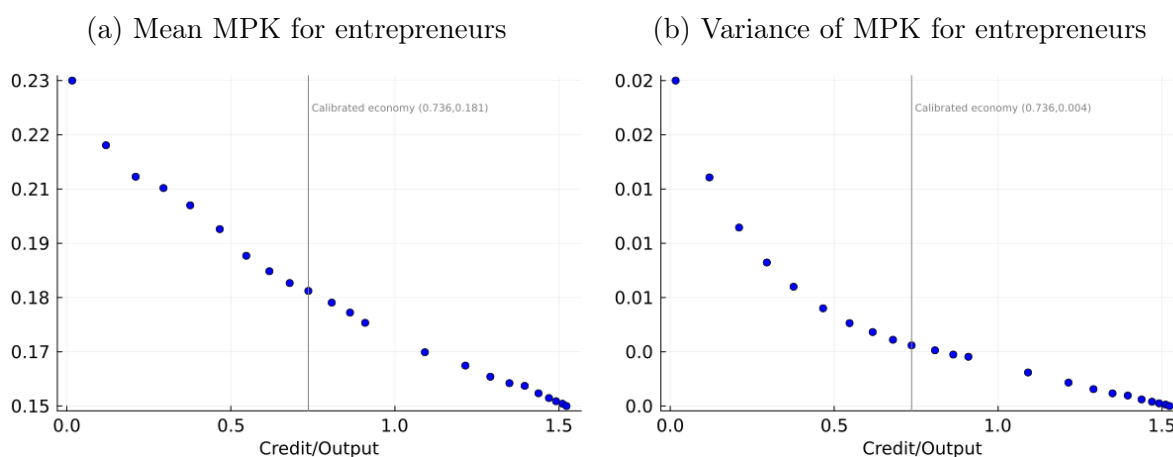
4.4.3 Marginal Product of Capital

Next, to investigate the change in capital productivity from financial liberalisation, the Marginal Product of Capital, MPK , is considered. MPK is calculated as the mean of the marginal products of capital across all entrepreneurs:

$$MPK = \sum_{z_{mi}, z_{wi}, \forall i \text{ s.t. } O_i \neq W} \int_{a_i, \forall i \text{ s.t. } O_i \neq W} \frac{\eta y(a_i, z_{mi}, z_{wi}; w, r)}{k_d(a_i, z_{mi}, z_{wi}; w, r)} da_i \quad (1.25)$$

and, similarly, the variance of MPK is calculated.

Figure 1.12: Mean and variance of Marginal Product of Capital, MPK for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

The law of diminishing returns implies that the MPK is positive but decreasing in the level of capital. On top of that, financial liberalisation implies a higher level of capital stock. Thus, financial liberalisation should lead to a decrease in the average MPK . From Figure 1.12a, we do observe a decrease in the mean of MPK of entrepreneurs.

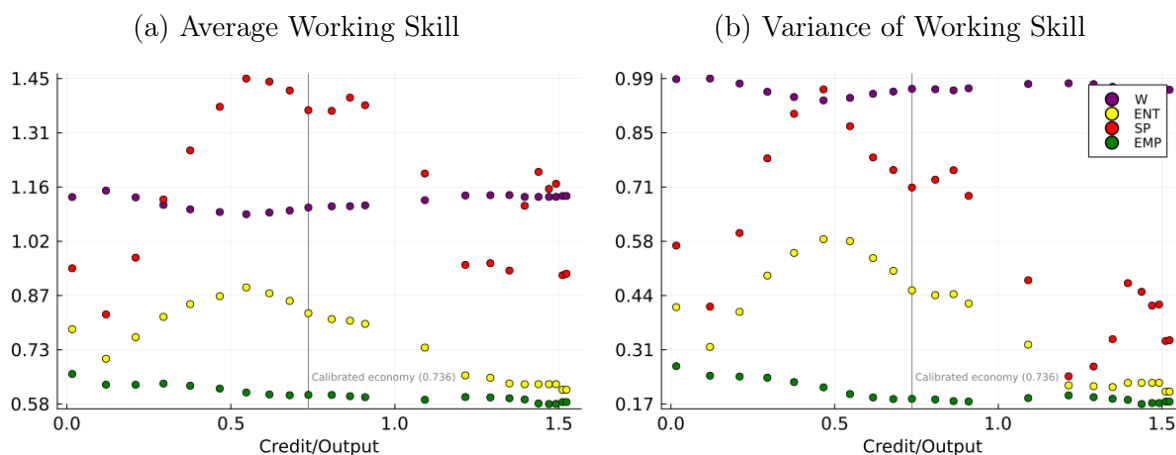
To summarise, the rise in output cannot be explained solely by the rise in aggregate capital because there is a drop in capital productivity as a result of financial liberalisation. Therefore, this increase in output is explained by a rise in TFP, which in turn is explained by an increase in labour productivity and by a “better” sorting of households to different occupations. This means that entrepreneurs with higher managerial abilities can get more funding for their projects in economies with better financial liberalisation and thus generate more output than entrepreneurs with lower managerial abilities in economies with lower levels of financial liberalisation.

4.4.4 Mean and Variance of skills

To check the hypothesis that the productivity improvement is achieved by a “better” sorting of households into occupations, the distribution of skills within the different occupations is considered. In particular, the main interests in this exercise are the means and variances of working skills and managerial skills within and across occupations.

From Figure 1.13a, it is evident that the mean working skill of workers does not change drastically with increased financial liberalisation. At high levels of financial liberalisation, the mean working skill of sole proprietors declines, whereas the mean working skill of employers slightly rises. The main explanation behind the last phenomenon is that work-

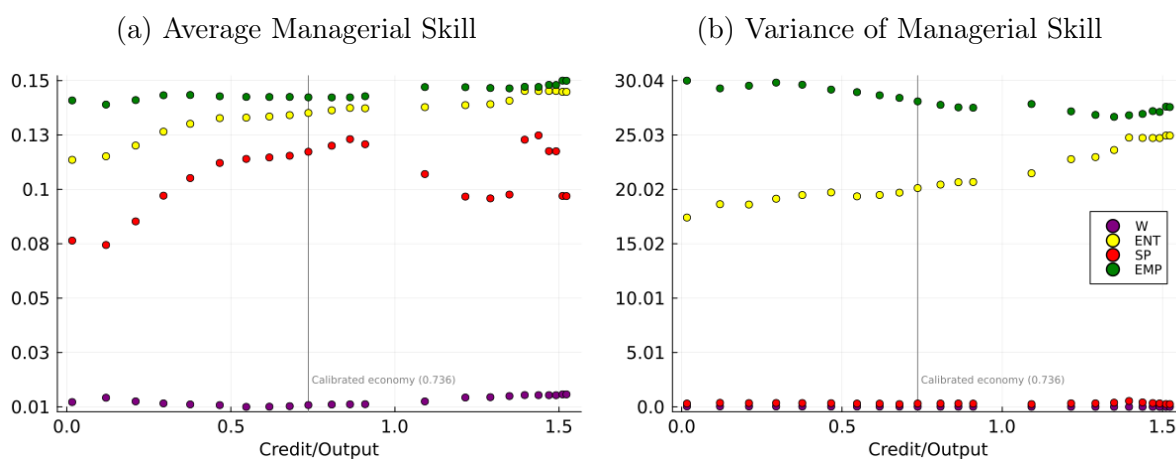
Figure 1.13: Mean and variance of working skills are given for all occupations for a given level of financial frictions, λ



Notes: Here, W stands for workers, ENT — for entrepreneurs, which is a combination of SP for sole proprietors and EMP — for employers. The grey vertical line indicates the calibrated economy.

ing skill is correlated with managerial skill, which means that the increase in the mean managerial skill for employers should correlate with an increase in the mean working skill.

Figure 1.14: Mean and variance of managerial skills are given for all occupations for a given level of financial frictions, λ



Notes: Here, W stands for workers, ENT — for entrepreneurs, which is a combination of SP for sole proprietors and EMP — for employers. The grey vertical line indicates the calibrated economy.

From Figure 1.14a, there is a slight decrease in the mean managerial skill of workers, which should indicate an increase in the mean managerial skill of entrepreneurs. This increase for entrepreneurs is supported by the increase in the mean managerial skills of sole proprietors and employers.

Thus, it is possible to conclude that the “better” sorting hypothesis is consistent with my finding that a rise in the mean managerial skill amongst entrepreneurs across both sole proprietors and employers. In other words, households with higher managerial skills have more opportunity to become employers in economies with highly developed financial markets, which increases the mean managerial skill across this category and leads directly to a rise in total factor productivity and therefore output. However, we do not observe a similar change in the mean of working skills for workers.

To summarise, in this section of the results I have shown that there is an increase in productivity resulting from the liberalisation of financial markets. The increase in productivity is achieved primarily by the increased marginal product of labour. Moreover, productivity is increased due to an improved self-sorting of households into occupations. The improved self-sorting results in an increased average working skill among workers and increased average managerial skill among employers.

5 Conclusion

The [Allub and Erosa \(2018\)](#) model is solved in general equilibrium and used to study the effects of financial liberalisation on occupational choice, inequality, and productivity. The model is one in which households are heterogeneous in managerial and working skills and entrepreneurs decide how much to devote to the supply of labour and/or managerial input. The model is calibrated to the Italian economy. The model can replicate the occupational structure and main characteristics (Credit-to-Output, Capital-to-Output ratios and measures of inequality between and within occupations) of Italy.

The results of the analysis shed light on the reason behind the decrease in the share of entrepreneurs after financial liberalisation: the share of employers does not change, whereas the share of sole proprietors decreases significantly. The mechanism behind these effects is the following: the relaxation of financial constraints increases the capital demand. The increase in capital demand increases the market interest rate. The increase in interest rate makes it more costly to be sole proprietor or employer. The rise in the cost of being an employer leads to employers demanding more labour to compensate for the increased cost of capital. The increase in demand for labour increases the market wage rate. The increased wage rate makes being a worker a more attractive option compared to being a sole proprietor. To summarise, financial liberalisation leads to an increase in factor prices, which reduces the profit of sole proprietors and increases the earnings of workers. These two effects lead to a decrease in the share of sole proprietors, an increase in the share of workers and no change in the share of employers. The larger reallocation of

capital towards a smaller number of entrepreneurs in this economy implies a large credit expansion and output gain.

Additionally, this model allows me to address questions about inequality. As a whole, the aggregate economy benefits from a reduction in financial frictions. In particular, this is shown through the reduction of income and wealth inequality between occupations. However, the results for the inequality within occupations are different to the results between occupations. In particular, I find that workers tend to have an increase in mean income and wealth within their cohort. It is important to note that there is a rise in the workers' income and wealth inequality during low levels of financial liberalisation and a fall during high levels of financial liberalisation. Both sole proprietors and employers, on the other hand, tend to have a decrease in their mean income and wealth, but there is an increase in income equality within their respective cohorts throughout economies. On top of that, there is a decrease in wealth inequality among sole proprietors, whereas there is an increase in wealth inequality among employers in the respective economies with gradually improving financial markets.

Finally, I have shown that there is an increase in productivity resulting from the liberalisation of financial markets. The increase in productivity is achieved primarily by the increased marginal product of labour. Moreover, productivity is increased due to an improved self-sorting of households into occupations. The improved self-sorting results in an increased average working skill among workers and increased average managerial skill among employers.

Bibliography

- Agnello, L., Mallick, S. K., and Sousa, R. M. (2012). Financial reforms and income inequality. Economics Letters, 116(3):583–587.
- Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.
- Annicchiarico, B., Di Dio, F., Felici, F., and Monteforte, L. (2013). IGEM: A Dynamic General Equilibrium Model for Italy. Working Paper, Department of the Treasury, Italian Ministry of the Economy and of Finance, 4(April):1–54.
- Arizala, F., Cavallo, E., and Galindo, A. (2013). Financial development and tfp growth: cross-country and industry-level evidence. Applied Financial Economics, 23(6):433–448.

Ballarino, G., Braga, M., Checchi, D., Filippin, A., Leonardi, M., and Meschi, E. (2012). Gini Country Report Italy. (September).

Banerjee, A. V. and Duflo, E. (2005). Growth theory through the lens of development economics. Handbook of economic growth, 1:473–552.

Biagi, F. (2012). Earning profiles for italian male workers: is there evidence of a premium for education

Borella, M. and Belloni, M. (2018). Self-Employment in Italy: The Role of Social Security Wealth. SSRN Electronic Journal, (April).

Brunetti, I. and Fiaschi, D. (2021). Occupational mobility: Theory and estimation for italy. arXiv preprint arXiv:2104.01285.

Brunnermeier, M. K., Eisenbach, T. M., and Sannikov, Y. (2012). Macroeconomics with financial frictions: A survey.

Buera, F. J., Kaboski, J. P., and Shin, Y. (2015). Entrepreneurship and Financial Frictions: A Macroeconomic Perspective. Annual Review of Economics.

Buera, F. J. and Shin, Y. (2013). Financial Frictions and the Persistence of History: A Quantitative Exploration. Journal of Political Economy, 121(2):221–272.

Cornia, G. A. (2003). The impact of liberalisation and globalisation on income inequality in developing and transitional economies. Available at SSRN 380347.

Dobbin, C. P. (1991). Capital stock and capital output ratios: A comparison between the united states, united kingdom and the federal republic of germany.

Fonseca, J. and Van Doornik, B. (2019). Financial development, labor markets, and aggregate productivity: Evidence from brazil. Unpublished Working Paper.

Heathcote, J., Storesletten, K., and Violante, G. L. (2005). Two views of inequality over the life cycle. Journal of the European Economic Association, 3(2-3):765–775.

Heer, B. and Maussner, A. (2005). Dynamic General Equilibrium Modeling.

Hsieh, C.-T. and Klenow, P. J. (2014). The life cycle of plants in india and mexico. The Quarterly Journal of Economics, 129(3):1035–1084.

Itskhoki, O. and Moll, B. (2019). Optimal development policies with financial frictions. Econometrica, 87(1):139–173.

- Jappelli, T. and Pistaferri, L. (2009). Income Inequality in Italy ? (May).
- King, R. G. and Levine, R. (1993). Finance and growth: Schumpeter might be right. The quarterly journal of economics, 108(3):717–737.
- Krueger, D., Mitman, K., and Perri, F. (2016). Macroeconomics and Household Heterogeneity. Handbook of Macroeconomics, 2:843–921.
- Lucas Jr, R. E. (1978). On the size distribution of business firms. The Bell Journal of Economics, pages 508–523.
- Moll, B. (2014). Productivity Losses from Financial Frictions. American Economic Review, 104(10):3186–3221.
- Moyo, C. and Le Roux, P. (2020). Financial liberalisation, financial development and financial crises in sadc countries. Journal of Financial Economic Policy.
- O’Driscoll, M. P., Humphries, M., and Larsen, H. H. (1991). Managerial activities, competence and effectiveness: manager and subordinate perceptions. The International Journal of Human Resource Management, 2(3):313–326.
- Pietrunti, M. (2017). Financial frictions and the real economy. Technical report, ESRB Working Paper Series.
- Report, D. (2017). Diagnostic Report Italy.
- Roy, A. D. (1951). Some thoughts on the distribution of earnings. Oxford economic papers, 3(2):135–146.
- Schivardi, F. and Torrini, R. (2005). Firm Size Distribution and EPL in Italy. SSRN Electronic Journal, (613).
- Shaw, E. S. (1973). Financial deepening in economic development.
- Violante, G. L., Polo, A., and Acciari, P. (2019). " and yet, it moves": Intergenerational mobility in italy.

APPENDIX

1.A Solution

1.A.1 Profit maximisation problem

The solution to the profit maximisation problem requires finding profits for each occupational choice and choosing the occupation which provides the maximum profit for the given factor prices and the household's current skills. Profit for a worker is straightforwardly determined, whereas, both sole proprietors and employers need to solve optimisation problems to determine profits.

1.A.1.1 Sole Proprietor

The profit of the sole proprietor is the following:

$$\pi(a, z_m, z_w; w, r) = \max_{0 \leq d \leq 1, k \leq \lambda a} (dz_m)^\gamma k^\eta ((1-d)z_w)^\theta - (r + \delta)k \quad (1.26)$$

Immediately, it is easy to deduce that $d \neq 0$ and $d \neq 1$, because otherwise, the production function would produce zero output. Therefore, the corresponding Lagrangian is the following:

$$L = (dz_m)^\gamma k^\eta ((1-d)z_w)^\theta - (r + \delta)k - \mu_k(k - \lambda a), \quad (1.27)$$

where μ_k is the Lagrangian multiplier associated with the collateral constraint on capital.

Corresponding first order conditions for managerial time, d , capital, k , and Lagrange

multiplier on borrowing constraint, μ_k , are the following:

$$\frac{\partial L}{\partial d} = \gamma d^{\gamma-1} z_m^\gamma k^\eta (1-d)^\theta z_w^\theta - d^\gamma z_m^\gamma k^\eta \theta (1-d)^{\theta-1} z_w^\theta = 0, \quad (1.28)$$

$$\frac{\partial L}{\partial k} = (dz_m)^\gamma \eta k^{\eta-1} ((1-d)z_w)^\theta - (r + \delta) - \mu_k = 0, \quad (1.29)$$

$$\mu_k (k - \lambda a) = 0, \quad (1.30)$$

with $\mu_k \geq 0$.

The optimal time for managerial activities is obtained directly from equation 1.28:

$$d^* = \frac{\gamma}{\gamma + \theta} \quad (1.31)$$

The optimal choice for the capital to use in the production is chosen from two options:

1. under the condition that Lagrange multiplier, from equation 1.30, for borrowing constraint is not equal to zero, optimal capital is equal to the boundary of borrowing constraint: $k^* = \lambda a$
2. under the condition that Lagrange multiplier, from equation 1.30, for borrowing constraint is equal to zero, capital is obtained from the first-order condition in equation 1.29: $k^* = \left(\frac{\eta((1-d^*)z_w)^\theta (d^* z_m)^\gamma}{r + \delta} \right)^{\frac{1}{1-\eta}}$

All solutions have to satisfy the borrowing constraint, $k \leq \lambda a$, and the managerial time constraint $0 \leq d \leq 1$.

As a result, sole-proprietor households can be divided into two categories: those, who are constrained in their choice of capital, see the solution (1), and those, whose optimal choice is not affected by the borrowing constraint, see the solution (2).

1.A.1.2 Employer

The profit of the employer is the following:

$$\pi(a, z_m, z_w; w, r) = \max_{0 \leq d \leq 1, k \leq \lambda a, n > 0} (dz_m)^\gamma k^\eta ((1-d)z_w + n)^\theta - wn - (r + \delta)k - c_e \quad (1.32)$$

As for sole proprietors, it is easy to deduce that $d \neq 0$, because otherwise, the production function would produce zero output. Therefore, the corresponding Lagrangian is the following:

$$L = (dz_m)^\gamma k^\eta ((1-d)z_w + n)^\theta - wn - (r + \delta)k - c_e - \mu_k (k - \lambda a) - \mu_t (d - 1), \quad (1.33)$$

where μ_k is the Lagrangian multiplier associated with collateral constraint on capital and μ_t is the Lagrangian multiplier associated with managerial time not being bigger than one.

Corresponding first order conditions for managerial time, d , capital, k , and hired labour, n , and Lagrange multipliers on borrowing constraint, μ_k , and on managerial time, μ_t , are the following:

$$\frac{\partial L}{\partial d} = \gamma d^{\gamma-1} z_m^\gamma k^\eta ((1-d)z_w + n)^\theta - d^\gamma z_m^\gamma k^\eta \theta ((1-d)z_w + n)^{\theta-1} - \mu_t = 0, \quad (1.34)$$

$$\frac{\partial L}{\partial k} = (dz_m)^\gamma \eta k^{\eta-1} ((1-d)z_w + n)^\theta - (r + \delta) - \mu_k = 0, \quad (1.35)$$

$$\frac{\partial L}{\partial n} = d^\gamma z_m^\gamma k^\eta \theta ((1-d)z_w + n)^{\theta-1} - w = 0, \quad (1.36)$$

$$\mu_k(k - \lambda a) = 0, \quad (1.37)$$

$$\mu_t(d - 1) = 0, \quad (1.38)$$

where $\mu_k \geq 0$ and $\mu_t \geq 0$.

The optimal choice for the capital to use in the production, the optimal time for managerial activities and optimal labour employment from the market are chosen from three options:

1.
 - The constrained capital: $k^* = \lambda a$
 - The optimal time for managerial activities: $d^* = \left(\frac{\theta^\theta \gamma^{1-\theta} z_m^\gamma z_w^{\theta-1}}{w} \right)^{\frac{1}{\eta}} k$
 - The optimal choice of labour: $n^* = z_w d^* \frac{\gamma+\theta}{\gamma} - z_w$
2.
 - The optimal capital: $k^* = \left(\frac{\eta}{r+\delta} \right)^{\frac{1-\theta}{\gamma}} \left(\frac{\theta}{w} \right)^{\frac{\theta}{\gamma}} z_m$
 - The constrained time for managerial activities: $d^* = 1$
 - The optimal choice of labour: $n^* = \left(\frac{\theta z_m^\gamma k^{*\eta}}{w} \right)^{\frac{1}{1-\theta}}$
3.
 - The constrained capital: $k^* = \lambda a$
 - The constrained time for managerial activities: $d^* = 1$
 - The optimal choice of labour: $n^* = \left(\frac{\theta z_m^\gamma k^{*\eta}}{w} \right)^{\frac{1}{1-\theta}}$

All solutions have to satisfy the borrowing constraint, $k \leq \lambda a$, and the managerial time constraint $0 \leq d \leq 1$ as for the problem of the sole proprietor.

Consequently, employers can be divided into three groups: those, who use all of the available credit and decide to provide their working skills into their venture, see option

(1); those, who do not use all of the available capital and provide only their managerial skill, see option (2); and those, who use all of the available credit and their resources and allocate their time exclusively to managerial activities, see option (3).

Note that it is optimal to have non-constrained time for managerial activities only when the choice of capital is constrained. When the optimal choice capital is not constrained, then it is optimal to allocate all of the time towards managerial activities. The reason is that labour input can be hired outside of the household, whereas managerial input cannot. Therefore, the employer has a better return from their managerial skill than from their working skill.

1.A.2 Stationary joint distribution of assets and skills

To describe the stationary joint distribution of assets and skills we first define the joint unconditional distribution of (a, z_m, z_w) as

$$G(a, z) = P(a_t = a, z_t = z), \quad (1.39)$$

where $z = (z_m, z_w)$ is the pair of managerial and working skills.

The joint conditional probability is defined as

$$G((a', z')|(a, z)) = P((a_{t+1} = a', z_{t+1} = z')|(a_t = a, z_t = z)), \quad (1.40)$$

which shows the probability of arriving to the state (a', z') from the state (a, z) .

The unconditional probability distribution evolves over time and is updated using the joint conditional probability:

$$G(a', z') = \sum_a \sum_z G((a', z')|(a, z)) \times G(a, z) \quad (1.41)$$

It has to be noted that conditional on (a, z) , the probability that $a_{t+1} = a'$ is independent of the probability that $z_{t+1} = z'$. This is because, conditional on (a, z) , a_{t+1} follows the deterministic policy function $a'(a_t, z_t)$ and is, thus, not affected by the realisation of z_{t+1} , in other words, it is predetermined. Similarly, conditional on (a, z) , and, more precisely, conditional on the realisation of $z_t = z$, $z_{t+1} = z'$ are determined by the exogenous Markov chain and is not affected by a_{t+1} because the skills are exogenous.

Therefore,

$$G(a', z') = \sum_a \sum_z G(a'|a, z) \times G(z'|z) \times G(a, z), \quad (1.42)$$

or for given values of interest rate, r , and wage rate, w :

$$G(a', z') = \sum_a \sum_z I(a', a, z; r, w) \times G(z'|z) \times G(a, z), \quad (1.43)$$

where $I(a', a, z; r, w)$ is the indicator function such that it takes the value one if $a' = a'(a, z; r, w)$ and zero otherwise. In other words, the probability of the state is calculated by summing over current states that are consistent with the policy function. If the policy rule is invertible, then for given values of interest rate, r , and wage rate, w , the formula can be simplified to:

$$G(a', z') = \sum_z \pi(z'|z) \times G(a'^{-1}(a', z; r, w), z), \quad (1.44)$$

where $\pi(z'|z)$ is the probability of moving to the pair of skills z' conditional on having skills z . Then, the equation above is used to find the joint distribution function $G^*(a, z; r, w)$ by iterating directly over equation 1.44.

1.A.3 Computing general equilibrium

Here I describe the algorithm used to compute the household's decision function and the stationary joint distribution of wealth and working and managerial skills for fixed factor prices, interest rate r and wage w :

1. Solve the profit maximisation problem for each state of assets, managerial and working skills for given values of r and w .
2. Use dynamic programming to solve the household's optimisation problem to obtain $c(a, z_m, z_w)$ and $a'(a, z_m, z_w)$.
3. Compute the stationary joint distribution of assets and skills using the inverse of the policy function $a'(a, z_m, z_w)$.
4. Obtain the cross-sectional stationary joint unconditional distribution *across* households over assets, managerial and working skills. Use this distribution to calculate aggregate capital demand K_d and aggregate capital supply K_s and aggregate labour demand L_d and aggregate labour supply L_s values.

Now, it is possible to describe the algorithm for obtaining the general equilibrium:

1. Guess initial values for interest rate, r_0 , and wage, w_0 .

2. Use the bisection method to find the wage, w_1 , that clears the labour market, given the interest rate, r_0 .
3. Use the bisection method to find the interest rate, r_1 , that clears the capital market, given the wage, w_1 .
4. If both markets for capital and labour clear at the end of Step 3, i.e. if $(r_1, w_1) == (r_0, w_0)$, then general equilibrium is found. Otherwise, update the guess, $(r_0, w_0) := (r_1, w_1)$, and go to Step 2.

1.B Numerical solution

This section describes the approximation objects that are used in the numerical computation of the general equilibrium. Then, it describes the main numerical algorithms used in the code. Lastly, the calibration of the parameters is outlined.

1.B.1 Approximation objects

1.B.1.1 Assets

The next object of interest that needs to be approximated is the set of possible levels of assets for a typical household. To approximate this object, four hyper-parameters are needed:

1. Minimum value of an asset, a_{min} — since no borrowing is allowed for households' consumption, this value is set to zero.
2. Maximum value of an asset, a_{max} — the value has to be chosen such that it does not bind as the choice variable for the future level of assets, thus the maximum value is set to 50 units.
3. Number of nodes — this value is the compromise between accuracy (bigger number) and speed (smaller number), thus, the value is chosen to be 25.
4. Distribution of nodes on the range $[a_{min}, a_{max}]$ — this interval should be divided into sub-intervals of non-equal length. Finer sub-intervals should be chosen at the lower and upper ends of the interval.¹⁸ As a result, a third of nodes is distributed uniformly

¹⁸First reason is that a high degree of nonlinearity is present near the zero level of assets due to the binding of the budget constraint. It is going to happen in the form of transferring all of the earnings into the consumption (future assets are set to zero) and then at some critical point, there is going to be a

for the first 20% of asset levels, another third of nodes are distributed uniformly for the next 60% of asset levels and the final third is distributed uniformly for the last 20% of asset levels.

1.B.2 Algorithms and functions

The numerical solution is obtained with the use of the programming language Julia. The final program consists of the following major sections:

1. The realisation of profit maximisation problem and value function iteration algorithm solving the household's problem.
2. Computation of the stationary distribution and aggregation of capital supply and demand; and labour supply and demand.

1.B.2.1 Realisation of profit maximisation problem and value function iteration process

The solution of the profit maximisation is realised as multiple functions which return the values of the profit from different occupations and configurations with inputs as the state of the household (a, z_m, z_w) and given interest rate and wage. After that, these possible values are checked whether they satisfy conditions and then, finally, the maximal value out of the candidates, that satisfy the conditions above, is chosen.

The initial guess for the value function is set to a utility function of consumption for each state (a, z_m, z_w) , which is equal to a third of the total profit of a household with this particular state. Thus, for each state (a, z_m, z_w) initial guess for value function is:

$$V_0(a, z_m, z_w) = \ln \left(\frac{1}{3} (\Pi(a, z_m, z_w; r, w) + (1 + r)a) \right) \quad (1.45)$$

Then, the iteration process proceeds until the tolerance level is achieved and for each iteration, the value function is updated. The update process for every state of assets and skills (a, z_m, z_w) of each iteration for iteration i is the following:

1. Find optimal future assets by solving the following equation for a'^* with the use of

positive choice of the future level of assets. Another reason is that at the upper end, it is needed to ensure that households will not go over the maximum value of an asset, thus the policy function is artificially bounded by the condition $a_{t+1} = a_t$ for upper levels of assets to ensure convergence of the algorithm. Whereas in the middle of the interval, all policies should behave linearly, thus uniform distribution should be used for this part of the interval.

function `find_zero()` from the package `Roots.jl`:

$$\frac{1}{a'^* - \pi(a, z_w, z_m; w, r) + (1+r)a} - \beta \frac{\partial \mathbb{E}V_i(a'^*, z'_m, z'_w; r, w)}{\partial a'} = 0, \quad (1.46)$$

2. Calculate V_{i+1} with the use of the following formula and the optimal consumption c^* found in the previous step:

$$V_{i+1}(a, z_m, z_w; r, w) = \ln(a'^* - \pi(a, z_w, z_m; w, r) + (1+r)a) + \beta \mathbb{E}V_i(a'^*, z'_m, z'_w; r, w) \quad (1.47)$$

3. Repeat the previous two steps for all combinations of state variables (a, z_m, z_w)
4. If

$$\max_{(a, z_m, z_w)} \left\{ |V_{i+1}(a, z_m, z_w) - V_i(a, z_m, z_w)| \right\} < \textit{tolerance level}, \quad (1.48)$$

then the iteration process has converged. Otherwise, increase the iterator by one and go to the first step.

It has to be noted that the expectation of function with respect to skills is calculated simply by summing up products of function evaluation in all possible states of skills and the probability of arriving at these possible states from the current state.

1.B.2.2 Computing the stationary distribution

The next module of the code is dedicated to computing the joint unconditional distribution of assets and skills following the method from [Ríos-Rull \(1999\)](#). To do that following steps are taken:

1. Construct a grid for assets which has 10 times more nodes than the grid used to compute the optimal decision rules in the value function iteration procedure.
2. Compute the inverse of the decision rule $a'(a, z_m, z_w)$ by solving for each (a, z_m, z_w) the following equation:

$$a'(x, z_m, z_w) = a, \quad (1.49)$$

where $x = a'^{-1}(a, z_m, z_w)$ is the inverse of the decision rule.

3. Set an initial piecewise distribution $G_0(a, z_m, z_w)$ over the grid and possible states to a uniform distribution.

4. Iterate on:

$$G_{i+1}(a', z'_m, z'_w) = \sum_{z_m, z_w} p((z'_m, z'_w)|(z_m, z_w))G_i(a'^{-1}(a', z_m, z_w), z_m, z_w) \quad (1.50)$$

on grid points (a', z'_m, z'_w) and a'^{-1} is the notation for the inverse of the policy rule. There are two conditions imposed for the computation process above:

- (a) if $a'^{-1}(a, z_m, z_w) < a_{min}$, then $G(a, z_m, z_w) = 0$
- (b) if $a'^{-1}(a, z_m, z_w) \geq a_{max}$, then $G(a, z_m, z_w) = g(z_m, z_w)$, where $g(z_m, z_w)$ denotes the ergodic distribution of the skill process.

5. Repeat the previous step until the desired tolerance level is achieved.

After that, aggregate capital and labour supply and demand values are calculated according to equations 1.19-1.20.

It has to be noted that the structure of the overall program and the algorithms, that have been chosen, allow the use of the parallelisation paradigm of programming. This is achieved with the use of Julia programming language in-built parallelisation modules which implement multi-core distributed processing. Therefore, the final program is executed on eight parallel cores and the data across these cores is synchronised with the use of *Distributed.jl* package.

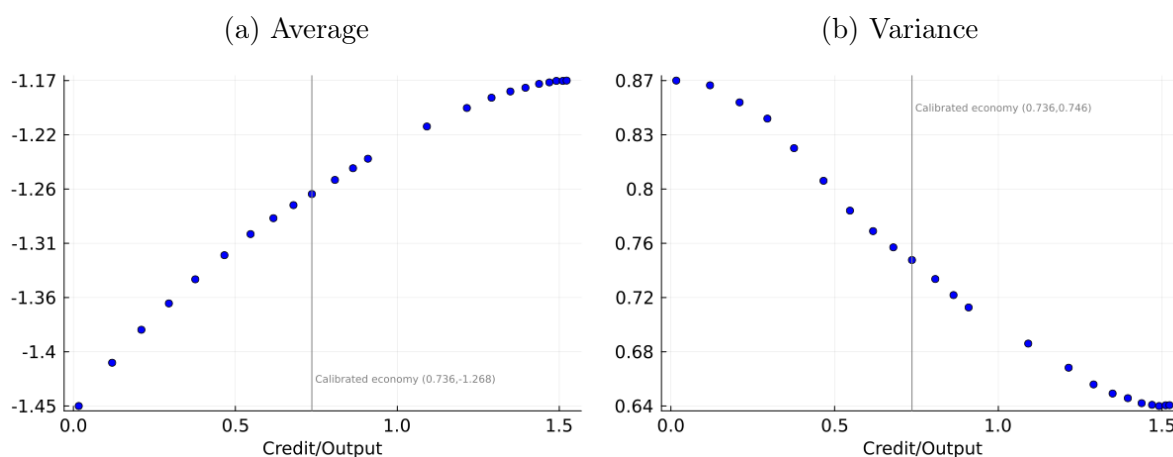
1.C Additional results

In this section, I present additional results on the effects of financial liberalisation on inequality. In particular, I focus on comparing stationary equilibria of economies with different levels of borrowing constraint. The additional results are split into three parts. The first part discusses the effects of financial liberalisation on the average and variance of log-consumption among households and across occupations. The second part describes the changes in stationary equilibria values of log-earnings among households and across occupations. Finally, the third part provides the analysis of gini coefficients for consumption, earnings and wealth among households and across occupations.

1.C.1 Log-consumption

Figure 1.15a shows that there is an increase in the average of log-consumption throughout financial liberalisation. Moreover, we observe a consistent decrease in the variance

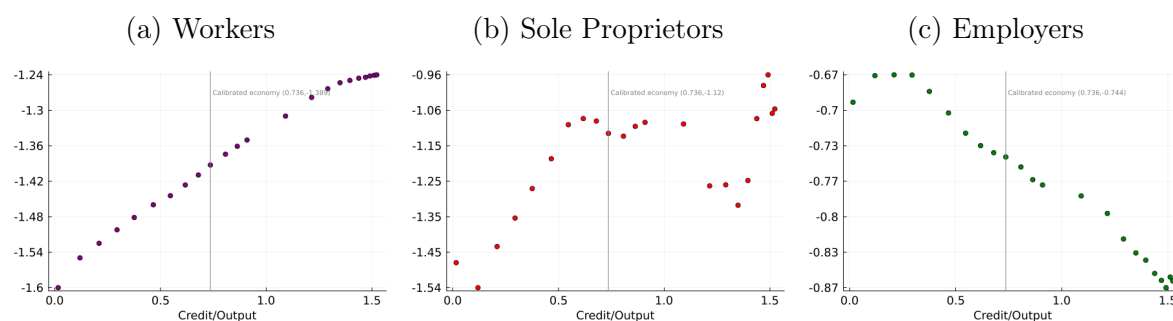
Figure 1.15: Average and variance of log-consumption and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

of log-consumption, according to Figure 1.15b. Thus, these results suggest that financial liberalisation consistently leads to better, on average, consumption outcomes, while minimising the log-consumption inequality.

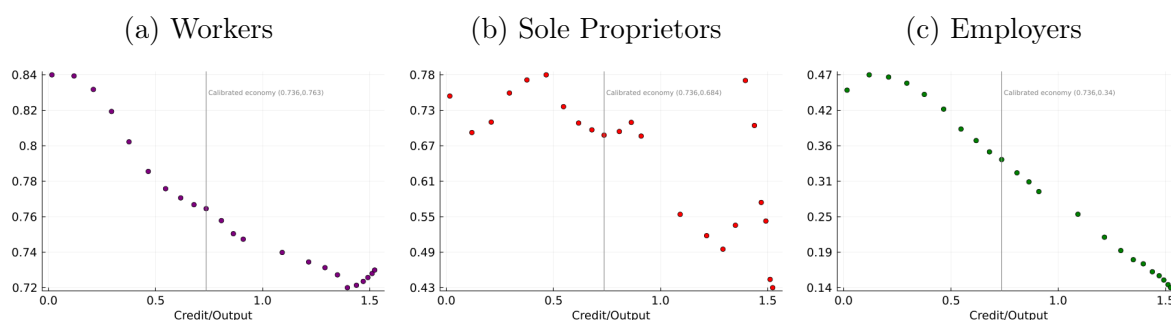
Figure 1.16: Average of log-consumption across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

However, it is interesting to see which of the three occupations gained in their log-consumption as the financial markets get more liberalised. From Figure 1.16, we observe that there is an increase in the average of workers' log-consumption and in the average of sole-proprietors' log-consumption because of the financial liberalisation. Whereas, employers' average log-consumption decreases during the initial stages of financial liberalisation (for values of Credit-to-Output being less than 0.66) and increases during the latter stages. Thus, we can conclude that the variance of log-consumption decreases, because there is a decrease in average log-consumption for employers and an increase for workers and sole proprietors.

Figure 1.17: Variance of log-consumption across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ

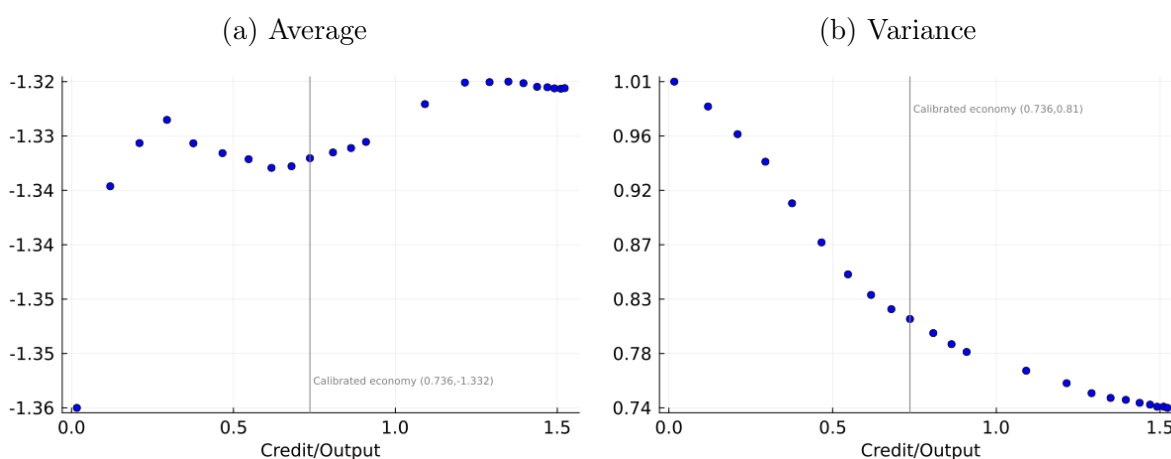


Notes: The grey vertical line indicates the calibrated economy.

Finally, let us deduce some conclusions about the log-consumption inequality within occupations from Figure 1.17. In particular, we observe significant decreases in the variance of log-consumption among all three occupations as a result of financial liberalisation.

1.C.2 Log-earnings

Figure 1.18: Average and variance of log-earnings and their relationships to Credit-to-Output, for a given level of financial frictions, λ

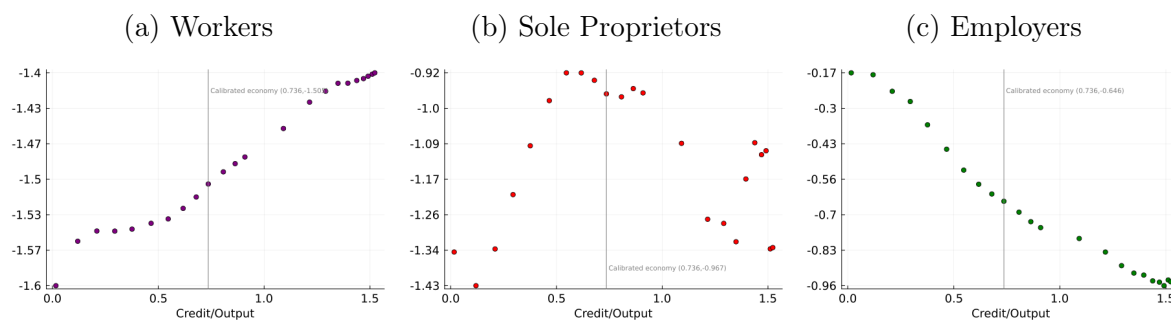


Notes: The grey vertical line indicates the calibrated economy.

Figure 1.18a shows that there is an increase in the average log-earnings in the initial stages of financial liberalisation. Whereas, at the latter stages of financial liberalisation, there is almost no change in the average of log-earnings. Moreover, we observe a consistent decrease in the variance of log-earnings, according to Figure 1.18b. Thus, these results suggest that financial liberalisation leads to noticeably better average consumption outcomes only in the initial stages of financial liberalisation. Whereas, the log-consumption

inequality is consistently minimised.

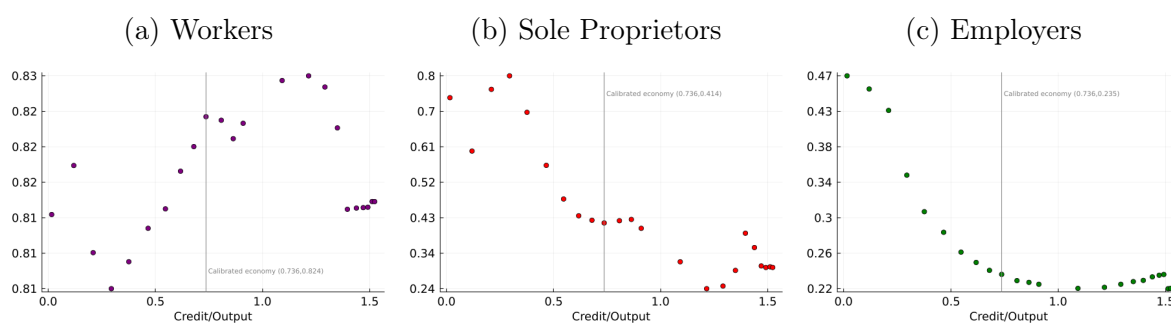
Figure 1.19: Average of log-earnings across occupations and their relationships to Credit-to-Output, for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

However, it is interesting to see which of the three occupations gained in their log-earnings as the financial markets get more liberalised. In particular, Figure 1.19 reports that the average of workers' log-earnings increases with the financial liberalisation. Whereas, sole-proprietors' average of log-earnings tends to follow a parabola with the peak being reached at the value of Credit-to-Output of 0.75. Therefore, it seems that the main source of the decrease in households' variance of log-earnings is the significant decrease in employers' variance of log-earnings.

Figure 1.20: Variance of log-earnings across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ

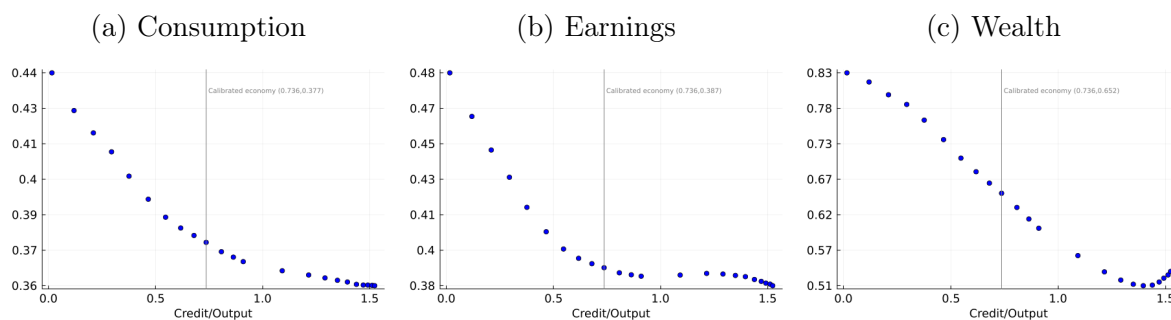


Notes: The grey vertical line indicates the calibrated economy.

Finally, we can deduce some conclusions about the log-earnings inequality within occupations from Figure 1.20. There is no change in the variance of workers' log-earnings. However, we observe a slight increase in the variance of sole-proprietors' log-earnings and a noticeable decrease in the variance of employers' log-earnings as a response to the financial liberalisation.

1.C.3 Gini measurements

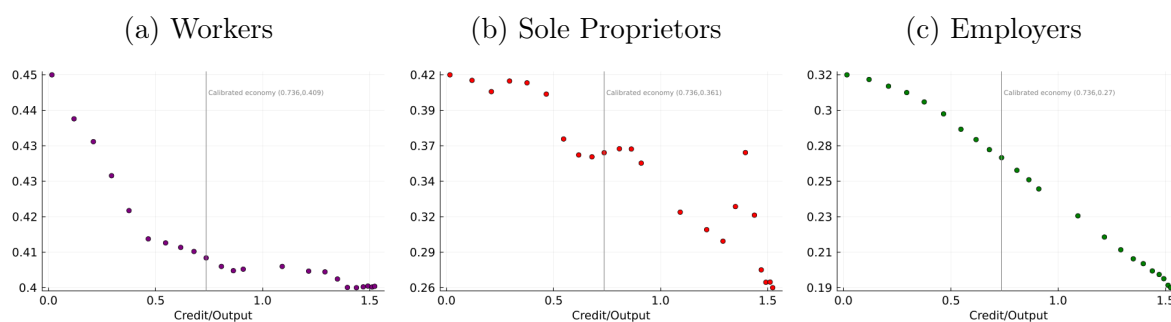
Figure 1.21: Gini coefficients for consumption, earnings and wealth and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

Gini measurements for consumption, earnings and wealth among households are reported in Figure 1.21. It is evident that there are decreases in inequality among households across all three metrics: by negative eight percentage points in consumption; by negative ten percentage points in earnings; and -32 percentage points in wealth. Note that there is a significant decrease of inequality of earnings among households from 0.41 to 0.34 with the plateau at the value of 0.37 for the values of Credit-to-Output between 0.5 and 1.0.

Figure 1.22: Gini coefficients for consumption across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ

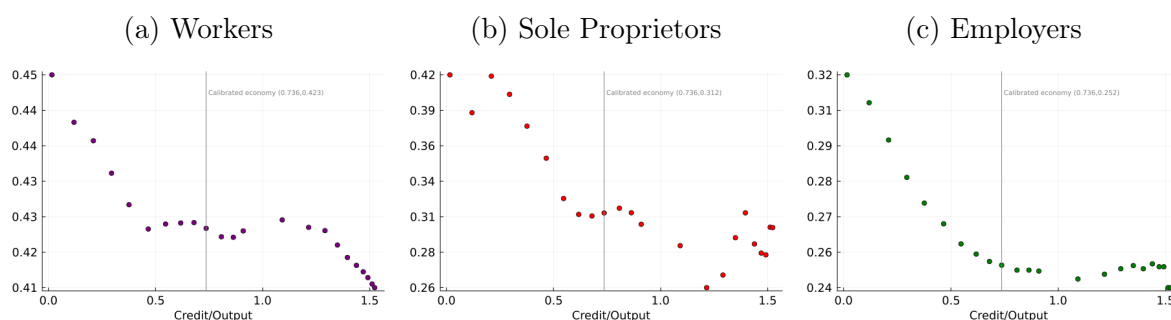


Notes: The grey vertical line indicates the calibrated economy.

Figure 1.22 shows that decreases in ginis for all three occupation cohorts' consumption take place with the financial liberalisation in the economy: by negative five percentage points for workers; by -16 percentage points for sole proprietors; and by -13 percentage points for employers.

Financial liberalisation does not change significantly gini coefficients for workers' earnings, but the inequality for sole-proprietors' earnings tends to increase with the liberalisation of financial markets, according to Figure 1.23. Meanwhile, employers' gini of earnings

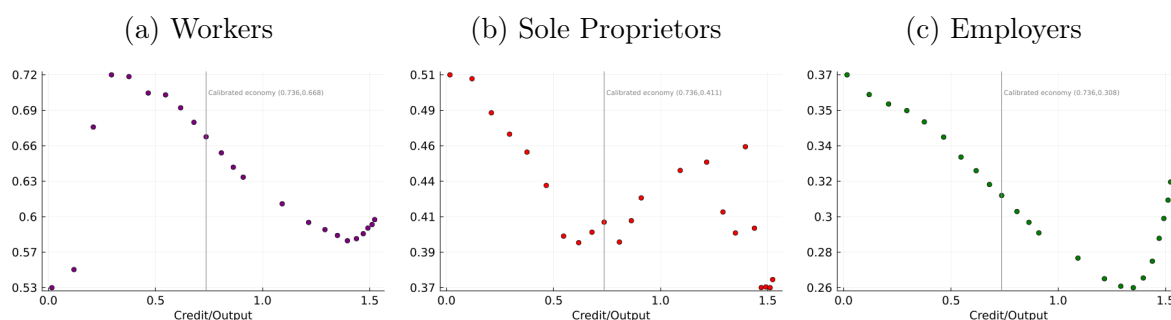
Figure 1.23: Gini coefficients for earnings across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

tend to decrease significantly for all values of Credit-to-Output less than 0.75 and at the latter stages of financial liberalisation employers' gini of earnings plateau.

Figure 1.24: Gini coefficients for wealth across occupations and their relationships to Credit-to-Output for a given level of financial frictions, λ



Notes: The grey vertical line indicates the calibrated economy.

Figure 1.24 reports the decrease of inequality in workers' wealth along all levels of financial liberalisation. Whereas both sole-proprietors' and employers' gini coefficients of wealth tend to increase at the latter stages of financial liberalisation, with a greater increase in wealth inequality among sole proprietors compared to employers.

Bibliography

Ríos-Rull, J.-V. (1999). Computation of equilibria in. Computational methods for the study of dynamic economies, page 238.

CHAPTER 2

TRANSITIONAL DYNAMICS OF FINANCIAL LIBERALISATION AND THEIR EFFECTS ON THE AGGREGATE ECONOMY, OCCUPATIONAL CHOICE AND INEQUALITY

1 Introduction

Financial markets play a crucial role in the efficient functioning of the economy, see [Allen \(1993\)](#). These markets allow savers to invest their money in productive activities that require funding, and they enable borrowers to access the funds they need to invest in their businesses or projects. Inefficient financial markets and financial frictions can lead to severe economic and social consequences, see [King and Levine \(1993\)](#). Thus, the removal of financial frictions should lead to improved resource allocation and, as a result, improved functioning of the economy in the long run. However, it is important to understand what are the short- and long-term effects of such financial liberalisation on income and wealth inequality. Therefore, this chapter's objective is to provide a comprehensive understanding of the changes in the distribution of income and wealth that result from the removal of financial frictions, and its impact on households' choice between becoming workers, sole proprietors, or employers. The focus on the dynamics of the economy in the aftermath of

such reform allows me to investigate the most immediate effects, which might be different from the long-term effects.

For example, [Evans \(1989\)](#) argued that the presence of borrowing constraints leads to a higher concentration of wealth among entrepreneurs. This high concentration creates a self-selection bias where only rich households can become entrepreneurs. In turn, entrepreneurs become richer due to their savings rate being higher than workers' saving rate. Therefore, financial frictions play a crucial role in shaping the economy and, more specifically, the distribution of income and wealth. Thus, the removal of financial frictions has the potential to significantly impact the dynamics of the economy both short- and long-term, see [Boháček and Zubrický \(2012\)](#). The research by [Roy \(1951\)](#) and [Buera and Shin \(2013\)](#) suggests that eliminating of financial frictions should reduce the number of firms and increase the number of workers in the economy. However, the literature on this topic rarely specifies what kind of firms are closed as a result of financial liberalisation and how long it takes for the number of firms to reduce. That is why this chapter focuses on investigating the short- and long-term effects of such reform on subcategories of entrepreneurs: employers and sole proprietors. The decrease in entrepreneurship as an outcome of the reform is explained mostly by the decrease in the share of sole proprietors because it is mostly associated with low productivity even in developed economies, see [Baldwin et al. \(2011\)](#). Therefore, the importance of studying the dynamics of occupational choice and inequality measures after financial liberalisation is crucial for assessing the potential benefits and costs of reducing financial frictions, according to [Quadrini \(2000\)](#).

The focus on the dynamics allows me to study the short- and long-term effects on occupational choice, as well as the inequality measures after financial liberalisation. For this purpose, this chapter employs the DSGE version of the model by [Allub and Erosa \(2018\)](#), which was calibrated to the Italian economy. The model is a type of [Lucas Jr \(1978\)](#) and [Roy \(1951\)](#) models, where financial frictions are modelled as borrowing constraints. Households are assumed to be heterogeneous in managerial and working skills and asset holdings. The combination of assets and skills determines households' occupations between being workers, sole proprietors or employers. I extend the model with the dynamics of the transition from pre- to post-financial reform economy and investigate these dynamics in the style of [Krusell and Smith \(2006\)](#) and [Buera \(2008\)](#). Specifically, the path of factor prices is computed such that both markets are cleared at every period along the convergence path by using the [Heer and Maussner \(2005\)](#) methodology. Stationary equilibria of pre-reform and post-reform economies are defined and calculated as in the previous chapter using the methodology of [Antunes et al. \(2008\)](#). The study

of dynamics allows me to track households' occupation on the transition path and thus, evaluate "winners" and "losers" of such financial liberalisation.

The main results of this chapter revolve around changes in the dynamics of occupational choice and inequality measures after financial liberalisation. For example, the results show that financial liberalisation leads to a decrease in the number of sole proprietors, an increase in the number of workers, and virtually no change in the share of employers. The stability of the share of employers suggests that there is a decrease only in low-productivity entrepreneurship and the financial liberalisation allows the economy to become more productive by using labour more efficiently. The decrease in entrepreneurship is explained by the dynamics of the transitional probabilities, which suggest that after a financial liberalisation, sole proprietors become workers or employers in the short run, which implies an increase in occupational mobility. Furthermore, the majority of the changes in the distribution of occupations occur within the first five years. Thus, the results suggest that financial liberalisation has a strong, quick and long-lasting effect on the labour market under the assumption of no labour market frictions. The rapid convergence to the new stationary equilibrium is due to the increased occupational mobility, which implies quick convergence of aggregate earnings.

Next, the removal of financial frictions leads to a greater use of capital in production and to a simultaneous increase in the ability of the average employer, which leads to the convergence to a new steady-state value within 25-30 years after the reform. Here, slow convergence of the aggregate economy implies slow but steady convergence of capital income. This result means that the positive effects of financial reform that were reported in the previous chapter are not going to be observed in the economy in the short- (five years and less) or medium- (between five and 25 years) runs. In particular, the results from the model show that there is a fall in earnings in the short- and the long run, as well as a short-run fall in aggregate consumption with a subsequent rise in the long run. The long-run results replicate the results from [Hawkins and Mustre-del Rio \(2016\)](#) which investigated the inequality effects of financial market incompleteness on the earnings and consumption in the context of the US. However, this chapter extends their analysis of the effects of financial reform by taking into account not just earnings and consumption dynamics, but also dynamics of output, income and wealth.

Finally, the results indicate that financial liberalisation leads to a reduction in inequality between occupations in the both short and the long run. This reduction in inequality is due to a redistribution of income from employers to workers, which subsequently trickles down to the distribution of wealth across occupations and results in some convergence of consumption across occupations. However, measures of inequality

for consumption, earnings, and income tend to over-decrease during the first 10-15 years following a financial liberalisation before rising back to what is ultimately a lower long-run equilibrium level. Within occupations, measures of inequality in earnings and income do not change significantly, while measures of consumption inequality decrease significantly within employers. It was found that after the financial reform, the average consumption of households dropped initially but reached a new, higher steady state within 30 years. Average earnings drop in the first two years after the reform but converge to a new, lower steady state within 25 years, while average income and wealth gradually converge within 20 and 40 years, respectively. The sudden decrease in aggregate consumption and aggregate earnings was found to only affect workers and employers but was compensated by a sudden increase in aggregate capital income for employers. The latter result supports findings about entrepreneurial wealth and income distribution by [Gentry and Hubbard \(2000\)](#).

Overall, the results suggest that the primary winners of the financial reform undertaken in this chapter are households who were workers prior to the reform. Workers gain the most after the reform due to the increase in wages, which translates into an increase in earnings, and due to the increased occupational mobility, which means that the most talented workers can more easily become employers. At the same time, the primary losers of the financial reform are households who were employers prior to the reform. In particular, employers, who before the reform had compensated their lack of skills with a large amount of wealth, are facing more intense competition. This competition comes primarily from the most talented households who now have improved access to the capital market because of the financial reform. As a result, the composition of employers changes and a larger proportion of them is now made up of households who have borrowed more funds, which lowers profitability. Although sole proprietors as a group significantly diminish as a share of the population, households who were sole proprietors before the reform, for the most part, enjoy the benefits of being workers or, if they are talented enough, can become employers. Thus, sole proprietors are also short-term winners of financial liberalisation.

The literature on the effects of financial liberalisation, or removal of financial frictions on aggregate macroeconomic values, occupational mobility and inequality is extensive and includes a variety of approaches and findings. For example, [Maksimovic et al. \(2000\)](#) found that financial liberalisation is positively associated with an increase in occupational mobility and an increase in output, while [Jayaratne and Strahan \(1996\)](#) found that the removal of financial frictions leads to increased investment in small and medium-sized enterprises. In addition, some studies have focused on the impact of financial liberalisation

on income inequality. For example, [Jappelli and Pistaferri \(2011\)](#) found that financial liberalisation led to a positive change in inequalities in Italy. In particular, [Jappelli and Pistaferri \(2011\)](#) found that after a financial reform, the dramatic increase in income inequality has not been matched by an increase in consumption inequality. This chapter expands on these existing results by making a distinction between sole proprietors and employers, and by investigating the dynamics of occupational choice and inequality. The investigation of the dynamics allows me to identify both the short and long-term effects of financial liberalisation and, more importantly, to identify the winners and losers of such reform.

The rest of the chapter is organised in the following way. Section [two](#) describes the model and the underlying structure of the economy. Section [three](#) describes the calibration of the model. Next, section [four](#) describes the experiments and analyses the results of those experiments. Finally, the chapter is concluded by section [five](#).

2 Model

In this section, I present the model that I use to study the transition dynamics that arise following a financial liberalisation. Financial liberalisation, here, will correspond to the relaxation of a borrowing constraint that limits entrepreneurs' access to capital. Consider an economy populated by a large number (normalised to one) of infinitely-lived households who are heterogeneous in their endowed managerial and working skills as well as in regard to their asset holdings. Households face uninsurable idiosyncratic shocks to their skills; their asset holdings are determined endogenously as the outcome of a forward-looking saving decision.

The model allows households to choose among three occupations: worker, sole proprietor, or employer, with this choice depending on several factors, including their managerial and working skills. When making their decisions, households know the factor prices — the interest rate and the wage rate — that clear the markets for capital and labour over the transition path. Knowledge of these transition paths arises as a consequence of there being no aggregate uncertainty in the model together with households knowing the precise inter-temporal nature of the financial liberalisation. Each period, each household uses its knowledge regarding factor prices to make the occupational choice between selling its labour services for the wage rate and thus becoming a worker or using its skills to pursue entrepreneurial profits and thus become either a sole proprietor or an employer. Employers differ from sole proprietors in that the former hire workers whereas the latter do not.

Employers hire labour in a perfectly competitive market while both employers and sole proprietors can rent capital in a perfectly competitive market, subject to a collateral constraint.

2.1 Heterogeneity and demographics

Following the first chapter, each household's working skill and managerial skill evolves stochastically over time and there is no market to insure skill risk. The logarithm of skills for household i is governed by:

$$\ln z_{mit} = \alpha_{mit} + u_{mit} + \zeta_{it}, \quad (2.1)$$

$$\ln z_{wit} = \alpha_{wit} + u_{wit} \quad (2.2)$$

where α_{mit} and α_{wit} represent “fixed effects” skill components, which change infrequently by drawing from a Pareto distribution, of managerial and working productivities, u_{mit} and u_{wit} denote persistent shocks to skills, which follow first-order auto-regressive processes, and ζ_{it} is a transitory shock to the managerial skill component. This transitory skill component is assumed to be completely independent of its previous period's value and to be distributed normally with a mean zero.

2.2 Occupational choice

Every period households use their individual current levels of working, z_{wt} , and managerial, z_{mt} , skills and asset holdings, a_t , to make an occupational choice, $O_t \in \{W, S, E\}$, where W denotes worker, S denotes sole proprietor, and E denote employer. The household's choice is made by comparing the earnings that it would receive from each occupation and choosing the occupation with the highest earnings, taking into consideration the current market values for the interest rate, r_t , and the wage rate, w_t . Thus, the occupational choice is modelled as $\max_{O_t \in \{W, S, E\}} \pi(O_t, a_t, z_{mt}, z_{wt}; r_t, w_t)$, where W denotes worker, S denotes sole proprietor, and E denotes employer.

If a household chooses to become a worker, $O_t = W$, then they receive wages proportional to the number of efficiency units they provide:

$$\pi(W, a_t, z_{mt}, z_{wt}; r_t, w_t) = w_t z_{wt} \quad (2.3)$$

If a household decides to become a sole proprietor, $O_t = S$, then they need to decide how much capital k_t to rent and how to allocate their time between managerial d_t and working $(1 - d_t)$ activities. Thus, given factor prices r_t and w_t , the sole proprietor's

problem is the following:

$$\pi(S, a_t, z_{mt}, z_{wt}; r_t, w_t) \equiv \max_{d_t, k_t} \{(d_t z_{mt})^\gamma k_t^\eta ((1 - d_t) z_{wt})^\theta - (r_t + \delta) k_t\} \quad (2.4)$$

such that:

$$0 < d_t < 1, \quad (2.5)$$

$$k_t \leq \lambda_t a_t. \quad (2.6)$$

In equation 2.4 the term $d_t z_{mt}$ represents the managerial input into the production function, $\gamma \in [0, 1]$, $\eta \in [0, 1]$ and $\theta \in [0, 1]$ are shares of managerial, capital and labour inputs respectively, such that $\gamma + \eta + \theta = 1$, and $\delta \in [0, 1]$ is the depreciation rate of capital.

Lastly, if a household decides to become an employer, $O_t = E$, then they need to make the same decisions as the sole proprietors, and they also need to choose the number of efficiency units n_t to hire on the labour market. Thus, given factor prices, the employer's problem is the following:

$$\pi(E, a_t, z_{mt}, z_{wt}; r_t, w_t) \equiv \max_{d_t, k_t, n_t} \{(d_t z_{mt})^\gamma k_t^\eta ((1 - d_t) z_{wt} + n_t)^\theta - w_t n_t - (r_t + \delta) k_t - c_e\} \quad (2.7)$$

such that:

$$0 < d_t \leq 1, \quad (2.8)$$

$$k_t \leq \lambda_t a_t, \quad (2.9)$$

$$n_t > 0 \quad (2.10)$$

Employers are assumed to incur a fixed per-period operating cost equal to c_e . This fixed cost is introduced so that employers demand a non-trivial amount of labour (an amount bounded away from zero), thereby making the distinction between a sole proprietor and employer meaningful.¹

It is important to note that the sole proprietors and employers are household/producers, so the production side of the model is essentially incorporated into the household's problem through the sole proprietors and employers' occupation categories.

¹The fixed cost for employing is calibrated to be a small number, so in general equilibrium, it is paid by an employer as a price for hiring labour. In this model, the aggregate cost of employment accounts only for 0.49% of aggregate output. Note that because the cost is minuscule it is not included in the resource constraint.

2.3 Labour and financial markets

The labour market is assumed to be frictionless. Workers supply their labour in the form of working skills, z_{wt} , (or efficiency units of labour) to employers in return for the wage rate, w_t , per each efficiency unit of labour. Employers hire n_t efficiency units of labour for the price w_t per unit. Effectively, all labour provided at time t is pooled and then distributed among employers according to their labour hiring decisions. Note that, the labour market clears, i.e. the sum of all working skills provided by workers is equal to the sum of all labour hired by employers, at every period t as the economy transitions towards stationary equilibrium.

As mentioned earlier, the financial market is assumed to be perfectly competitive. Financial intermediaries take deposits from households at the beginning of period t and pay the net interest rate r_t at the end of period t . These financial intermediaries lend capital to entrepreneurs (sole proprietors and employers) at the rental price $r_t + \delta$, where δ is the depreciation rate.

Enforcement problems limit the capital lent to entrepreneurs. Following [Buera and Shin \(2013\)](#) and [Moll \(2014\)](#), the capital lent to entrepreneurs is constrained by the collateral constraint, $k_{it} \leq \lambda_t a_{it}$, where a_{it} denotes household's i wealth at period t . Each entrepreneur can produce using a quantity of capital that is no more than their individual wealth multiplied by the coefficient λ_t , which is the same for entrepreneurs. The parameter $\lambda_t \geq 1$ governs the magnitude of the financial friction in the economy, where $\lambda_t = \infty$ represents perfect financial markets and $\lambda_t = 1$ represents an economy with no credit.

The capital market is assumed to clear each period, i.e., the sum of all deposits collected by financial intermediaries is equal to the sum of all capital lent to entrepreneurs.

2.4 Household problem

All households face the same problem each period, thus in the following discussion, the subscript denoting household i is dropped.

At the beginning of each period t , a household observes their level of assets, a_t , their working, z_{wt} , and managerial, z_{mt} , skills and then decides how much to consume, c_t , and how many assets to save for next period, a_{t+1} . Moreover, they choose their occupation: worker, sole proprietor, or employer. Households are price takers, i.e. they make all their decisions taking the interest rate r_t and the wage w_t as given.

Therefore, the household's problem is the following:

$$\max_{\{c_t, a_{t+1}, O_t\}_{t=0}^{\infty}} \mathbb{E}\left\{\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right\} \quad (2.11)$$

subject to the budget constraint:

$$c_t + a_{t+1} = \pi(O_t, a_t, z_{mt}, z_{wt}; r_t, w_t) + (1 + r_t)a_t, \quad \forall t \geq 0, \quad (2.12)$$

where $\pi(O_t, a_t, z_{mt}, z_{wt}; r_t, w_t)$ is the household's earnings function given the occupation, O_t .

3 Equilibrium, solution and calibration

To investigate the short- and long-run implications of financial liberalisation I conduct the following exercise: first, I relax the parameter for collateral constraint, λ , from the calibrated value of 1.67 to a value that characterises the economy with minimal financial frictions — 10.0; and then I compute the path the economy follows as it transitions to the new stationary equilibrium. The value of 10.0 is chosen to represent the elimination of 95% of financial frictions. In effect, I characterise the post-reform economy as the economy where entrepreneurs can borrow 10 times the amount of assets that they own.

More specifically, at the beginning of period one, households learn that from period two the parameter λ_t of collateral constraint will no longer have a value of 1.67 — it will become equal to 10.0: $\lambda_1 = 1.67$ and $\lambda_t = 10.0$ for $t \geq 2$.

In this section, I characterise the equilibrium that governs the transition to a new stationary equilibrium following a financial liberalisation and I describe the solution procedure. I also present the model's parametrisation/calibration.

3.1 Equilibrium

The problem is formulated as follows: Given:

- a stationary equilibrium for the economy with the initial level of financial frictions, $\underline{\lambda}$, which consists of the interest rate \underline{r} and the wage \underline{w} , a time invariant joint distribution for assets and skills $\underline{G}(a, z_m, z_w; \underline{r}, \underline{w})$, individual decision rules $\underline{c}(a, z_m, z_w; \underline{r}, \underline{w})$ and $\underline{a}'(a, z_m, z_w; \underline{r}, \underline{w})$, entrepreneurial decision rules $\underline{k}(a, z_m, z_w; \underline{r}, \underline{w})$, $\underline{n}(a, z_m, z_w; \underline{r}, \underline{w})$ and $\underline{d}(a, z_m, z_w; \underline{r}, \underline{w})$,

- a stationary equilibrium for the economy with the final level of financial frictions, $\bar{\lambda}$, which consists of the interest rate \bar{r} and the wage \bar{w} , a time invariant joint distribution for assets and skills $\bar{G}(a, z_m, z_w; \bar{r}, \bar{w})$, individual decision rules $\bar{c}(a, z_m, z_w; \bar{r}, \bar{w})$ and $\bar{a}'(a, z_m, z_w; \bar{r}, \bar{w})$, entrepreneurial decision rules $\bar{k}(a, z_m, z_w; \bar{r}, \bar{w})$, $\bar{n}(a, z_m, z_w; \bar{r}, \bar{w})$ and $\bar{d}(a, z_m, z_w; \bar{r}, \bar{w})$,
- a path for financial liberalisation, which is modelled as a path for the level of collateral, $\{\lambda_t\}_{t=0}^{t=T}$

find the transition path of the economy towards stationary equilibrium for the post-reform economy defined as:

- paths for the interest rate, $\{r_t\}_{t=0}^{t=T}$, and the wage, $\{w_t\}_{t=0}^{t=T}$, such that $r_0 = \underline{r}$ and $w_0 = \underline{w}$, $r_T = \bar{r}$ and $w_T = \bar{w}$, such that the capital and labour markets clear at every period t ,
- a path for the joint distributions of assets and skills $\{G_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$ where $G_0(a, z_m, z_w; r_0, w_0) = \underline{G}(a, z_m, z_w; \underline{r}, \underline{w})$ and $G_T(a, z_m, z_w; r_T, w_T) = \bar{G}(a, z_m, z_w; \bar{r}, \bar{w})$,
- paths for the individual decision rules for consumption $\{c_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$ and next period's assets $\{a'_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$ where $c_0(a, z_m, z_w; r_0, w_0) = \underline{c}(a, z_m, z_w; \underline{r}, \underline{w})$ and $a'_0(a, z_m, z_w; r_0, w_0) = \underline{a}'(a, z_m, z_w; \underline{r}, \underline{w})$, $c_T(a, z_m, z_w; r_T, w_T) = \bar{c}(a, z_m, z_w; \bar{r}, \bar{w})$ and $a'_T(a, z_m, z_w; r_T, w_T) = \bar{a}'(a, z_m, z_w; \bar{r}, \bar{w})$ such that the household's problem is solved for each period t ,
- paths for the decision rules for capital $\{k_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$, for outside labour to hire $\{n_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$ and for time allocated towards managerial activities $\{d_t(a, z_m, z_w; r_t, w_t)\}_{t=0}^{t=T}$ where $k_0(a, z_m, z_w; r_0, w_0) = \underline{k}(a, z_m, z_w; \underline{r}, \underline{w})$ and $k_T(a, z_m, z_w; r_T, w_T) = \bar{k}(a, z_m, z_w; \bar{r}, \bar{w})$, $n_0(a, z_m, z_w; r_0, w_0) = \underline{n}(a, z_m, z_w; \underline{r}, \underline{w})$ and $n_T(a, z_m, z_w; r_T, w_T) = \bar{n}(a, z_m, z_w; \bar{r}, \bar{w})$, $d_0(a, z_m, z_w; r_0, w_0) = \underline{d}(a, z_m, z_w; \underline{r}, \underline{w})$ and $d_T(a, z_m, z_w; r_T, w_T) = \bar{d}(a, z_m, z_w; \bar{r}, \bar{w})$ such that the entrepreneurial problem is solved for each time period t .

3.2 Solution

To compute the transition dynamics that arise after the financial liberalisation I use the following steps from [Heer and Maussner \(2005\)](#):

1. Compute the stationary equilibrium for the terminal period.

2. Choose the number of transition periods T .
3. Initialise the initial-period distribution of assets and skills across households.
4. Guess time paths for the factor prices r_t and w_t for $t = 1, \dots, T$. The values of these variables in both periods $t = 1$ and $t = T$ are implied by the initial distribution pre-reform and stationary distribution post-reform.
5. Given the decision rules in period T and the conjectured paths for r_t and w_t , $t = 1, \dots, T$, compute the optimal decision rules that solve problems of optimal consumption, optimal savings and optimal occupational choice for periods $1, \dots, T - 1$; beginning with period $T - 1$ and iterating backwards through time.
6. Simulate the dynamics of the joint distribution for assets and skills with the help of the optimal policy functions and the initial distribution for the transition from $t = 1$ to $t = T$.
7. Check whether the markets for capital and labour clear each period. If markets do not clear, update the guess on the time path of the interest rate r_t and the wage w_t and go to Step 5.
8. Compare the simulated distribution at time T with the stationary distribution of the post-reform economy. If the sum of absolute differences between the simulated distribution in period T and the stationary distribution of the post-reform economy is bigger than 10^{-4} , increase the number of transition periods T and go to step 3.

3.3 Calibration

Drawing on Chapter 1, I calibrate the model in two stages. In the first stage, some parameters are set using estimates from other studies. For example, the shares of managerial, γ , labour, θ , and capital, η , inputs in the production and the depreciation rate of capital, δ , follow the calibration undertaken in [Annicchiarico et al. \(2013\)](#). Following [Heathcote et al. \(2005\)](#), the autocorrelation of shocks to working skills, ρ_w , is set to 0.96 to capture the feature from Italian data that wage inequality grows linearly over the life cycle. Also, the variance of the working-skills fixed effect, σ_α^2 , is set exactly to the variance of log-wages at age 25 in Italy, see [Krueger et al. \(2016\)](#). Finally, the first grid point's probability mass of the discretised Pareto distribution for the fixed effects of managerial skill is set to the share of Italian 25-65 year-olds who have low literacy and/or numeracy proficiency.

In the second stage, I estimate the remaining parameters by minimising the sum of square percentage deviations between key moments and the Italian data. There are 12

parameters that are calibrated by this internal process to fit 14 moments from the data. In particular, the parameters were chosen to try to replicate the following data/moments: the occupational choice structure is taken from the ILO dataset; the variance of log-consumption and the variance of log-earnings, see [Jappelli and Pistaferri \(2009\)](#); the Gini coefficient for entrepreneurial income and the Gini coefficient for workers' income, see [Ballarino et al. \(2012\)](#); the annual transition rates among occupations, see [Borella and Belloni \(2018\)](#) and [Schivardi and Torrini \(2005\)](#); the annual credit-to-output ratio and the annual capital-to-output ratio, see World Bank Open Data.

Table 2.1: Calibrated parameters

Panel A: Externally calibrated parameters		
δ	Depreciation rate of capital	0.10
γ	Share of managerial input to the production	0.16
η	Share of capital input to the production	0.30
θ	Share of labour input to the production	0.54
ρ_w	Autocorrelation of working skill	0.96
σ_α^2	Variance of fixed effects on working skills	0.12
$p_{\bar{\alpha}}$	Probability of first fixed effect of managerial skill	0.39
Panel B: Internally calibrated parameters		
c_e	Fixed operating cost of hiring employees	0.057
μ_α	Location of first fixed effect of managerial skill	-3.27
p_α	Probability of new skills draw	0.02
η_α	Pareto tail of managerial skill	5.81
σ_m^2	Variance of innovation of managerial persistent shocks	0.75
ρ_{mw}	Correlation between innovations of persistent shocks	0.22
ρ_m	Autocorrelation of managerial skill	0.95
σ_ζ^2	Variance of transitory shock of managerial skill	0.21
ρ_α	Correlation between fixed effects of managerial and working skills	0.15
σ_w^2	Variance of innovation of working persistent shocks	0.049
λ	Collateral constraint	1.67
β	Discount factor	0.93

Notes: Panel A shows parameters that are set using estimates from other studies in the literature. Panel B shows parameters that are set according to the results of the calibration of the model.

The full list of calibrated parameters is presented in [Table 2.1](#). The model captures the occupational shares, capital-to-output and credit-to-output values quantitatively, whereas inequality measures are replicated qualitatively. The model replicates the stylised facts that consumption inequality is less than earnings inequality, and the income inequality for workers is higher than the income inequality for entrepreneurs.

4 Results

In this Section, I present the results of an experiment of a sudden elimination of financial frictions in an economy that is in equilibrium and the consequent convergence of the economy towards a new equilibrium state. The event of the removal of financial frictions is referred to as the “reform”. Moreover, the economy with the presence of high financial frictions, i.e. low levels of $\lambda = 1.67$ is referred to as the “pre-reform economy” and the economy with nearly absent financial frictions, i.e. high levels of $\lambda = 10.0$ — the “post-reform economy”. The reform is modelled as a change in levels of λ that occurs within one time period and then it stays at the new level. In particular, $\lambda_1 = 1.67$ and $\lambda_t = 10.0$ for $t \geq 2$.

Note that the pre-reform economy represents the economy in its stationary equilibrium, the parameters of which were calibrated with the use of the calibration process described in the previous section, whereas the post-reform economy represents the hypothetical economy in its stationary equilibrium where the only changed parameter compared to the pre-reform is the collateral constraint parameter, λ .

Table 2.2: Stationary equilibria

Statistics	Pre-reform economy	Post-reform economy
Collateral constraint, λ	1.67	10.0
Capital-to-Output	187.9%	200.21%
Credit-to-Output	73.62%	152.28%
<i>Occupational structure</i>		
Workers	77.44%	81.75%
Sole proprietors	6.47%	1.75%
Employers	16.08%	16.49%
<i>Consumption inequality</i>		
Coef. of variation of consumption	25.64	21.02
<i>Income inequality: Between occupations</i>		
Coef. of variation of earnings	28.21	19.97
Coef. of variation of income	29.70	24.21
<i>Income inequality: Within occupations</i>		
Gini for workers' income	0.58	0.59
Gini for entrepreneurs' income	0.37	0.28

Notes: variance in earnings is computed using the natural logarithm of earnings; occupational transitions from the data are computed comparing the same month of two consecutive years, keeping only households that were employed in both years.

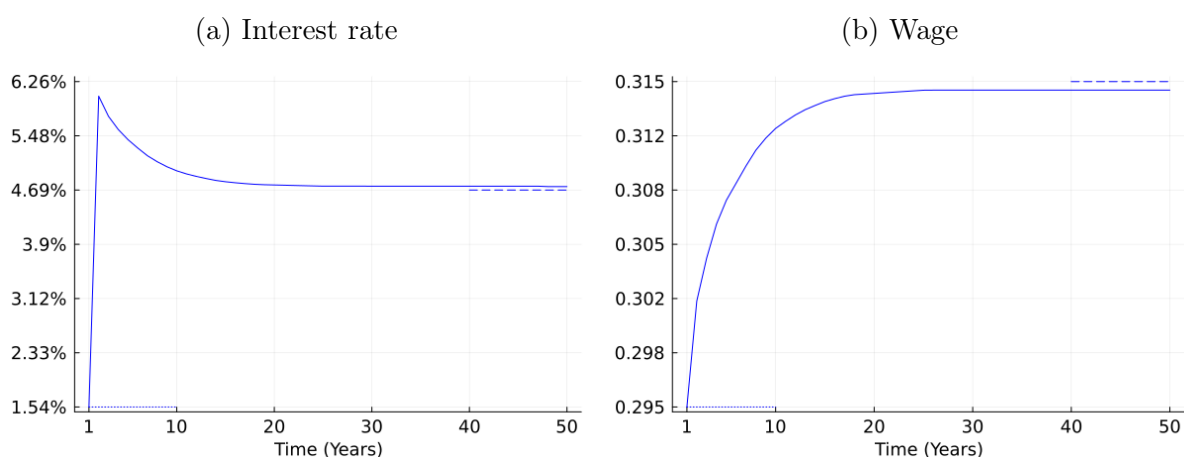
Table 2.2 reports the main characteristics of two economies at their equilibrium states

under different levels of financial frictions. The results state that, in the long run, the reform significantly increases the Capital-to-Output and the Credit-to-Output ratios of the aggregate economy. At the same time, consumption and income inequality values are decreased in the long run as a result of the reform. Moreover, in the long run, the reform changes the occupational distribution: there are more workers, fewer sole proprietors, and the same amount of employers. However, the results from the table above only report the effects of financial liberalisation in the long run. Whereas, the chapter's main focus is to investigate the effects of the removal of financial frictions in the short- (one to five years) and medium-runs (six to 20 years).

4.1 Aggregate dynamics

The dynamics of aggregate variables due to financial liberalisation are driven primarily by changes in the interest rate and the wage rate. Financial liberalisation leads to the elimination of the financial friction that was limiting the demand for capital from entrepreneurs.² The interest rate rapidly reacts to this change in financial market conditions, due to capital supply not being elastic enough to satisfy the sudden increase in capital demand. Thus, to discourage demand and encourage supply, the interest rate adjusts rapidly and overshoots the new long-run value in the short run. This over-shooting phenomenon can be seen in Figure 2.1a.

Figure 2.1: Transition paths for the interest rate and the wage



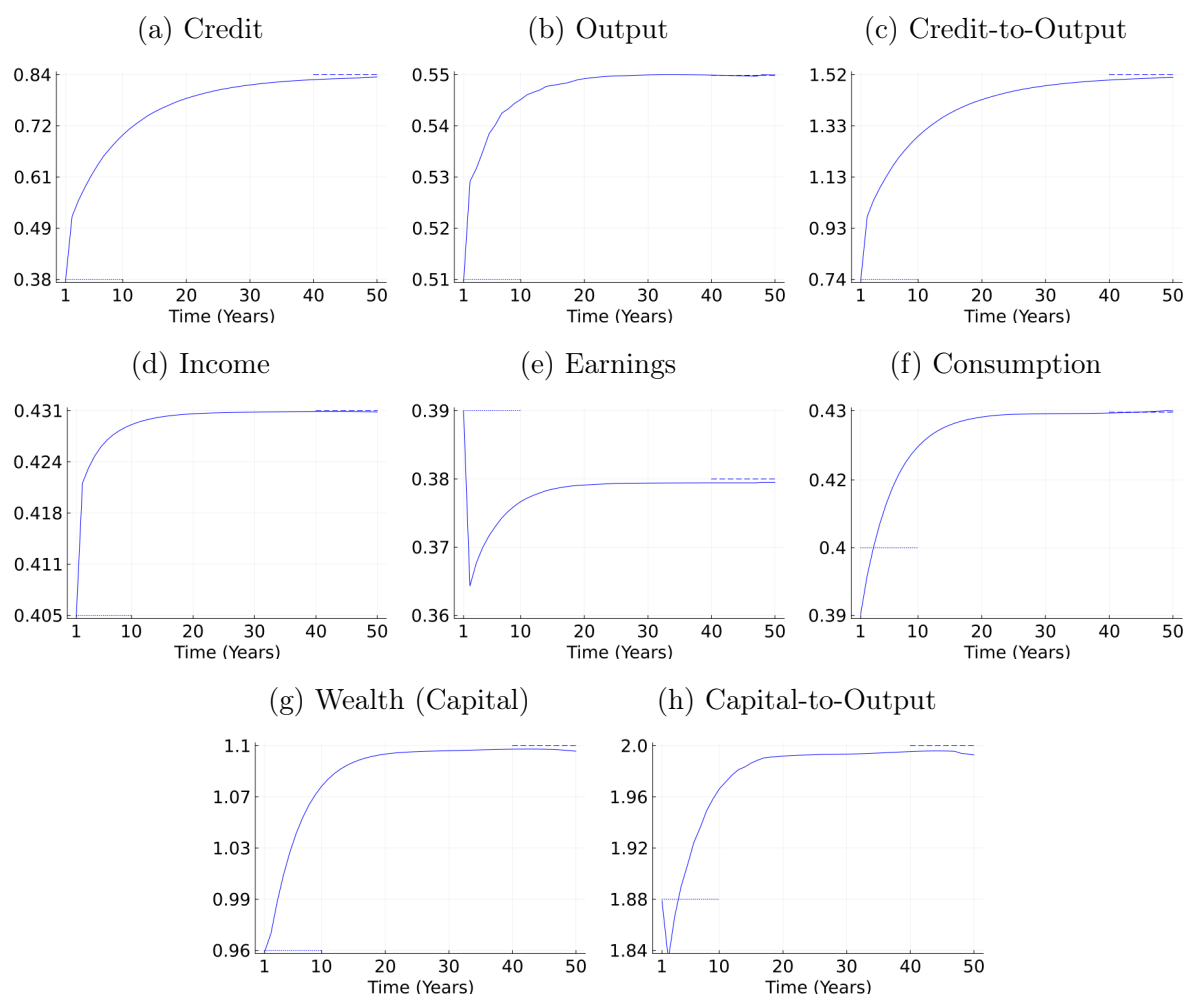
Notes: The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

The adjustment to the interest rate has an indirect effect on the labour market as well. Employers, who are faced with a sudden increase in the cost of capital, are substituting

²Entrepreneurs is the common name for the group that consists of both sole proprietors and employers.

away from capital and toward labour when producing goods, thus creating a higher labour demand. Ordinarily, the increased demand for labour might generate a spike in the wage, however, from Figure 2.1b, we observe no such spike during the initial stages of the post-reform economy. To understand why an immediate rise in the real wage does not occur, keep in mind, that a sudden increase in the interest rate makes the entrepreneurial pursuit of households a less attractive occupational choice due to the increase in costs of capital used in production, which results in an increased labour supply. In fact, we observe a more gradual response of the wage rate to the reduction in financial frictions due to the higher elasticity of labour supply. Over a period of 25-30 years, both the real wage and the interest rate converge to the new stationary equilibrium by mutual reduction of pressures on capital and labour markets.

Figure 2.2: Transition paths of aggregate statistics



Notes: The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

Let us further investigate the aggregate effects on the real economy of the sudden financial liberalisation coupled with the dynamics to factor prices shown in Figure 2.1. The sudden reform combined with the sudden rise and consequent decrease in the interest rate smoothes out the dynamics of aggregate credit in the economy, which gradually converge after about 50 years to a new steady state value, see Figure 2.2a. At the same time, from Figure 2.2b, we observe that aggregate output increases rapidly, rising at a rate of 3.96% in the first five years and reaching a steady state in just 25 years.

However, the rise in the aggregate credit is larger than the rise in the aggregate output, which results in a steady climb of the credit-to-output ratio, see Figure 2.2c. This result is in line with findings by Kelly et al. (2013), where it is predicted that the build-up of credit and the increase in its use in the economy increases output. It has to be noted that their findings are observed in the Irish context, where economic expansion has followed the rapid credit growth during the 2000s. It can be argued that the Italian economy during the 2000s experienced similar dynamics as in Ireland, therefore these chapter's results report a similar conclusion about the relationship between the increased credit and the increased output.³ Therefore, the rise in the credit-to-output ratio is interpreted as a marker of financial liberalisation, i.e. better availability and the use of capital through credit throughout the economy.

Meanwhile, the growth in output leads to a spurt of income growth, which rises at the rapid rate of 4.26% in the first five years and then converges within 20 years to the post-reform economy's equilibrium level, see Figure 2.2d. However, this rise in aggregate income⁴ is not driven by an increase in earnings. In fact, from Figure 2.2e we observe a significant fall of 7.2% in earnings immediately after the financial reform. However, aggregate earnings increase over the next 25 years to a new steady state value, which is still lower than the pre-reform value of aggregate earnings. Note that, earnings in this model are defined as labour income for workers and profits for sole proprietors and employers. Therefore, the dynamics of earnings suggest that the increase in income, especially in the short-run, is explained by the increase in the interest rate that leads to the increase in capital income.⁵

The rise in aggregate income drives the dynamics of consumption and wealth ac-

³At the same time, it must be noted that significant build-up of credit can worsen the effects of the unexpected financial crisis on the output levels, see Lane and Milesi-Ferretti (2011), but the model described in this chapter does not account for the possibilities of entrepreneurial default.

⁴In this chapter, we differentiate between three measures of income: earnings, capital income and income. Earnings are defined as labour income for workers and profit of entrepreneurial pursuit for sole proprietors and employers. Capital income is defined as capital rental payments — $r_t a_t$. Finally, income is defined as a sum of earnings and capital income.

⁵Here, earnings refer to the term $\pi(O_t, a_t, z_{mt}, z_{wt}; r_t, w_t)$ and capital income refers to the term $r_t a_t$ in the budget constraint, see Equation 2.12.

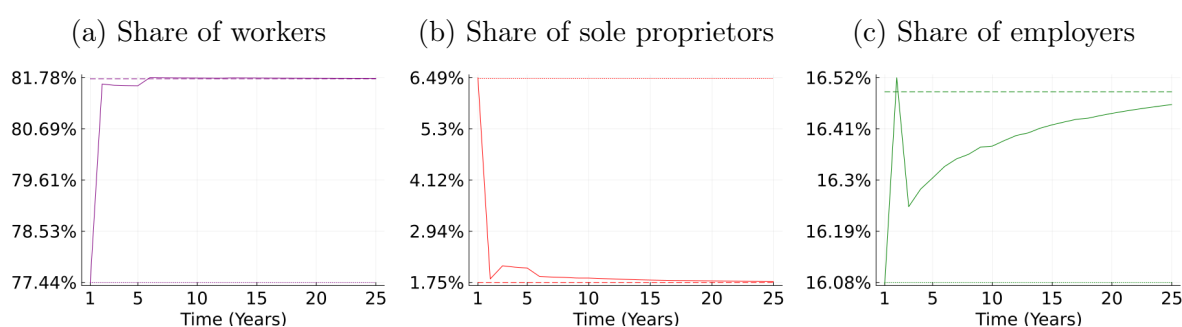
cumulation. In particular, from Figure 2.2f, we observe the convergence of aggregate consumption to its new steady state within 25-30 years. Whereas, capital, which in this model also represents households' wealth, gradually increases to its new steady state value within the same 25-30 year period, see Figure 2.2g. This steady rise in aggregate capital supply combined with the initially high interest rate relieves the pressure on the capital market from the initial increase in aggregate capital demand. The capital market's pressure relief leads to a decrease in pressure on the labour market as well. Moreover, we observe that financial liberalisation leads to greater use of capital in production, see the dynamics of the capital-to-output ratio in Figure 2.2h.

Two puzzling results emerge from this analysis: why there is a short-run and long-run decrease in aggregate earnings; and why there is a short-run decrease followed by a long-run increase in aggregate consumption. To find the explanation, we need to understand the dynamics of the decision-making of households and, in particular, understand how financial liberalisation affects occupational choice.

4.2 Occupational-choice dynamics

The research by Roy (1951) and Buera and Shin (2013) suggests that eliminating of financial frictions should reduce the number of firms and increase the number of workers in the economy. However, the literature on this topic rarely specifies what kind of firms are closed as a result of financial liberalisation and how long it takes for the number of firms to reduce.

Figure 2.3: Occupational distribution along the transition path



Notes: The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

The following results shed light on possible answers to these questions. Figure 2.3 shows the distribution of occupations among households along the transition path that the economy takes from pre-reform to post-reform equilibrium state.⁶ The main result that

⁶The distribution is represented by shares of particular occupations. These shares are measured as a

we observe is that there is a significant increase in the number of workers (+4.34%), a simultaneous decrease in the number of sole proprietors (-4.74%) and virtually no change in the share of employers (+0.46%). This finding is in line with [Allub and Erosa \(2018\)](#), who showed in a partial equilibrium setup that the decrease in entrepreneurship is explained by the virtual elimination of sole proprietors and stability in the share of employers.

However, note that the majority of the change in the distribution of occupations among households happens during the first five years. This rapid adjustment in occupational shares suggests that the initial and sudden increase in the interest rate is enough to discourage households from choosing to become sole proprietors. Moreover, the results in [Figure 2.3](#) indicate that a large share of households become workers, which is explained by the gradually increasing wage rate. At the same time, in the second year after the reform, we observe a sudden increase in both shares of workers and employers, which might indicate that some sole proprietors choose to become workers or employers.

These observations illustrate two facts. First, the financial liberalisation leads to an increase in the labour force supply mostly at the expense of sole proprietors. Second, labour supply is strongly elastic with respect to the change in the wage rate due to the rapid occupational mobility and two sources of pressure on households to become workers. These two sources of pressure are: i) the incentive to become a worker from increased wage rate and ii) the disincentive to become an entrepreneur from higher factor costs and thus lower profits. Note that the second source of pressure is a stronger factor than the first source.

However, from the dynamics of occupational shares in isolation, it is impossible to fully understand the dynamics of occupational mobility. That is because the dynamics of occupational shares only show the changes in the outcome of occupational choice, not the change in the underlying choice itself. In other words, we need to understand who changes their occupation. To better understand the dynamics of occupational mobility, we need to turn our attention to transitional probabilities of households switching occupations.

[Table 2.3](#) shows the transitional probabilities of occupational mobility before and after financial liberalisation in their respective steady states. The numbers reported in the table reflect the conditional probabilities of households at time $t + 1$ being O_{t+1} conditional on the occupational choice at time t being O_t .⁷ Note that these transition probabilities are calculated from the stationary equilibria of the pre-reform and post-reform economies.

We observe from [Table 2.3](#) that in the stationary equilibrium of the post-reform economy, there is a significant increase in mobility for sole proprietors towards being an em-

ratio of the number of households with particular occupations at a particular time t over the total number of households at the same time t .

⁷[Appendix 2.A](#) shows technical details on how these matrices are calculated.

Table 2.3: Transition probability matrices that characterise the occupational mobility in steady states of pre-reform and post-reform economies

	Pre-reform economy			Post-reform economy		
$O_t \backslash O_{t+1}$	W	S	E	W	S	E
Workers	97.79	1.95	0.26	96.84	0.61	2.55
Sole Prop.	16.71	71.59	11.7	19.86	29.38	50.76
Employers	3.93	2.05	94.03	13.57	4.49	81.94

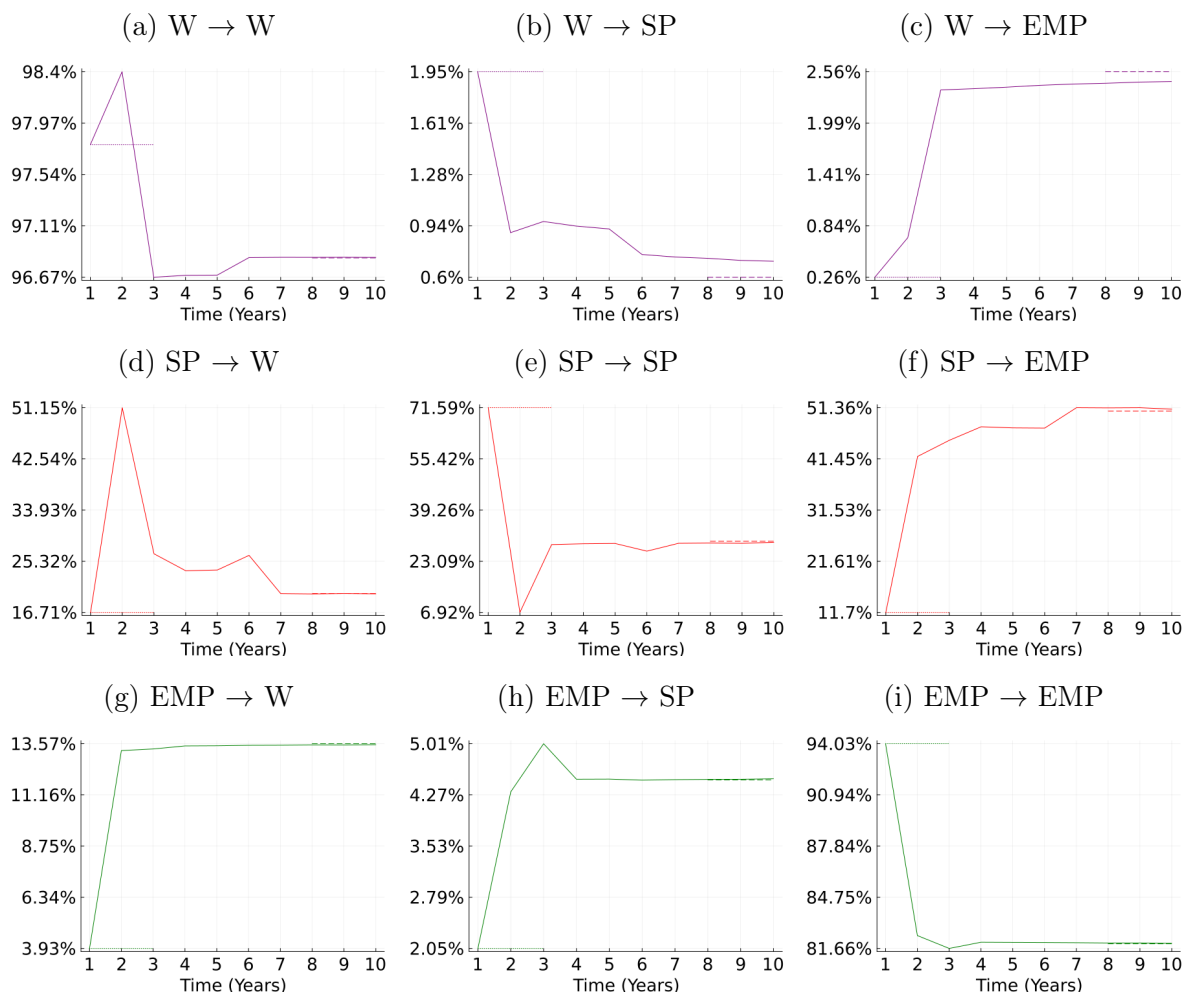
Notes: Each table shows the probability of occupational choice at time $t+1$ being O_{t+1} conditional on the occupational choice at time t being O_t . All numbers are reported in percentage points. In this table, W stands for workers, S stands for sole proprietors, and E stands for employers.

ployer (11.70% versus 50.76%) and in mobility for employers towards being a worker (3.93% versus 13.57%). These results suggest that after financial liberalisation in the long run most sole proprietors become employers, whereas a bigger share of employers become workers, which explains the increase in the share of workers, the decrease in sole proprietors and no change in the share of employers.

However, if we look at the dynamics of the transition probabilities of occupational mobility, we find that the story above is not complete. Figure 2.4 shows how the probabilities of switching occupations from one period to the next one change during the economy's convergence from pre-reform to post-reform stationary equilibrium.⁸ In particular, although the elimination of financial frictions does lead to the immediate increase in the mobility of sole proprietors towards being employers (up to 42% from 12% within the first year after the reform), it also leads to a short-term spike in the share of sole proprietors who move towards being workers (up to 50% from 17% in the first year). The latter result combined with the short-term spike in the share of workers who stay in the same occupation (from 97.8% to 98.4%), and the increase in the share of employers who switch to being workers (from 4% to 13%), explains the quick increase in the equilibrium value of the share of workers. At the same time, the results indicate that there is a significant and immediate increase in the share of employers who switch their occupation to being workers (from 4% to 13%) as well as an immediate decrease in the share of employers who stay in the same occupation (from 94% to 82%). The increase in the share of employers who switch occupations, particularly, provides evidence that financial liberalisation positively affects upward and downward occupational mobility in the short-run, which is in line with findings from the data on intergenerational occupational mobility after the economic liberalisation by [Gugushvili \(2015\)](#). Moreover, these results highlight the importance of

⁸Appendix 2.B describes technical details on how these dynamics of probabilities are calculated.

Figure 2.4: Transition probabilities of the occupational mobility along the transition path



Notes: Each graph $O_{t-1} \rightarrow O_t$ shows the probability of occupational choice at time t being O_t conditional on the occupational choice at time $t - 1$ being O_{t-1} for $t = 1..10$. All values are measured in %. The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

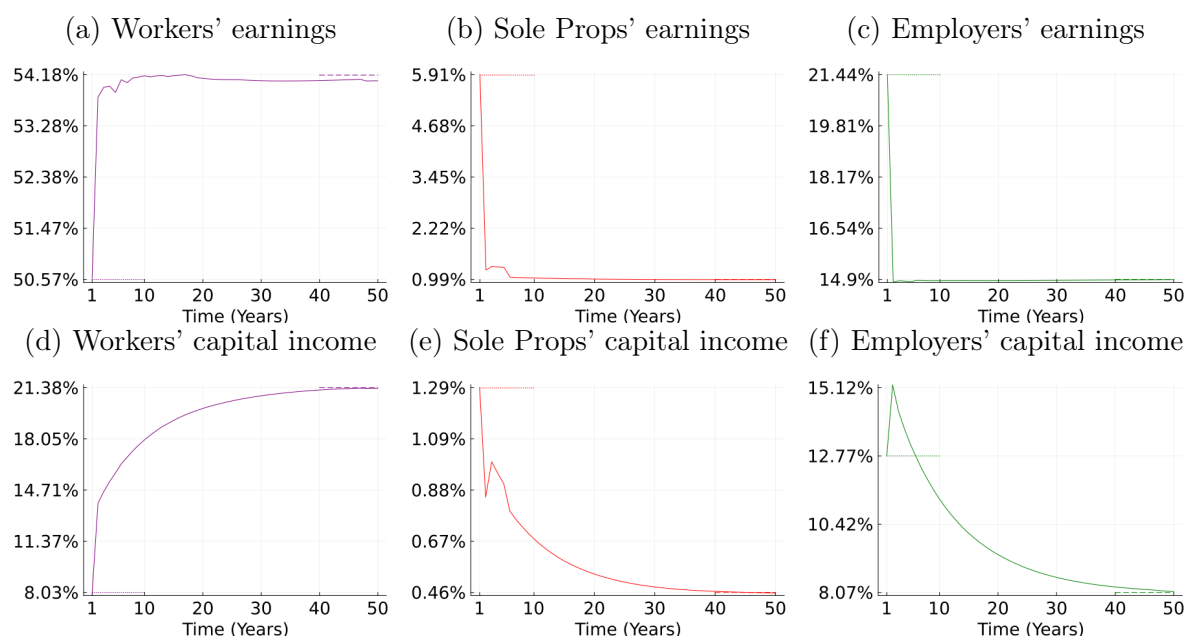
investigating the dynamics of occupational mobility during the transition period after the reform, as opposed to just comparing the stationary equilibria of the pre and post-reform economies, because inferences from Table 2.3 alone would have missed the initial shift of sole proprietors to being workers.

Finally, occupational dynamics can be characterised as follows: after the financial liberalisation, more than half of sole proprietors quickly become employers due to the relaxation of the financial constraint. At the same time, due to the increase in the interest rate, more than 40% of sole proprietors and more than 10% of employers cannot sustain the increased capital rent payments and thus become workers. The decrease in the share

of sole proprietors happens after the first year of the reform when there has been a spike in the interest rate. After the second year, the values of the transition probabilities become stable due to the opposing forces from the simultaneous and equal in magnitude change in factor prices: the interest rate starts decreasing and the wage rate keeps increasing. On the one hand, a decrease in the interest rate leads to a decrease in the cost of renting capital which encourages 2% of workers and 46% of sole proprietors to become employers. On the other hand, an increase in the wage leads to an increase in the cost of employing labour, therefore 13% of employers switch to being workers and 4.5% of employers become sole proprietors. Moreover, the increase in the wage also makes the choice of being a worker more attractive to 25% of sole proprietors. Ten years after the financial reform, the majority of the transition probabilities converge to their new steady-state levels, which coincides with the convergence rate of the occupational shares.

Note that the occupational shares converge much faster than the overall economy (10 years vs 30-50 years). One of the consequences of that is the fact that quick convergence of occupational choice implies quick convergence of earnings because the optimal occupational choice is dependent only on the choice of better earnings. At the same time, total income takes longer to converge than the earnings, see Figure 2.2d.

Figure 2.5: Earnings and capital income of occupations along the transition path



Notes: Each graph shows the corresponding statistics as a share of the aggregate output of the economy in percentage points. The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

These two findings, slow convergence of income and quick convergence of earnings lead to the following conclusion: there should be slow convergence of the other component of income — capital income. Here, we define capital income as the interest on deposits received from the financial intermediary. Capital income must converge slowly due to the slow accumulation of capital stock. This difference in the speed of convergence of earnings and capital income leads to a redistribution of total output across these components of total income across occupations.

From Figure 2.5, we observe that the distribution of total output changes significantly. For example, as expected, earnings of all occupations quickly converge to their new steady state shares of total output: workers' earnings gain an additional four percentage points of output share within the first ten years, sole proprietors' earnings lose five percentage points within the first three to five years and employers' earnings lose seven percentage points of total output within first three years.

The convergence of capital income of all occupations takes significantly longer than earnings — approximately 40-50 years, which is more in line with the paths of factor prices. In particular, we observe in Figures 2.5d-2.5f that workers' capital income gains 13 percentage points of total output share and sole proprietors' capital income accounts for just half of a percentage point of total output. At the same time, employers' capital income gains three percentage points of total output share within the first three years, but then it loses around seven percentage points in the subsequent years. The results above support the results on the change of capital flows after the financial liberalisation from Eichengreen et al. (2021). In particular, the authors deduce from the global data on capital income flows that the share of earnings tends to increase after the financial liberalisation in the developed economies. However, this section expands these results by quantifying and differentiating the effects on capital income and earnings flows between short- and long-run.

These results provide a very useful framework for predicting the outcomes of financial liberalisation: in the short-run, the economy's dynamics are driven by the change in occupational shares and earnings, whereas in the long run — the dynamics are driven by capital accumulation and the change in capital income. Moreover, these differences in short-run and long-run effects suggest that financial liberalisation might have important consequences for inequality among and within occupations.

4.3 Inequality dynamics

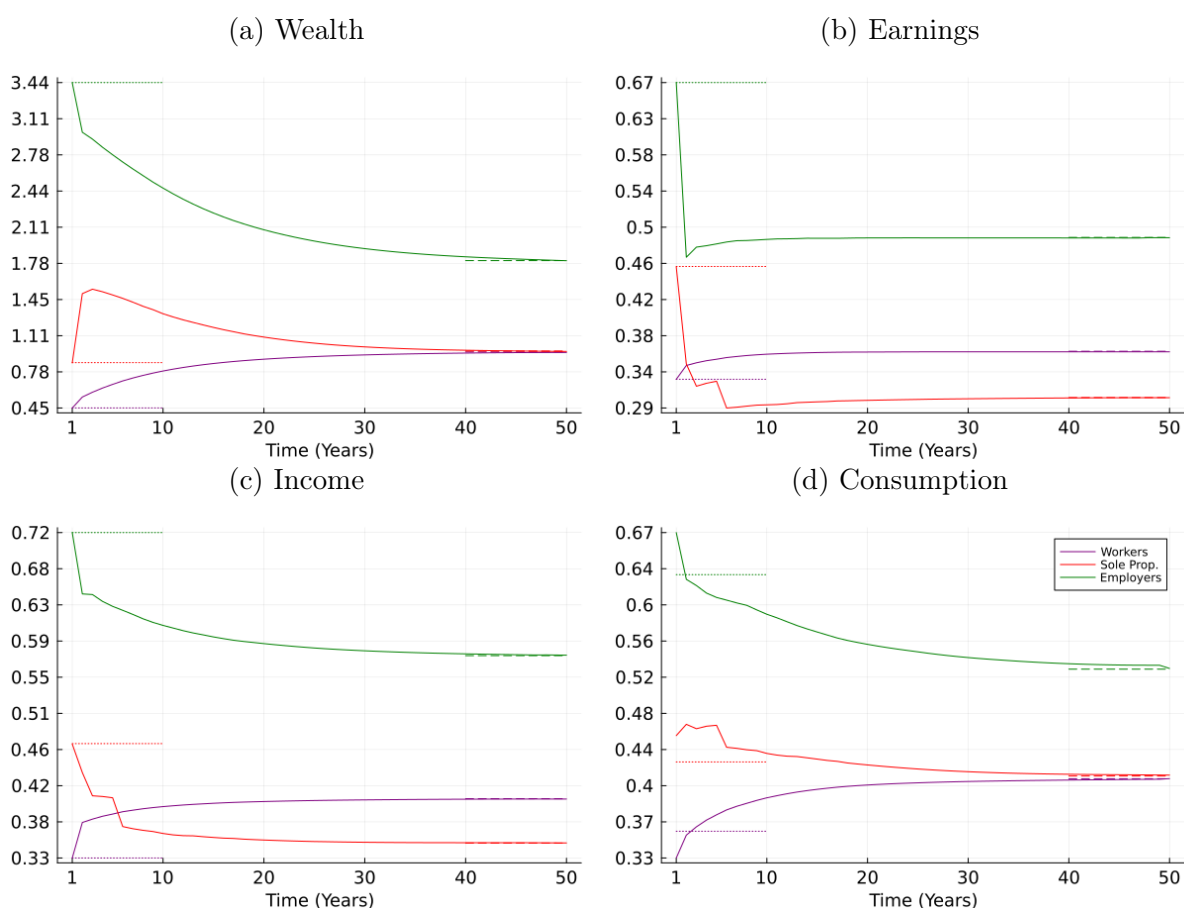
To fully understand the redistribution of output that occurs after the reduction of financial frictions described above, we will investigate the changes in the distributions of four

main welfare statistics: consumption, earnings, income and wealth. Moreover, we will investigate the inequality revealed in these measures between and within occupations. After that, we conclude with a discussion on who wins and who loses from the financial reform.

4.3.1 Inequality between occupations

We start our analysis by measuring inequality between occupations. We measure inequality between occupations in two ways: firstly, by calculating aggregate welfare statistics along the transition path for different occupations; and secondly, by computing gini coefficients for welfare statistics for all households together.

Figure 2.6: Means of welfare statistics across occupations along the transition path



Notes: Each graph shows values that are measured as the aggregation of corresponding statistics across households of corresponding occupations at time t . The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

Figure 2.6 shows the aggregate welfare statistics for different occupations. The initial

observation is that there is a significant difference in welfare between occupations. In particular, before the reform, employers have much higher consumption, earnings, income and wealth than workers or sole proprietors. Whereas, after the reform, employers' welfare measurements tend to decrease, which contrasts with findings from [Giné and Townsend \(2004\)](#). Authors have shown that entrepreneurs from Thailand had an increase in their aggregate welfare measurements after financial liberalisation. The difference in findings comes from this chapter's closed economy assumption, which allows us to observe the equilibrium effect. At the same time, the difference in these statistics between workers and sole proprietors is less prominent.

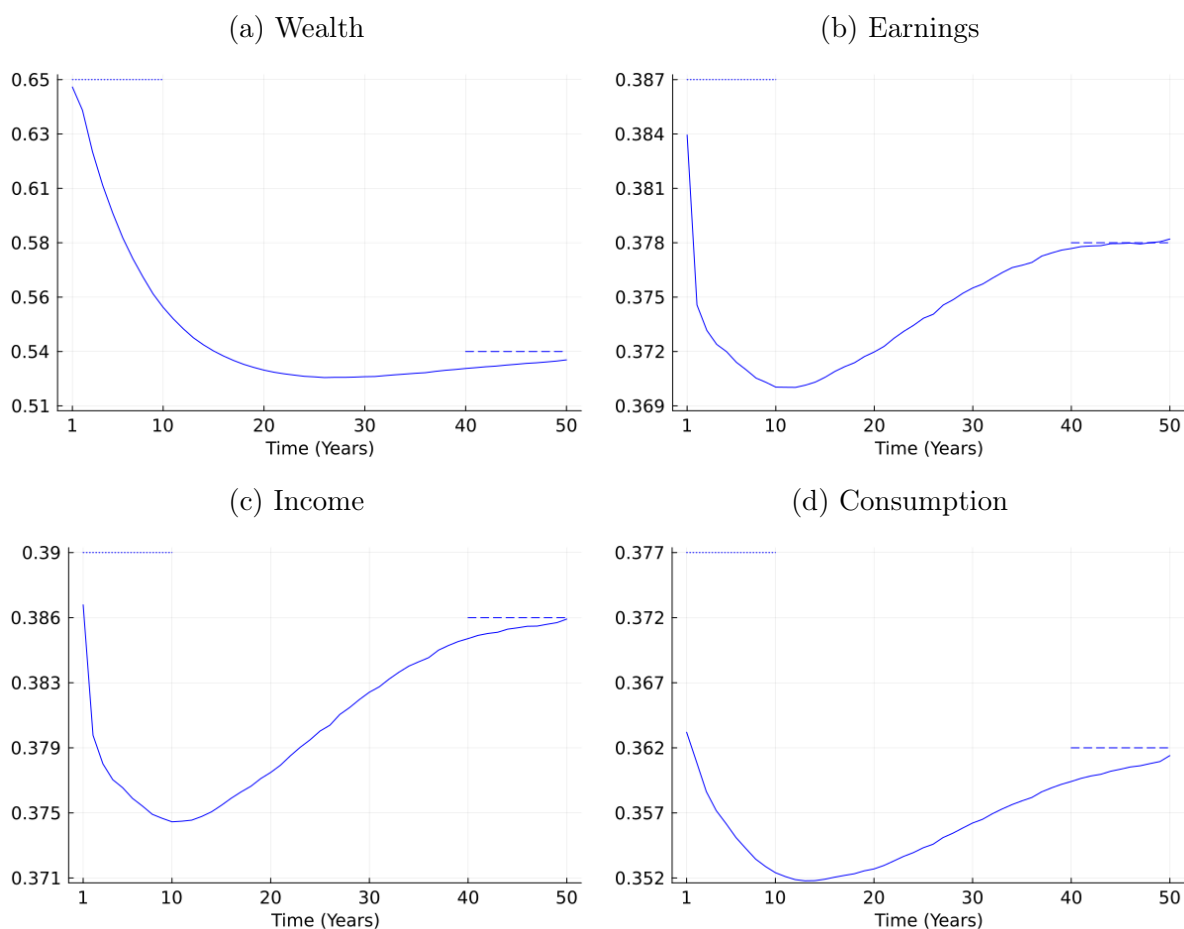
We observe that average consumption among workers and sole proprietors tends to converge to the same value. Meanwhile, the distance between workers' and employers' average consumption tends to decrease as a consequence of the financial reform. The decrease in the difference between employers' and workers' average consumption happens due to a decrease in average consumption among employers and an increase among workers. These consumption dynamics are a consequence of similar dynamics of earnings, income and wealth. Moreover, according to the dynamics of earnings and income for sole proprietors, they earn the least out of all occupations, which means that the relative role of this occupation has changed. Before the reform, the sole proprietor was an in-between step for a worker to accumulate enough wealth to become an employer. After the reform, being a sole proprietor becomes an option for households with low working and low managerial skills to maintain their living.

However, the main consequence of the reform is that these differences between occupations become smaller as the economy converges to its new steady state, which should indicate a decrease in the inequality between occupations. To observe the overall change in inequality, let us turn our attention towards the gini coefficients of these four welfare measures.

From [Figure 2.7](#), we observe that inequality does fall across all four statistics in the long run. However, we see that inequality among households in regard to consumption, earnings and income tends to over-decrease during the first 10-15 years after the financial liberalisation. This means that the short-term effects of financial liberalisation on inequality are much stronger than the long-term effects. After 10-15 years the Gini coefficients for these three statistics start to rise, albeit to lower equilibrium levels. Meanwhile, wealth inequality gradually decreases over the short and medium run and converges to a new steady state within 50 years.

The results indicate that inequality between occupations does decrease after the financial liberalisation. The main reason for this decline in inequality is a redistribution

Figure 2.7: Gini for welfare statistics across households along the transition path



Notes: Each graph shows values that are measured as gini coefficients for corresponding statistics at time t . The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

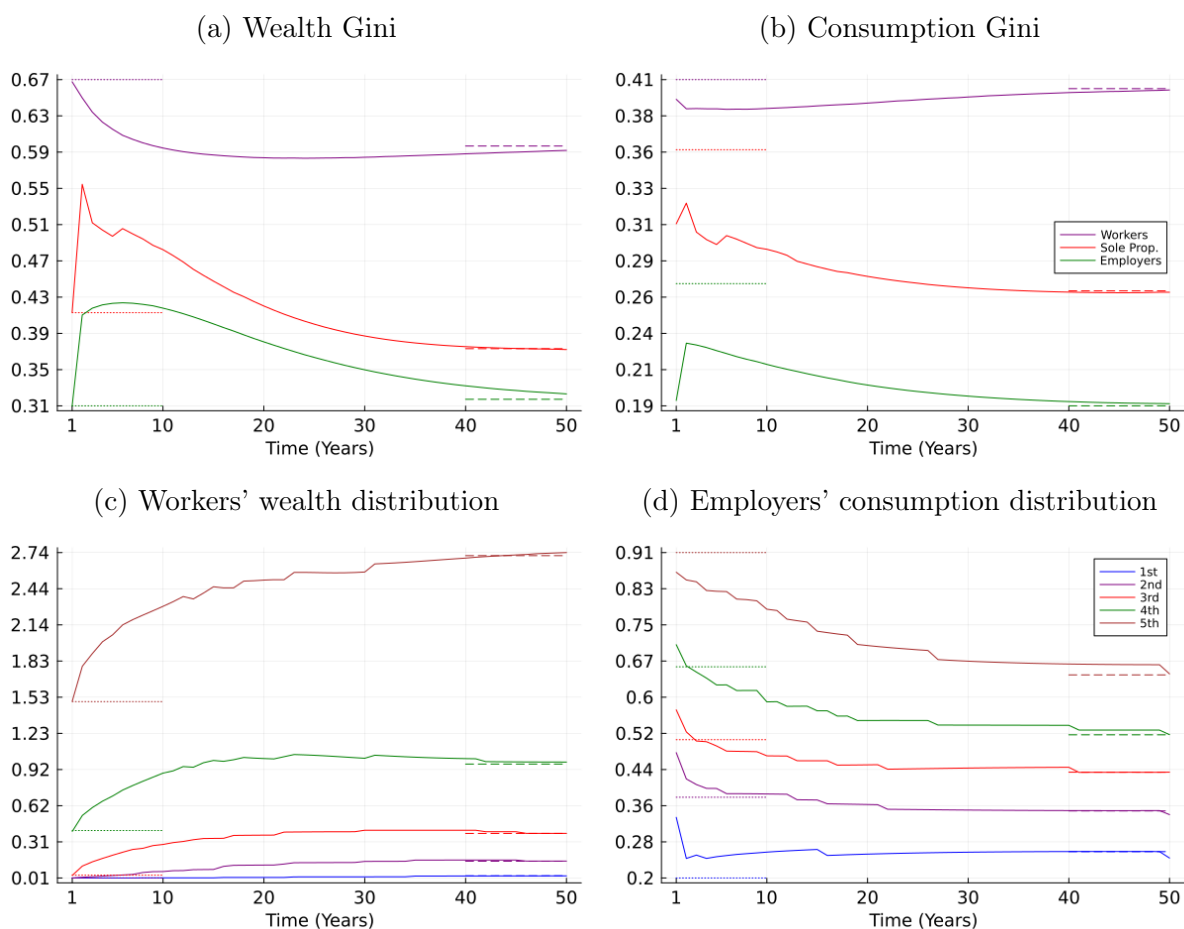
of output from employers to workers in the form of income, which trickles down to the distribution of wealth across occupations, which, in turn, results in a convergence of consumption across occupations.

4.3.2 Inequality within occupations

Having analysed inequality across occupations, we now analyse the inequality of earnings, income, consumption and wealth within occupations. First, results have shown that inequality measures of earnings and income within all three occupations do not change. This indicates that the effects of the reform on earnings and total income are distributed uniformly across everyone within their distribution.

Figure 2.8a shows that inequality of wealth within occupations would have fluctuating dynamics in the short and long run. In particular, there are increases in inequality within

Figure 2.8: Measures of inequality within occupations along the transition path



Notes: The top row shows the gini of consumption and wealth within workers, sole proprietors and employers. Each distribution in the bottom row is presented as a mean value for every quantile of the workers' wealth or employers' consumption distribution. The dotted line shows the pre-reform value and the dashed line shows the post-reform equilibrium value.

sole proprietors and employers in the short-run, whereas in the long-run these measures gradually decrease. The most interesting result is that there is a short-run (10-year) decrease in the inequality of wealth among workers. From Figure 2.8c, we can deduce that the decrease in the inequality among workers is explained by the significant increase among all quantiles of workers. This result suggests that financial liberalisation decreases the inequality of wealth among workers by propelling some of the low-wealth workers towards the middle class and increasing the wealth of high-wealth workers.

Next, there are significant decreases in consumption inequality within occupations. In particular, Figure 2.8b suggests that there is no significant change in consumption inequality among workers. However, there is an eight percentage point drop in the Gini

coefficient for employers' consumption in the short run. Moreover, from Figure 2.8d we can observe that this short-term decrease is attributed to a short-term increase in lower quantiles of consumption distribution, whereas the long-term decrease in inequality — is to a decrease in upper quantiles of consumption distribution. This means that financial liberalisation would benefit the majority of employers in the short run due to a sudden increase in capital income, which is explained by a predisposition to capital before the reform. More accurately, in the short run, employers would enjoy an additional consumption. However, in the long run, when increases in wage and interest rates would make the cost of inputs too expensive, earnings across all employers would fall, which would lead to a decrease in consumption for the upper quantiles of employers.

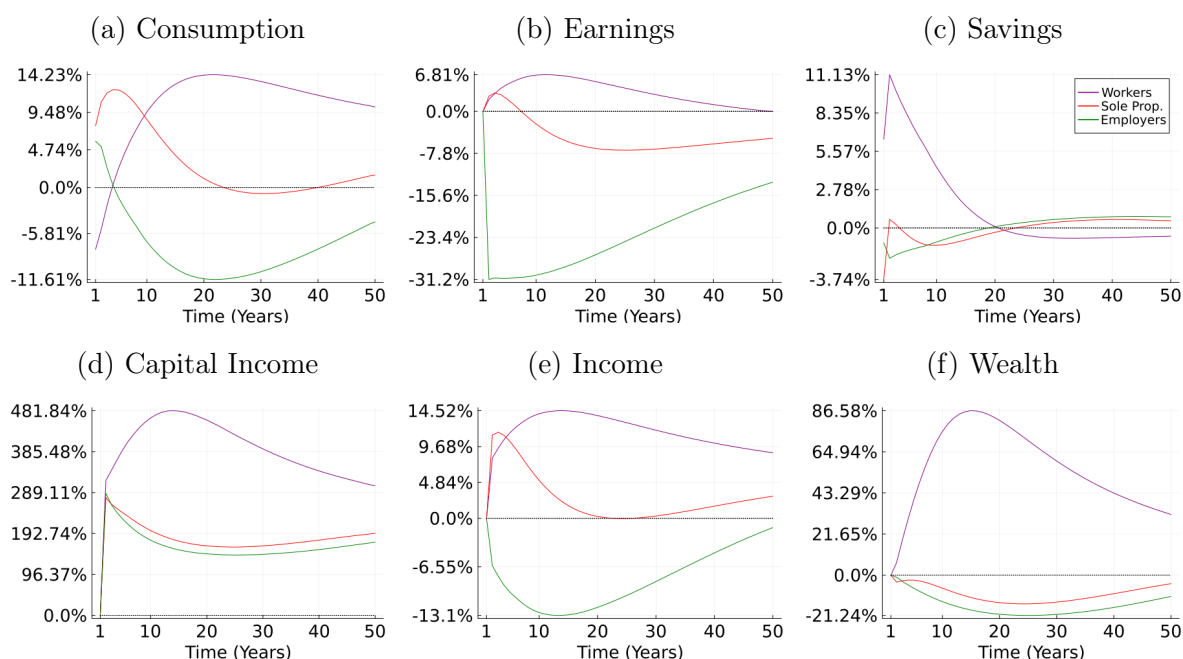
4.3.3 Who benefits from the reform?

Finally, we finish the discussion by exploring two puzzles about earnings and consumption and thus, we determine the so-called winners and losers of the reform. Firstly, why is there a short-term fall and a long-term rise in aggregate consumption? Secondly, why is there a decrease in aggregate earnings? To understand why there are these changes in aggregate consumption and aggregate earnings, we need to investigate which households experience these effects in the aftermath of the reform.

To understand the “who” part of the analysis, we employ a “difference-in-difference”-like approach applied to our simulated data. Take the distribution of occupations among households at the stationary equilibrium for the pre-reform economy and split households according to their occupation at that time. We mark this period as time $t = 0$. Next, we simulate 50 years of data from the stationary equilibrium of the pre-reform to get the baseline evolution across time of welfare statistics for households in each occupation. These simulated data provide the path for the “no-reform” economy. After that, we do a separate 50-year simulation of the post-reform economy along its transition path to the new stationary equilibrium. The data simulated from the post-reform economy produce paths that we denote the “post-reform” economy.

In essence, we have simulated two economies: in the first economy, the reform did not happen at all; and in the second economy, reform occurred at $t = 1$. Thus, we have two distinct worlds that we can use to show how the reform affected the welfare of an initially identical population of households. By taking the difference between the “post-reform” and “no-reform” path for each welfare statistic, we can quantify the effect of the reform on households with particular initial occupations, taking into account their skills heterogeneity. This approach allows us to identify and describe groups that were affected by the reform. Moreover, it allows us to track the differences in the decision-making

Figure 2.9: Comparative difference of aggregate welfare statistics for occupations between no-reform and post-reform dynamics of economies



Notes: The figure shows the difference in households' aggregate statistics at time $t = 1..50$ conditional on those households being of particular occupation at time 0. The black dotted line represents zero percentage difference.

process of households of different initial occupations at different stages of the post-reform economy.

Looking at Figure 2.9, we first observe that the presence of the reform decreases the aggregate consumption of initial workers by 6.5%. At the same time, we observe that there is a sudden increase in the average amount of savings of the same magnitude, which suggests that workers decrease their consumption for one period to be able to increase their wealth because they want to capitalise on the sudden increase in the interest rate in period two. This observation coupled with the fact that workers represent the largest share of households explains the short-term fall in aggregate consumption across households. Keep in mind, that the average worker's decision to temporarily decrease their consumption is rational because it creates a positive feedback loop on their consumption: the short-term decrease in consumption leads to a short-term increase in savings; this increase in savings leads to an increase in wealth, which leads to an increase in capital income, which, in turn, leads to an increase in total income; and this increase in total income translates into increases in both consumption and savings.

Secondly, Figure 2.9 reveals why earnings fall in the short run. Earnings fall (-31.2%)

for households that are initially employers. This fall in earnings is explained as follows: there is a sudden increase in the interest rate after the reform, which makes the cost of capital rent more expensive, and there is a gradual increase in the wage, which makes the cost of labour more expensive. This increase in the cost of inputs leads to a decrease in profits, which causes a decrease in employers' earnings. The significant decrease in employers' earnings from initially higher levels of earnings than workers' or sole proprietors' levels of earnings, explains why there is a decrease in aggregate earnings. Note that, sole proprietors experience a more gradual fall in earnings because the wage increase affects them in the opposite direction from employers. An increase in wage rate leads some sole proprietors to become workers and thus benefit from the wage increase. Other sole proprietors are not affected by the increase in wage rate because they do not employ more expensive workers.

To summarise, the results of this experiment have shown that the primary benefactors of this reform are workers. Workers gain the most from the reform due to the wage increase, which translates into an increase in earnings, and due to the increased occupational mobility, which means that the most talented workers can more easily become employers. At the same time, the primary losers of this reform are employers. Financial liberalisation leads to a more competitive economy. Therefore, those employers from the post-reform era who were able to compensate for their relative lack of skills with a large amount of wealth now cannot compete with "newcomers". Moreover, the financial reform changes the composition of employers and a larger proportion of them is now made up of households who have borrowed more funds, which has decreased employer profitability. What is surprising is that although sole proprietors as a group diminish as a share of households, households who were sole proprietors before the reform, for the most part, enjoy the benefits of being a worker or, if they are talented enough, can become employers. Thus, we can add sole proprietors as short-term winners of the financial liberalisation.

5 Conclusion

This chapter explores the implications of removing financial frictions in the economy through a sudden and permanent financial liberalisation. The removal of financial frictions leads to a greater use of capital in production, which leads to an increase in output. The overall convergence to a new steady-state value happens within 25-30 years after the reform. Moreover, the results show that financial reform in the form of a relaxed collateral constraint leads to a decrease in the number of sole proprietors, an increase in the number of workers, and virtually no change in the number of employers. The dynamics of the

transitional probabilities associated with changing occupations suggest that most sole proprietors become workers or employers in the short run, which implies an increase in occupational mobility. Furthermore, the majority of the changes to the distribution of occupations occur within the first five years, indicating that financial liberalisation has a strong, quick and long-lasting effect on the labour market.

Finally, the results of our analysis indicate that financial liberalisation leads to a long-run reduction in inequality between occupations. This reduction in inequality is due to a redistribution of income from employers to workers, which subsequently trickles down to the distribution of wealth across occupations and results in a convergence of consumption across occupations. However, measures of inequality for consumption, earnings, and income tend to over-decrease during the first 10-15 years following the financial liberalisation before climbing to a lower equilibrium level. Within occupations, measures of inequality based on earnings and income do not change significantly, while measures of consumption inequality decrease significantly within employers. There are short-run increases and long-run decreases in wealth inequality within sole proprietors and employers.

To conclude, my findings are consistent with previous research conducted by [Buera et al. \(2015\)](#), [Allub and Erosa \(2018\)](#), and [Ulyssea \(2020\)](#), and contribute to the understanding of the short- and medium-run effects of financial liberalisation on the functioning of the economy, inequality, and the dynamics of occupational mobility.

Bibliography

- Allen, F. (1993). Strategic management and financial markets. Strategic Management Journal, 14(S2):11–22.
- Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.
- Annicchiarico, B., Di Dio, F., Felici, F., and Monteforte, L. (2013). IGEM: A Dynamic General Equilibrium Model for Italy. Working Paper, Department of the Treasury, Italian Ministry of the Economy and of Finance, 4(April):1–54.
- Antunes, A., Cavalcanti, T., and Villamil, A. (2008). Computing general equilibrium models with occupational choice and financial frictions. Journal of Mathematical Economics, 44(7-8):553–568.
- Baldwin, J. R., Leung, D., and Rispoli, L. (2011). Labour productivity of unincorporated

- sole proprietorships and partnerships: Impact on the canada-united states productivity gap. Available at SSRN 1918854.
- Ballarino, G., Braga, M., Checchi, D., Filippin, A., Leonardi, M., and Meschi, E. (2012). Gini Country Report Italy. (September).
- Boháček, R. and Zubrický, J. (2012). A flat tax reform in an economy with occupational choice and financial frictions. The Economic Journal, 122(565):1313–1345.
- Borella, M. and Belloni, M. (2018). Self-Employment in Italy: The Role of Social Security Wealth. SSRN Electronic Journal, (April).
- Buera, F. J. (2008). Persistency of poverty, financial frictions, and entrepreneurship. Unpublished Manuscript, University of California at Los Angeles.
- Buera, F. J., Kaboski, J. P., and Shin, Y. (2015). Entrepreneurship and Financial Frictions: A Macroeconomic Perspective. Annual Review of Economics.
- Buera, F. J. and Shin, Y. (2013). Financial Frictions and the Persistence of History: A Quantitative Exploration. Journal of Political Economy, 121(2):221–272.
- Eichengreen, B. J., Csonto, B., ElGanainy, A. A., and Koczan, Z. (2021). Financial globalization and inequality: Capital flows as a two-edged sword. IMF Working Papers, 2021(004):A001.
- Evans, D. S. (1989). An Estimated Model of Entrepreneurial Choice under Liquidity Constraints Author (s): David S . Evans and Boyan Jovanovic Source : Journal of Political Economy , Vol . 97 , No . 4 (Aug . , 1989), pp . 808-827 Published by : The University of Chicago Pre. Journal of Political Economy, 97(4):808–827.
- Gentry, W. M. and Hubbard, R. G. (2000). Entrepreneurship and household saving.
- Giné, X. and Townsend, R. M. (2004). Evaluation of financial liberalization: a general equilibrium model with constrained occupation choice. Journal of development Economics, 74(2):269–307.
- Gugushvili, A. (2015). Economic liberalization and intergenerational mobility in occupational status. Comparative Sociology, 14(6):790 – 820.
- Hawkins, W. B. and Mustre-del Rio, J. (2016). Financial frictions and occupational mobility. Federal Reserve Bank of Kansas City Working Paper, (12-06).

- Heathcote, J., Storesletten, K., and Violante, G. L. (2005). Two views of inequality over the life cycle. Journal of the European Economic Association, 3(2-3):765–775.
- Heer, B. and Maussner, A. (2005). Dynamic General Equilibrium Modeling.
- Jappelli, T. and Pistaferri, L. (2009). Income Inequality in Italy ? (May).
- Jappelli, T. and Pistaferri, L. (2011). Financial integration and consumption smoothing. The Economic Journal, 121(553):678–706.
- Jayaratne, J. and Strahan, P. E. (1996). The finance-growth nexus: Evidence from bank branch deregulation. The Quarterly Journal of Economics, 111(3):639–670.
- Kelly, R. J., McQuinn, K., and Stuart, R. (2013). Exploring the steady-state relationship between credit and gdp for a small open economy: The case of ireland.
- King, R. G. and Levine, R. (1993). Finance and growth: Schumpeter might be right. The quarterly journal of economics, 108(3):717–737.
- Krueger, D., Mitman, K., and Perri, F. (2016). Macroeconomics and Household Heterogeneity. Handbook of Macroeconomics, 2:843–921.
- Krusell, P. and Smith, A. A. (2006). Quantitative macroeconomic models with heterogeneous agents. Econometric Society Monographs, 41:298.
- Lane, P. R. and Milesi-Ferretti, G. M. (2011). The cross-country incidence of the global crisis. IMF Economic Review, 59(1):77–110.
- Lucas Jr, R. E. (1978). On the size distribution of business firms. The Bell Journal of Economics, pages 508–523.
- Maksimovic, V., Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000). Financial structure and economic development: Firm, industry, and country evidence. Industry, and Country Evidence (June 2000).
- Moll, B. (2014). Productivity Losses from Financial Frictions. American Economic Review, 104(10):3186–3221.
- Quadrini, V. (2000). Entrepreneurship, Saving, and Social Mobility. Review of Economic Dynamics, 3(1):1–40.
- Roy, A. D. (1951). Some thoughts on the distribution of earnings. Oxford economic papers, 3(2):135–146.

Schivardi, F. and Torrini, R. (2005). Firm Size Distribution and EPL in Italy. SSRN Electronic Journal, (613).

Ulyssea, G. (2020). Informality: Causes and consequences for development. Annual Review of Economics.

APPENDIX

2.A Calculating the transition probabilities for occupational choice in the stationary equilibrium

The transitional probabilities for the pre-reform (post-reform) economy are calculated using:

- the stationary joint asset-skills distribution, $G(a, z_m, z_w)$
- the policy function that determines the future levels of assets given the current levels of assets and skills, $a'(a, z_m, z_w)$
- the policy function that determines occupational choice given the current levels of assets and skills, $OCC(a, z_m, z_w)$, which is defined as $OCC(a, z_m, z_w) = \operatorname{argmax}_O \{\pi(O, a, z_m, z_w)\}$
- the probability matrix of evolution of skills, $p((z_m, z_w)|(z'_m, z'_w))$, which shows the probability of skills being equal to (z_m, z_w) conditional on skills being previously equal to (z'_m, z'_w)

With these four objects, we create the transition probability matrix by computing the conditional probability $P(O'|O)$ of being in occupation O' conditional on being previously in occupation O :

$$P(O'|O) = \frac{\int_{OCC(a, z_m, z_w)=O'} G'_O(a, z_m, z_w) d(a, z_m, z_w)}{\int G_O(a, z_m, z_w) d(a, z_m, z_w)}, \quad (2.13)$$

where the joint distribution of assets and skills among households with occupation O is:

$$G_O(a, z_m, z_w) = G(a, z_m, z_w) \times 1_{OCC(a, z_m, z_w)=O}, \quad (2.14)$$

$1_{OCC(a, z_m, z_w)=O}$ is the indicator function when occupation at a particular state of assets and skills is equal to O , and the joint distribution of assets and skills among households with occupation O evolves over one time period according to:

$$G'_O(a, z_m, z_w) = \sum_{z_m^*, z_w^*} \int_{a^*: a=a'(a^*, z_m^*, z_w^*)} p((z_m, z_w)|(z_m^*, z_w^*)) \times G_O(a^*, z_m^*, z_w^*) da^* \quad (2.15)$$

2.B Calculating the transition probabilities for occupation choice along the transition path

The dynamics of the transitional probabilities of occupational choice along the transition path from pre-reform to long-run post-reform equilibrium state are calculated using:

- the paths for the interest rate, r_t , and the wage, w_t , for $t = 1..T$
- the stationary joint asset-skills distribution $G_0(a, z_m, z_w)$ for the pre-reform economy
- the joint asset-skills distributions $G_t(a, z_m, z_w; r_t, w_t)$ along the transition path for $t = 1..T$
- the policy functions that determine the future levels of assets given the current levels of assets and skills $a'_t(a, z_m, z_w; r_t, w_t)$ along the transition path for $t = 1..T$
- the policy function that determines occupational choice given the current levels of assets and skills $OCC_t(a, z_m, z_w; r_t, w_t)$, which is defined as $OCC_t(a, z_m, z_w; r_t, w_t) = \text{argmax}_O \{ \pi_t(O, a, z_m, z_w; r_t, w_t) \}$ along the convergence path for $t = 1..T$
- the probability matrix of evolution of skills $p((z_m, z_w)|(z_m^*, z_w^*))$, which shows the probability of skills being equal to (z_m, z_w) conditional on skills being previously equal to (z_m^*, z_w^*)

With these six objects, we compute the conditional probability $P_t(O'|O)$ of being in occupation O' at time t conditional on being previously in occupation O at time $t - 1$ for $t = 1..T$:

$$P_t(O'|O) = \frac{\int_{OCC_t(a, z_m, z_w; r_t, w_t)=O'} G'_O(a, z_m, z_w) d(a, z_m, z_w)}{\int G_O(a, z_m, z_w) d(a, z_m, z_w)}, \quad (2.16)$$

where the joint distribution of assets and skills among households with occupation O at time $t - 1$ is:

$$G_O(a, z_m, z_w) = G_{t-1}(a, z_m, z_w; r_{t-1}, w_{t-1}) \times 1_{OCC_{t-1}(a, z_m, z_w; r_{t-1}, w_{t-1})=O}, \quad (2.17)$$

where $1_{OCC_{t-1}(a, z_m, z_w; r_{t-1}, w_{t-1})=O}$ is the indicator function when occupation at a particular state of assets and skills is equal to occupation O at time $t - 1$, and the joint distribution of assets and skills among households with occupation O at time $t - 1$ evolves one time period forward as:

$$G'_O(a, z_m, z_w) = \sum_{z_m^*, z_w^*} \int_{a^*: a=a'_{t-1}(a^*, z_m^*, z_w^*; r_{t-1}, w_{t-1})} p((z_m, z_w)|(z_m^*, z_w^*)) \times G_O(a^*, z_m^*, z_w^*) da^*. \quad (2.18)$$

CHAPTER 3

THE INTERPLAY BETWEEN OCCUPATIONAL MOBILITY AND FINANCIAL LIBERALISATION - IMPLICATIONS FOR INEQUALITY AND PRODUCTIVITY

1 Introduction

How does occupational mobility interact with and influence the outcomes of financial liberalisation? Answering this overarching question requires delving into the intricate relationship between financial reform and the capacity for individuals to transition between entrepreneurial and non-entrepreneurial roles within an economy. The latter has been suggested to play a significant role in the mechanism of financial liberalisation, see [Stiglitz \(2000\)](#) and [Eichengreen \(2001\)](#). In this chapter, I dissect the interplay between occupational mobility, financial constraints, and resource allocation to grasp the full magnitude of the economic implications inherent in financial liberalisation. The decomposition of financial reform's effects allows us to understand the role of occupational mobility on the outcomes of sudden financial reform. More specifically, I aim to investigate and measure the effect of occupational mobility in terms of economic expansion, income distribution, and changes in productivity in the face of sudden financial reform.

Understanding how occupational mobility influences the outcomes of financial liberalisation is important for several compelling reasons. Firstly, financial liberalisation has been widely acknowledged as a catalyst for increased economic productivity, see [Heath \(2015\)](#). However, the study of financial reform, specifically through the lens of occupational mobility, allows us to uncover the mechanism behind these improvements by separating direct and indirect effects. Secondly, [Bekaert et al. \(2005\)](#) shows that financial liberalisation causes economic expansion through better utilisation of financial resources. The study of occupational mobility during financial reform expands our understanding of the efficiency improvements of both financial and non-financial resources, including labour and entrepreneurial management. Furthermore, viewing financial liberalisation through the lens of occupational mobility addresses the equity implications of financial reform. For example, according to [Atkinson and Morelli \(2011\)](#), income distribution is considered to be a pivotal aspect of financial liberalisation's consequences. Thus, it is important to understand whether occupational mobility contributes to mitigating income inequality across the economy or whether it exacerbates disparities in income and wealth for particular subsets of the population depending on their occupation over short and/or long periods of time, see [Martin et al. \(2016\)](#).

The methodological framework employed in this chapter revolves around the central objective of scrutinising occupational mobility during financial liberalisation, with financial liberalisation modelled as the relaxation of entrepreneurial borrowing constraints, in the same way as in [Buera and Shin \(2013\)](#) and [Moll \(2014\)](#). To achieve this, two DSGE models in the style of [Lucas Jr \(1978\)](#) and [Allub and Erosa \(2018\)](#) are employed — a model with occupational mobility and a model without occupational mobility. Both models have households that are heterogeneous in managerial and working skills and asset holdings. In the model with occupational mobility, households choose their occupation based on their assets and skills. Whereas in the model without occupational choice, a household's occupation is determined statically and exogenously such that the occupational shares in the two models for the same level of financial friction are close to the occupational shares in the International Labour Organisation dataset for Italy. In particular, this means that occupational shares are changing in the model with occupational mobility and are not changing in the model without occupational mobility. This approach allows us to compare the effects of a sudden financial reform on the economy's output, inequality and productivity depending on the presence or absence of occupational mobility in the economy.

The analysis of the occupational mobility contribution to the effects on aggregate economy, inequality and productivity after financial liberalisation is split into three parts.

The first part of the analysis is concerned with occupational mobility's long-term impact on the outcome of financial liberalisation. In particular, I am interested in how the presence or absence of occupational mobility between being a worker, sole proprietor and employer affects the aggregate outcomes of the reform where the financial friction is largely minimised. More specifically, I am concerned with the impact on the economy's outcomes on the aggregate level and across occupations. For this part of the analysis, the following computational experiment is conducted. I start with the computation of stationary equilibria for two models — with and without occupational mobility — for different levels of financial liberalisation. After that, the results from the two models are compared to observe the long-term effects of occupational mobility's presence/absence on the financial liberalisation of different magnitudes. Stationary equilibria for pre-reform and post-reform economies for models with and without occupational mobility are defined and calculated as in the first chapter using the methodology of [Antunes et al. \(2008\)](#).

The results show that the presence of occupational mobility during financial reform yields a substantial positive impact, leading to higher equilibrium wage rates and markedly improved economic outcomes, such as higher equilibrium levels of output, consumption, income and wealth/capital across all households and within occupations. However, results suggest that the presence of mobility improves consumption and wealth only for workers and sole proprietors; employers' aggregate consumption and wealth tend to be lower compared to the values under no mobility.

The second part of the analysis describes the mechanism of how the financial reform is conducted and decomposes the short- and long-term effects on the welfare measures among occupations. Specifically, the effect of financial liberalisation is split into two interconnected parts: the direct and indirect effects. The direct effect is the effect of increased capital usage after the borrowing constraint is relaxed, as in [Shaw \(1973\)](#). Whereas, the indirect effect captures all the effects of the household's ability to change their occupation during the removal of financial frictions. In particular, financial liberalisation improves the self-allocation of households towards appropriate occupations. In turn, improved self-allocation provides more working skills as labour input, more managerial skills as managerial input and overall, makes the use of production technology more efficient.

The second experiment, akin to [Antunes et al. \(2008\)](#), is conducted to disentangle these two effects. First, the dynamics of the two models with and without occupational mobility are simulated for the same starting distribution of assets and skills. After that, these two dynamic paths are compared and the effect of financial liberalisation is decomposed. The simulation of the economy with mobility gives the total effect of financial liberalisation. Whereas, the simulation of the economy without mobility has by definition only the

direct component of the reform. By comparing these two dynamic paths, it is possible to estimate the indirect effect of financial liberalisation as the difference between the total effect and the direct component of the effect. Note that the dynamics of transition from pre- to post-reform economy for both models with and without occupational mobility are calculated according to the approach by [Buera \(2008\)](#) as in the second chapter.

The results of this second counterfactual experiment show the financial reform's effects (and the decomposition of the effect) on groups of households in particular initial occupations.¹ Notably, the presence of occupational mobility amplifies the effect of financial reform through the indirect effect and thus contributes up to 60% of the total positive effect on workers' consumption, income and wealth, which is in line with neo-classical economics literature, for example, see [McKinnon \(1973\)](#). Meanwhile, financial liberalisation leads to an increase in factor prices and according to [Galbraith and Kum \(2005\)](#), an increase in factor prices should hurt employers' welfare measures. In particular, this experiment's results suggest that employers grapple with negative direct effects on their consumption, income and wealth due to increases in factor prices. These increases in factor prices make both labour and capital more costly which eats into income and subsequently into consumption. Another important result is that the indirect effect on employer outcomes is positive because employer with low productivity can change their occupation. More specifically, they can become a worker and earn an increased wage as income compared to low profit due to increased costs and low productivity. According to [Cingano \(2014\)](#), the ability to change occupations for employers contributes to the reduction of income inequality among employers.

Lastly, the third part of the analysis focuses on the dissection of output increase as a result of financial liberalisation. Particularly, I consider and evaluate the changes in productivity measurements, as well as resource accumulation efforts. I utilise a decomposition procedure, akin to the Solow decomposition, see [Kumar and Russell \(2002\)](#), that breaks down the change in aggregate output post-financial reform into components such as Multi-Factor Productivity (MFP), alterations in aggregate management, capital, and labour. After that, the marginal products of input factors are analysed and, as a result, the main driver of the output change is identified to be the change in the distribution of skills. In particular, the presence of occupational mobility allows households with high working skills to self-select into being workers, which results in increased aggregate labour. At the same time, households with high managerial skills are allowed to self-select into being employers, which increases the average management skill of employers. Finan-

¹In the second experiment, labels "workers", "sole proprietors" and "employers" refer to groups of households who were of corresponding occupation at the time of a sudden reform. Such labelling helps with answering the question: which group "wins or loses" as a result of the reform?

cial liberalisation amplifies these effects because it relaxes a constraint that would have otherwise distorted this self-selection process.

Thus, the results of this exercise help us to understand the mechanism that drives the increase in output following financial liberalisation. Heil (2019) report that the primary source of the increase in output post-reform is the increase in aggregate capital used in production. However, the results of the third experiment show that the increase in aggregate capital does not happen immediately after the financial reform. In particular, I show that, immediately after the reform, the efficiency of the aggregate production (MFP) increases, because the use of individual production technology is less constrained by borrowing limits. When employers are less constrained in their choice of capital, they can afford to hire more labour and thus allocate more of their time towards managerial input. At the same time, the removal of the borrowing constraint improves the occupational self-selection process, which in turn increases both aggregate labour and the average management skill of employers. In the periods immediately following the financial reform, there is a more efficient production that uses more management and labour input and thus produces more output, as indicated by the increase in marginal products of management and labour. After that, the increased output is partially transformed into an increase in aggregate capital, which, in turn, raises output even more. The increased aggregate capital improves the self-selection process giving rise to further increases in output. These findings expand the discussion of channels of financial liberalisation by Heil (2019), providing crucial insights into the intricate dynamics at the intersection between financial reform and occupational mobility.

The rest of the chapter is organised as follows. Section [two](#) describes the methodology. Section [three](#) describes the results. Section [four](#) concludes the chapter.

2 Methodology

The main goal of this chapter is to investigate the effects of occupational mobility following a financial liberalisation.² To achieve this, a version of the model from previous chapters is developed such that the economy without occupational mobility is simulated and then compared to the simulation of a similar economy where occupational mobility is present. Here, the absence of occupational mobility is the inability of households to choose between their occupation, whether to be a worker, a sole proprietor, or an employer. Instead, households are split into three corresponding groups of fixed shares of the

²Note that financial liberalisation corresponds to the relaxation of a borrowing constraint.

total population.³ Moreover, the model is solved to find both: stationary equilibria for economies with different levels of financial frictions; and the transition dynamics for the economy after the reform. This section describes the version of the model that investigates the transition dynamics.

2.1 Model

Consider an economy populated by a large number (normalised to one) of infinitely-lived households who are heterogeneous in their endowed managerial and working skills as well as regarding their asset holdings. Households face uninsurable idiosyncratic shocks to their skills; their asset holdings are determined endogenously as the outcome of a forward-looking saving decision. Households are split into three separate groups corresponding to the respective occupations: workers, sole proprietors, and employers. Each group has the same distribution of endowed managerial and working skills. This modelling choice was made to make sure that this model (without occupational mobility) is comparable to the model (with occupational mobility) from previous chapters.

2.2 Heterogeneity and demographics

Following the first and second chapters, each household's working skill and managerial skill evolves stochastically over time and there is no market to insure skill risk. The logarithm of skills for household i is governed by:

$$\ln z_{mit} = \alpha_{mit} + u_{mit} + \zeta_{it}, \quad (3.1)$$

$$\ln z_{wit} = \alpha_{wit} + u_{wit} \quad (3.2)$$

where α_{mit} and α_{wit} represent “fixed effects” skill components, which change infrequently by drawing from a Pareto distribution, of managerial and working productivities, u_{mit} and u_{wit} denote persistent shocks to skills, which follow first-order auto-regressive processes, and ζ_{it} is a transitory shock to the managerial skill component. This transitory skill component is assumed to be completely independent of its previous period's value and to be distributed normally with a mean zero.

³Workers constitute 77.48%, sole proprietors — 6.49% and employers — 16.02%. These numbers are taken directly from the calibration of the original model with occupational mobility that targets values from the International Labour Organisation dataset.

2.2.1 Labour and financial markets

The labour market is assumed to be frictionless. Workers supply their labour in the form of working skills, z_{wt} , (or efficiency units of labour) to employers in return for the wage rate, w_t , per efficiency unit of labour. Employers hire n_t efficiency units of labour for the price w_t per unit. Effectively, all labour supplied at time t is pooled and then distributed among employers according to their labour hiring decisions. Note that the labour market clears, i.e. the sum of all working skills provided by workers is equal to the sum of all working skills hired by employers, at every period t .

As mentioned earlier, the financial market is assumed to be perfectly competitive. Financial intermediaries take deposits from households at the beginning of period t and pay the interest rate r_t at the end of period t . These financial intermediaries lend capital to entrepreneurs (sole proprietors and employers) at the price $r_t + \delta$, where δ is the depreciation rate.

The main assumption about the financial market is that there are enforcement problems present that limit the capital that can be lent to entrepreneurs. Following [Buera and Shin \(2013\)](#) and [Moll \(2014\)](#), the capital lent to entrepreneurs is constrained by the collateral constraint, $k_{it} \leq \lambda_t a_{it}$, where a_{it} denotes household's i wealth at period t . Each entrepreneur can produce using a quantity of capital that is more than their individual wealth multiplied by the coefficient λ_t , which is the same for all entrepreneurs. The parameter $\lambda_t \geq 1$ governs the magnitude of the financial friction in the economy, where $\lambda_t = \infty$ represents perfect financial markets and $\lambda_t = 1$ represents an economy with no credit.

The capital market is assumed to clear every period, i.e., the sum of all deposits collected by financial intermediaries is equal to the sum of all capital lent to entrepreneurs.

2.2.2 Worker's optimisation problem

At the beginning of each period t , a worker observes their current level of assets, a_t , their working skill, z_{wt} , and then decides their current consumption, c_t , as well as their future level of assets, a_{t+1} . Workers are price takers, i.e. they make all their decisions taking the interest rate r_t and the wage w_t as given.

Therefore, the worker's problem is the following:

$$\max_{\{c_t, a_{t+1}\}_{t=0}^{\infty}} \mathbb{E} \left\{ \sum_{t=0}^{\infty} \beta^t \ln(c_t) \right\}, \quad (3.3)$$

subject to the budget constraint:

$$c_t + a_{t+1} = w_t z_{wt} + (1 + r_t)a_t, \quad \forall t \geq 0, \quad (3.4)$$

where $w_t z_{wt}$ is the worker's earnings from supplying their working skill, z_{wt} , for a wage-price, w_t , to employers via the labour market.

2.2.3 Sole proprietor's optimisation problem

At the beginning of each period t , a sole proprietor observes their current level of assets, a_t , their working, z_{wt} , and managerial, z_{mt} , skills and then decides on their current consumption, c_t , as well as their future level of asset holdings, a_{t+1} . Additionally, a sole proprietor has to solve their individual profit maximisation problem to determine their earnings in period t . In particular, they need to decide how much capital k_t to rent and how to allocate their time between managerial d_t and working $(1 - d_t)$ activities. Sole proprietors are price takers, i.e. they make all their decisions taking the interest rate r_t and the wage w_t as given.

Therefore, a sole proprietor's problem is the following:

$$\max_{\{c_t, a_{t+1}, d_t, k_t\}_{t=0}^{\infty}} \mathbb{E} \left\{ \sum_{t=0}^{\infty} \beta^t \ln(c_t) \right\}, \quad (3.5)$$

subject to the budget constraint:

$$c_t + a_{t+1} = \pi_t^{SP} + (1 + r_t)a_t, \quad \forall t \geq 0, \quad (3.6)$$

where π_t^{SP} denote the sole proprietor's earnings defined as:

$$\pi_t^{SP} \equiv (d_t z_{mt})^\gamma k_t^\eta ((1 - d_t) z_{wt})^\theta - (r_t + \delta)k_t \quad (3.7)$$

such that:

$$0 < d_t < 1, \quad (3.8)$$

$$k_t \leq \lambda_t a_t. \quad (3.9)$$

Here, the term $d_t z_{mt}$ represents the managerial input into the production function; $\gamma \in [0, 1]$, $\eta \in [0, 1]$ and $\theta \in [0, 1]$ are shares of managerial, capital and labour inputs respectively, such that $\gamma + \eta + \theta = 1$; and δ is the depreciation rate of capital.

2.2.4 Employer's optimisation problem

At the beginning of each period t , an employer observes their current level of assets, a_t , their working, z_{wt} , and managerial, z_{mt} , skills and then decides on their current level of consumption, c_t , as well as on their future level of asset holdings, a_{t+1} . Additionally, an employer has to solve their individual profit maximisation problem to determine their earnings. They need to make similar decisions to sole proprietors — how much capital k_t to rent and how to allocate their time between managerial d_t and working $(1 - d_t)$ activities. However, employers also need to choose the number of efficiency labour units, n_t , to hire on the labour market. Note that employers are price takers, i.e. they make all their decisions taking the interest rate r_t and the wage w_t as given.

Therefore, the employer's problem is the following:

$$\max_{\{c_t, a_{t+1}, d_t, k_t, n_t\}_{t=0}^{\infty}} \mathbb{E}\left\{\sum_{t=0}^{\infty} \beta^t \ln(c_t)\right\}, \quad (3.10)$$

subject to the budget constraint:

$$c_t + a_{t+1} = \pi_t^{EMP} + (1 + r_t)a_t, \quad \forall t \geq 0, \quad (3.11)$$

where π_t^{EMP} denotes the employer's earnings defined as:

$$\pi_t^{EMP} \equiv (d_t z_{mt})^\gamma k_t^\eta ((1 - d_t)z_{wt} + n_t)^\theta - w_t n_t - (r_t + \delta)k_t - c_e \quad (3.12)$$

such that:

$$0 < d_t \leq 1, \quad (3.13)$$

$$k_t \leq \lambda_t a_t, \quad (3.14)$$

$$n_t > 0. \quad (3.15)$$

Here, the term $d_t z_{mt}$ represents the managerial input into the production function; $\gamma \in [0, 1]$, $\eta \in [0, 1]$ and $\theta \in [0, 1]$ are shares of managerial, capital and labour inputs respectively, such that $\gamma + \eta + \theta = 1$; and δ is the depreciation rate of capital.

Note that employers are assumed to incur a fixed per-period operating cost equal to c_e . In previous chapters, this fixed cost was introduced so that employers demand a non-trivial amount of labour (an amount bounded away from zero). This modelling choice was made so that there was a clear-cut distinction between sole proprietors and employers. However, the model that is used in this chapter does not need this fixed cost

because the occupations can no longer be chosen — instead, we have three distinct groups of households with their corresponding occupation. Despite having no explicit need for the fixed cost, it is still present in the model to ensure the comparability of results from this model (without occupational choice) to the results from the model used in previous chapters (that allow occupational mobility). In the same spirit of comparability, the strict inequality is preserved for the constraint on outside labour, n_t .

2.3 Parametrisation

To get comparable equilibria and transitional dynamics for the models with and without occupational mobility, the parameter calibration was done for the version of the model with occupational mobility. In other words, the parametrisation of the model in this chapter was taken directly from previous chapters.

Table 3.1: Calibrated parameters

Panel A: Externally calibrated parameters		
δ	Depreciation rate of capital	0.10
γ	Share of managerial input to the production	0.16
η	Share of capital input to the production	0.30
θ	Share of labour input to the production	0.54
ρ_w	Autocorrelation of working skill	0.96
σ_α^2	Variance of fixed effects on working skills	0.12
$p_{\bar{\alpha}}$	Probability of first fixed effect of managerial skill	0.39
Panel B: Internally calibrated parameters		
c_e	Fixed operating cost of hiring employees	0.057
μ_α	Location of first fixed effect of managerial skill	-3.27
p_α	Probability of new skills draw	0.02
η_α	Pareto tail of managerial skill	5.81
σ_m^2	Variance of innovation of managerial persistent shocks	0.75
ρ_{mw}	Correlation between innovations of persistent shocks	0.22
ρ_m	Autocorrelation of managerial skill	0.95
σ_ζ^2	Variance of transitory shock of managerial skill	0.21
ρ_α	Correlation between fixed effects of managerial and working skills	0.15
σ_w^2	Variance of innovation of working persistent shocks	0.049
λ	Collateral constraint	1.67
β	Discount factor	0.93

Notes: Panel A shows parameters that are set using estimates from other studies in the literature. Panel B shows parameters that are set according to the results of the calibration of the model.

The full list of calibrated parameters is presented in Table 3.1. Here as explained in previous chapters, the externally calibrated parameters are set using estimates from other

studies. For example, the shares of managerial, γ , labour, θ , and capital, η , inputs in the production and the depreciation rate of capital, δ , follow the calibration undertaken in [Annicchiarico et al. \(2013\)](#). Following [Heathcote et al. \(2005\)](#), the autocorrelation of shocks to working skills, ρ_w , is set to 0.96 to capture the feature from Italian data that wage inequality grows linearly over the life cycle. Also, the variance of the working-skills fixed effect, σ_α^2 , is set exactly to the variance of log-wages at age 25 in Italy, see [Krueger et al. \(2016\)](#). Finally, the first grid point's probability mass of the discretised Pareto distribution for the fixed effects of managerial skill is set to the share of Italian 25-65 year-olds who have low literacy and/or numeracy proficiency.

The rest of the parameters were obtained via the calibration procedure of the model with occupational mobility targeting key moments from the Italian data: the occupational choice structure is taken from the ILO dataset; the variance of log-consumption and the variance of log-earnings, see [Jappelli and Pistaferri \(2009\)](#); the Gini coefficient for entrepreneurial income and the Gini coefficient for workers' income, see [Ballarino et al. \(2012\)](#); the annual transition rates among occupations, see [Borella and Belloni \(2018\)](#) and [Schivardi and Torrini \(2005\)](#); the annual credit-to-output ratio and the annual capital-to-output ratio, see World Bank Open Data.

Table 3.2 reports the results of the stationary equilibrium for the calibrated value of collateral constraint parameter, $\lambda = 1.67$. The parametrisation of the model without mobility seems to result in a slight overestimation of capital-to-output and underestimation of credit-to-output compared to the model with mobility while keeping the relative relationship — capital-to-output is larger than credit-to-output. The occupational structure for the model without mobility is equivalent to the structure in the model with mobility by construction. Inequality measures are replicated qualitatively in both models. Both models with and without mobility replicate the notions of consumption inequality being less than the variance of log earnings; and the inequality for workers being higher than the inequality for entrepreneurs. However, the model without mobility seems to consistently overestimate the values of inequality compared to the results from the model with mobility.

Note that, the model without occupational mobility has fixed occupational shares and this changes the stationary equilibrium.⁴ However, the goal of this experiment is not to improve the results of data replication but rather to create a counterfactual to investigate the mechanism behind financial liberalisation in the context of occupational mobility.

⁴Note that due to the absence of occupational mobility, the occupational shares are fixed at the stationary equilibrium values for the calibrated value of lambda 1.6. See the values of occupational shares for two models in Appendix 3.A.

Table 3.2: Base results for Italy

Statistics	Data	Model with mobility	Model without mobility
Capital-to-Output	170.40%	188.36%	200.55%
Credit-to-Output	60.35%	73.81%	68.31%
<i>Occupational structure</i>			
Workers.	70.20%	77.48%	77.48%
Sole Proprietors	8.50%	6.49%	6.49%
Employers	21.40%	16.02%	16.02%
<i>Consumption inequality</i>			
Var(log(c))	0.26	0.74	0.96
<i>Occupational one period transition rates</i>			
W to W	98.53%	97.75%	—
W to SP	0.89%	1.99%	—
SP to SP	83.66%	70.34%	—
SP to EMP	13.49%	12.52%	—
EMP to SP	8.42%	2.42%	—
EMP to EMP	88.73%	93.65%	—
<i>Income inequality: Between occupations</i>			
Variance of log-earnings	0.48	0.81	1.02
<i>Income inequality: Within occupations</i>			
Gini for workers' income	0.43	0.42	0.44
Gini for entrepreneurs' income	0.25	0.25	0.56

Notes: In the table, W stands for workers, SP for sole proprietors and EMP for employers. Variance in earnings is computed using the natural logarithm of earnings. Occupational transitions from the data are computed comparing the same month of two consecutive years, keeping only households that were employed in both years.

3 Results

The analysis of the occupational mobility contribution to the effects on aggregate economy, inequality and productivity after financial liberalisation is split into three parts.

The first part of the analysis is concerned with occupational mobility's long-term impact on the outcome of financial liberalisation. In particular, I am interested in how the presence or absence of occupational mobility between being a worker, sole proprietor and employer affects the aggregate outcomes of the reform where the financial friction is largely minimised. More specifically, I am concerned with the impact on the economy's outcomes on the aggregate level and across occupations.

The second part of the analysis describes the mechanism of how the financial reform is conducted and decomposes the short- and long-term effects on the welfare measures

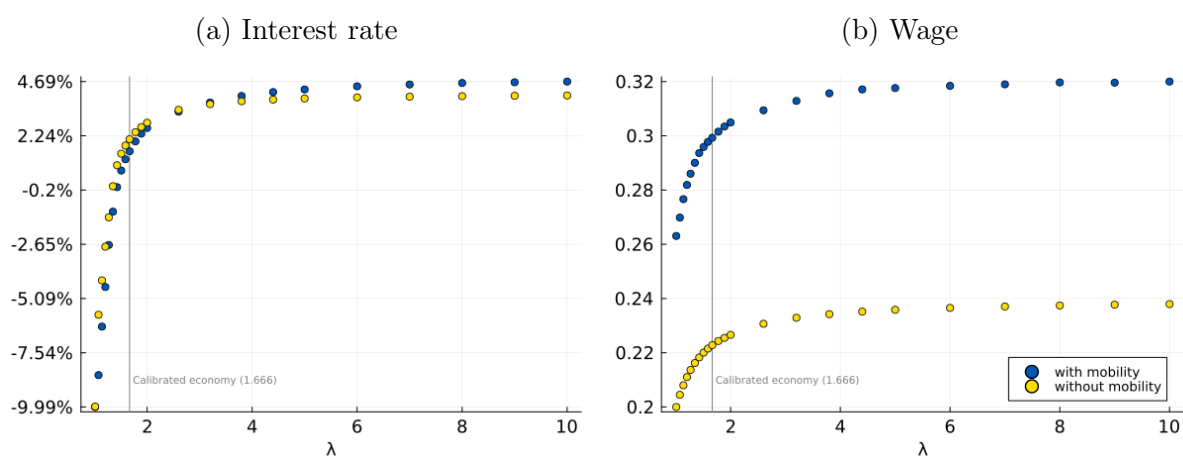
among occupations. Specifically, the effect of financial liberalisation is split into two interconnected parts: the direct and indirect effects. The distinction is described further in a corresponding section of the results.

Lastly, the third part of the analysis focuses on the dissection of output increase as a result of financial liberalisation. Particularly, I consider and evaluate the changes in productivity measurements, as well as resource accumulation efforts.

3.1 Occupational mobility's impact on the reform's outcome

In this subsection, I investigate the importance of occupational mobility for the outcomes of financial liberalisation. To investigate the importance of occupational mobility, I conduct the following experiment: compute the stationary equilibrium for the calibrated model with occupational mobility present; compute the stationary equilibriums for the model without occupational mobility for different levels of financial liberalisation, λ , and compare these results to the stationary equilibriums for the model with occupational mobility for the same level of financial liberalisation.

Figure 3.1: Factor prices



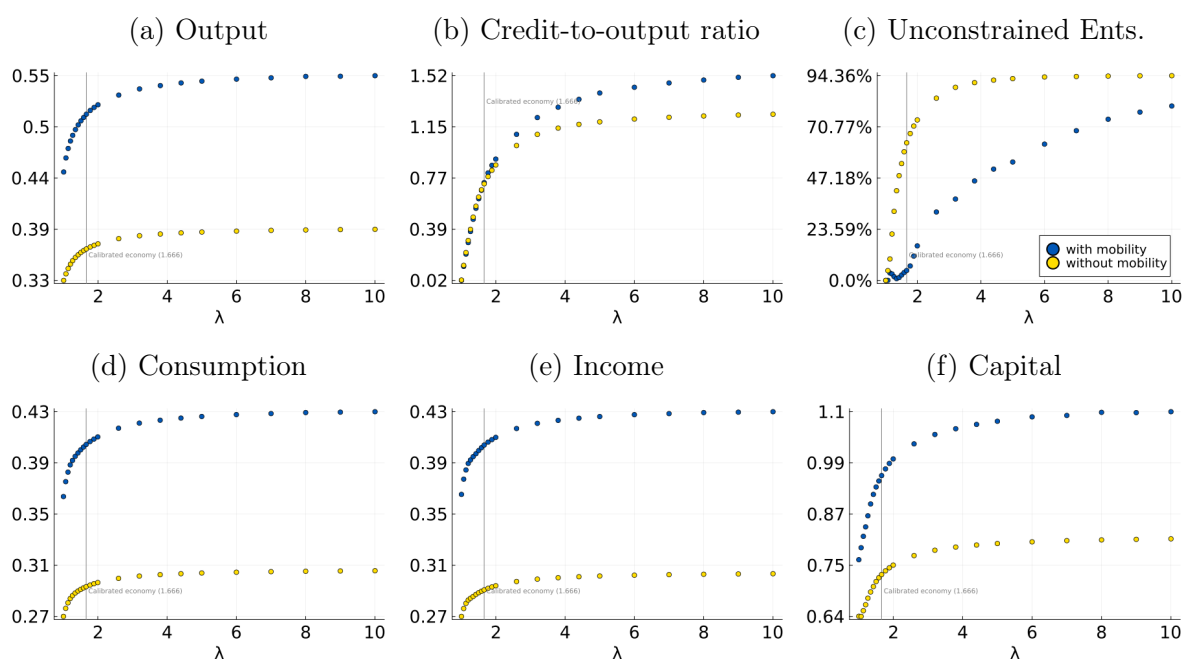
Notes: The grey vertical line indicates the calibrated economy with occupational mobility.

The first important observation is that the presence of occupational mobility doesn't significantly change the values of the equilibrium interest rate, however, the equilibrium values for the wage rate do change significantly, see figure 3.1. This means that the presence of occupational mobility results in higher wage rates across all levels of financial liberalisation.

Occupational mobility's presence in the economy can elevate equilibrium wage rates through a combination of factors. First, the prevalence of occupational mobility strength-

ens the demand side of the market, which creates upward pressure on wages, because if wages fall too far, then workers would find becoming sole proprietors a more attractive option than staying a worker. Second, the presence of occupational mobility allows households to align with more suitable occupations, boosting productivity and justifying higher wages from employers seeking more labour. The alignment is represented by the change in aggregate skill levels for occupations and I expand on the reasons behind the productivity gains in further subsections.

Figure 3.2: Economy outcomes



Notes: Here, “Unconstrained Ents” represents the number of sole proprietors and employers whose capital demand is not constrained divided by the total number of sole proprietors and employers. The grey vertical line indicates the calibrated economy with occupational mobility.

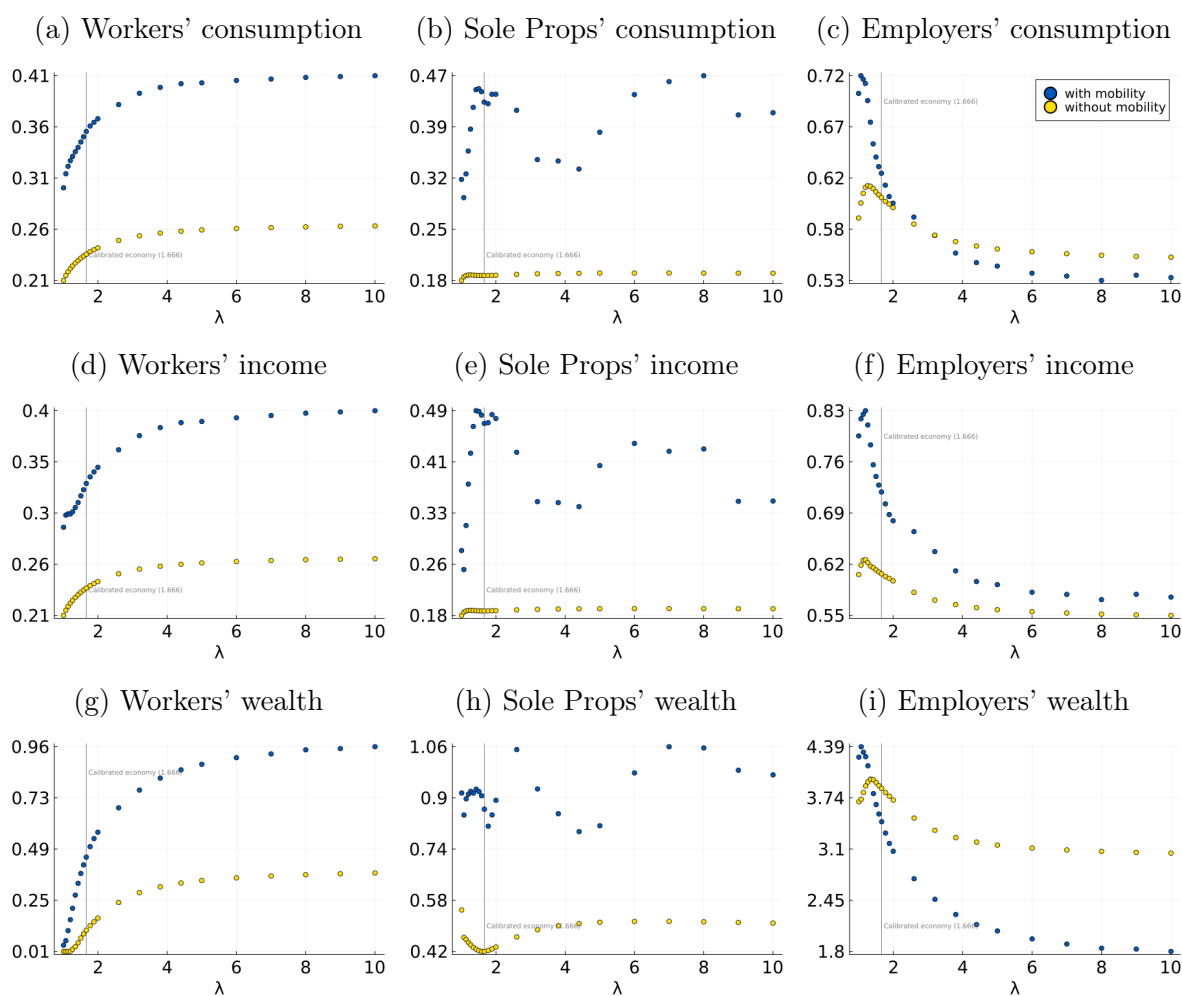
The second important observation is about economic outcomes. From figure 3.2, note that the values for aggregate output, consumption, income and capital across all levels of financial liberalisation are higher with occupational mobility compared to without occupational mobility. In particular, output for economies with occupational mobility seems to be consistently higher than output without mobility, regardless of the level of financial frictions. This difference in the level of output fuels the differences in the capital, which in turn leads to higher outcomes for income as well as for consumption.

The major drawback of occupational mobility is that it requires greater levels of financial liberalisation to achieve full elimination of borrowing constraints than in the economy without occupational mobility, see figure 3.2c. A possible explanation for this phenomenon

is that when the economy has occupational mobility, there is a bigger pool of households, with smaller levels of assets and bigger levels of managerial skill, that require credit to set up their business. Thus, to satisfy the greater demand for capital, a less restricted borrowing constraint is needed.

Notice also that as the economies with and without occupational mobility undergo financial liberalisation, the economy with occupational mobility tends to get to higher equilibrium values for the Credit-to-Output ratio, see figure 3.2b. A higher Credit-to-Output ratio indicates that the mere presence of occupational mobility reduces the amount of assets needed to borrow enough capital to produce the same level of output. The reduced requirement of assets or savings leads to a greater increase in consumption. Moreover, increased levels of income also lead to a greater increase in consumption. Keep in mind, that this effect holds only for high values of financial liberalisation.

Figure 3.3: Outcomes across occupations



Notes: The grey vertical line indicates the calibrated economy with occupational mobility.

Finally, the last important observation is that the benefits of having occupational mobility can be seen in equilibrium aggregate values for consumption, income and wealth within occupations as well, see figure 3.3. On average, across all levels of financial liberalisation, workers' and sole proprietors' consumption, income and wealth levels are higher for the economy with occupational mobility compared to the economy without. The notable exceptions are the equilibrium aggregate values for employers. Financial liberalisation in the presence of occupational mobility results in lower levels of equilibrium aggregate consumption and wealth across employers. It seems that the presence of occupational mobility results in higher aggregate values of consumption and wealth among employers only for small levels of financial liberalisation — when financial markets have a large amount of friction. On the other hand, employers' equilibrium aggregate income is higher in the presence of occupational mobility compared to the case without it. One possible explanation for these phenomena is that occupational mobility promotes a better utilisation of households' skills: households with high managerial skills tend to become employers, whereas households with large working skills tend to become workers. This leads to increased productivity of employers (improved levels of management and labour usage) which translates into higher income.

These three observations lead to the following conclusion: the presence of occupational mobility contributes a lot to the state of the economy regardless of the level of financial liberalisation. At the same time, occupational mobility acts as a catalyst that amplifies the positive impacts of financial liberalisation. The presence of occupational mobility increases output by up to 40% as a result of financial liberalisation. In turn, an additional increase in output increases aggregate levels of consumption, income, and wealth across households by up to 38% compared to the outcome of financial liberalisation without occupational mobility. Occupational mobility amplifies the effect of financial liberalisation due to an improved allocation of skills to the appropriate entrepreneurial occupations. The combination of financial liberalisation and occupational mobility leads to better outcomes for the economy that benefit a wide spectrum of households. However, this comparison of equilibrium outcomes does not reveal the mechanics of how occupational mobility amplifies the effects of financial liberalisation during the economy's transition to a steady state.

3.2 Occupational mobility's impact on the reform's process

The reform that occurs in the economy where occupational mobility is present has two interconnected effects on the economy. The first effect is the direct impact of financial liberalisation: the relaxation of the borrowing constraint allows for greater use of capital, which leads to an increase in output, which in turn should lead to increases in income,

wealth and consumption. The second effect is an indirect impact of financial liberalisation: the relaxation of the borrowing constraint allows productive, but constrained, households to become sole proprietors and employers, which should lead to an increase in the economy's productivity, which in turn should lead to increases in output, income, wealth and consumption. In this section, I investigate the impact of occupational mobility on the decision-making process for different occupations during the financial liberalisation.

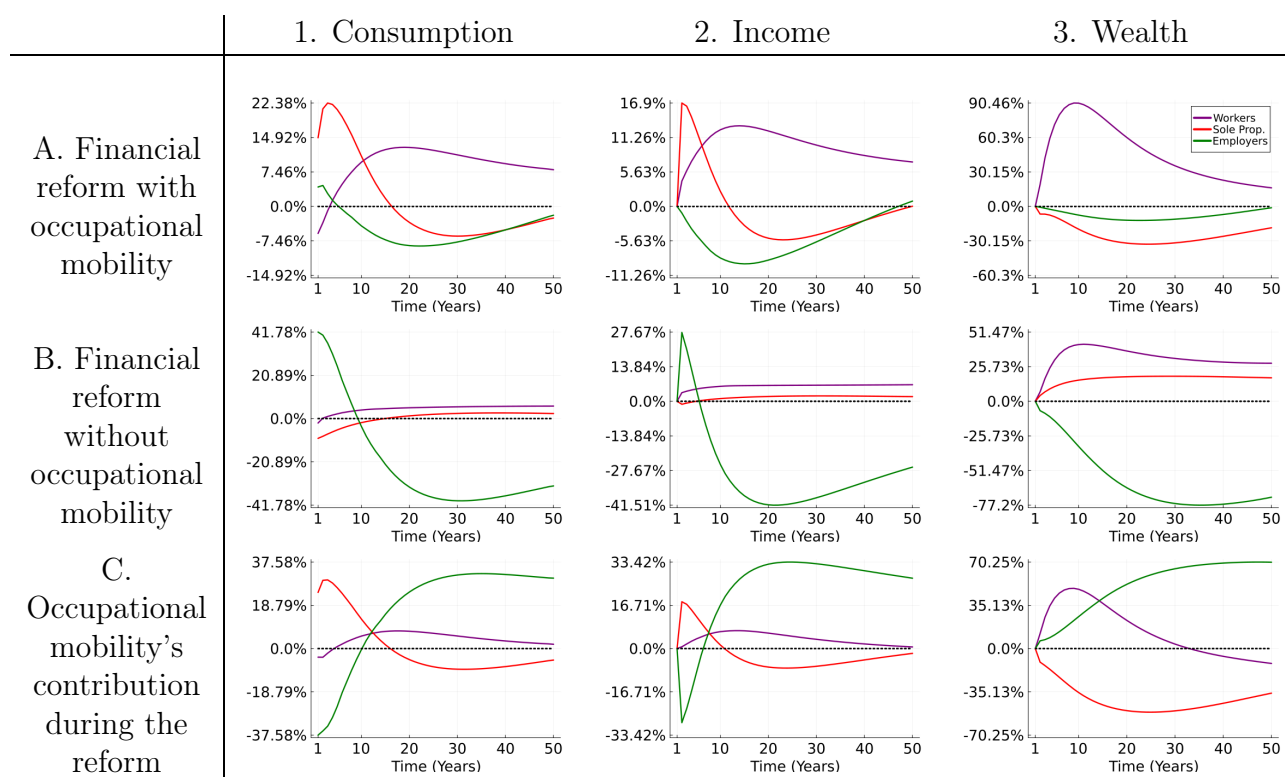
To disentangle the two effects described above I undertake the following experiment. Let us fix the occupations of households at time 0 at their pre-reform stationary distribution for the economy without occupational mobility. Next:

1. Simulate the dynamics of the economy without occupational mobility before and after the reform, take the difference of the dynamic paths of the variables to measure the direct effect of the reform on the decision-making of different cohorts of households;
2. Take the stationary distribution of the pre-reform economy without occupational mobility and use it as the initial distribution for the economy with occupational mobility;⁵
3. Simulate the dynamics of the economy with occupational mobility for the stationary distribution from Step 2 before and after the reform, take the difference of the before- and after-dynamics to measure the full effect of the reform on the decision-making of different cohorts of households;
4. Subtract from the full effect of the reform (in the economy with occupational mobility) the direct effect of the reform (in the economy without occupational mobility) to estimate the indirect effect of the reform.

This procedure allows me to estimate the indirect effect of the reform by observing the difference in the behaviour of identical cohorts of people in economies that undergo the same financial liberalisation with the only difference being the presence/absence of occupational mobility. The presence/absence of occupational mobility determines the presence/absence of the indirect effect of the reform because, without the ability to switch occupations, there is no mechanism to transfer high managerial skills from workers towards sole proprietors and/or employers, which is a significant contributor to the production function.

⁵Note that the resulting initial distribution for the model with occupational mobility is not stationary equilibrium.

Figure 3.4: The decomposition of the financial liberalisation and occupational mobility effects on welfare statistics among cohorts



Notes: Each graph shows the difference in corresponding statistics for every occupation at time $t = 1..50$ conditional on those households being of particular occupation at time 0.

3.2.1 The direct effect of financial liberalisation

Figure 3.4 shows the results of the experiment described above. In particular, row A shows the effect of financial reform on the economy when occupational mobility is present; row B shows the effect of the same reform on the economy when occupational mobility is absent; and finally, row C shows the estimation of occupational mobility's contribution during the financial reform.

Before discussing the decomposition and the magnitude of the indirect effect, let us focus on the effect of financial liberalisation on the economy in the case when there is no occupational mobility. The absence of occupational mobility allows us to interpret the effect of financial liberalisation here as the direct effect because by construction there cannot be any effect happening due to improved self-selection of households towards better occupations. The first observation to note is that employers' aggregate wealth holdings tend to decrease after the reform, see figure 3.4.3B because less wealth is needed to maintain the same level of capital for production. On the other hand, workers' and

sole-proprietors' aggregate wealth holdings tend to increase. The explanation is mainly connected to the rise in capital income and the gradual increase in wages.

The second observation to note is that financial liberalisation has relatively small effects on workers' and sole proprietors' consumption (up to 6% and 2% respectively in the long-term, see figure 3.4.1B) and income (up to 7% and 2% respectively in the long-term, see figure 3.4.2B). This observation means that the direct effect of the reform on workers' and sole-proprietors' well-being is positive but not as significant as the effect on employers.

This leads to the third important observation which is that employers are significantly affected by the direct effect of financial reform. In particular, the sudden elimination of financial frictions increases employers' capital demand, which in turn causes the interest rate to rapidly increase. The latter means that capital income has to increase in the short-term, which is represented in higher income and a subsequent increase in consumption, see figures 3.4.2B and 3.4.1B. However, the interest rate increase, as well as the wage increase,⁶ results in an increase in total production costs, which in turn reduces employers' earnings and thus, reduces employers' income in the medium- and long-term, see figure 3.4.2B. Consequently, a reduction in employers' income leads to a gradual decrease in employers' consumption, see figure 3.4.1B. Thus, the direct effect of financial liberalisation benefits workers at the cost of employers.⁷

3.2.2 The indirect effect of financial liberalisation

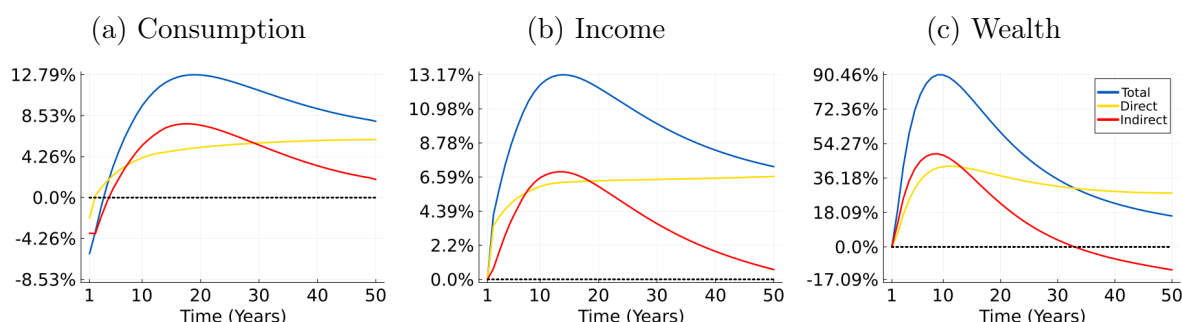
With the direct effect discussed above, let us turn our attention towards the indirect effect. It is important to emphasise that the indirect effect is estimated by taking the difference between the total effect of financial liberalisation (when occupational mobility is present) and the direct effect (estimated by observing the effect of financial liberalisation when there is no occupational mobility).

The first set of results is the decomposition of the financial liberalisation effects on workers. The total effect on aggregate workers' income is larger than the isolated direct effect both in the short-term and in the long-term. This observation suggests that the indirect effect also positively affects worker's income. To quantify this positive effect, let us decompose workers' aggregate income increase by up to 14.8% as shown in Figure 3.5b. The direct effect contributes up to 8.1 percentage points of worker's income

⁶The wage increases as a response to the increase of labour demanded. Labour demand increases because employers are trying to compensate for the increased cost of capital by employing more labour instead of getting more capital.

⁷It is important to acknowledge that these results are relative to the initial state of the economy before the reform, so the results can be interpreted as the reduction of inequality between occupations.

Figure 3.5: The decomposition of the financial liberalisation and occupational mobility effects on welfare statistics among workers



Notes: Each figure shows the decomposition of the total effect into two effects (direct and indirect) in corresponding statistics at time $t = 1..50$ conditional on those households being workers at time 0. The total effect is the effect of financial liberalisation with occupational mobility. The direct effect is the effect of financial liberalisation without occupational mobility. The indirect effect is the difference between the total effect and the direct effect.

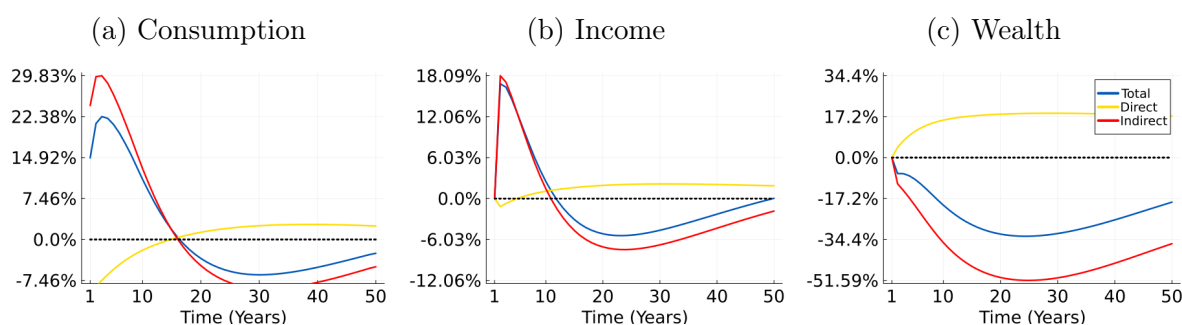
increase consistently through all 50 years. Whereas the indirect effect contributes up to 6.7 percentage points mostly within the first 15 years. Thus, the workers' income tends to increase because of two effects: 1) the increase of capital income and workers' earnings due to the increases in the interest rate and the wage rate respectively (the direct effect); and 2) the ability to change their occupation and capitalise on their managerial skill (the indirect effect).

However, the most drastic contribution of indirect effect for workers is in aggregate worker's wealth. Let us decompose the total effect on workers' wealth, which is shown by Figure 3.5c to be an increase by up to 90%. The direct effect of financial reform contributes up to 45 percentage points to the wealth holdings of workers. Therefore, the indirect effect seems to provide additionally up to 45 percentage points at its peak. Thus, the finding here is that workers tend to increase their wealth holdings for two reasons: either they want to increase their precautionary savings to smooth their consumption (the direct effect), or they want to accumulate enough savings to switch their occupation to profit from their managerial skills (the indirect effect).

Both effects are taking place at the same time and it is most evident by the impact on workers' consumption. Figure 3.5a shows that workers' consumption increases in the long-term up to 13% in total after the reform. When there is no occupational mobility, workers' consumption contributes only up to 5.5 percentage points and we interpret this contribution as the direct effect. Thus, we deduce that the rest of the contribution of up to 7.5 percentage points to the workers' consumption is associated with the indirect effect. It

is interesting to note that right after the reform there is a slight decrease in consumption, which is attributed to both effects. This phenomenon can be explained by the desire of workers to increase their capital income in future periods by over-saving in the periods immediately after the reform when the interest rate is at its peak values.⁸ A few years after the reform workers' consumption tends to increase and it seems that both effects contribute to this increase. Essentially, the presence of occupational mobility during the financial liberalisation doubles the effect of the reform on workers' consumption, income, and wealth.

Figure 3.6: The decomposition of the financial liberalisation and occupational mobility effects on welfare statistics among sole proprietors



Notes: Each figure shows the decomposition of the total effect into two effects (direct and indirect) in corresponding statistics at time $t = 1..50$ conditional on those households being sole proprietors at time 0. The total effect is the effect of financial liberalisation with occupational mobility. The direct effect is the effect of financial liberalisation without occupational mobility. The indirect effect is the difference between the total effect and the direct effect.

The second set of results is the decomposition of the financial liberalisation effects on sole proprietors. From Figure 3.6a, we observe a significant short-term total increase in sole-proprietors' consumption of up to 22%. However, the contribution to the increase from the direct effect is negative. In particular, the direct effect's contribution is down to -8 percentage points to the total increase in sole-proprietors' consumption, which means that this short-term increase is explained mostly by the indirect effect of financial reform. Indeed, the indirect effect's contribution ends up to be of up to 30 percentage points. We can interpret the described results of the sole-proprietors' consumption decomposition as follows. Most of the total effect is explained by the increase in occupational mobility, which leads to a better distribution of sole proprietors to more productive occupations.

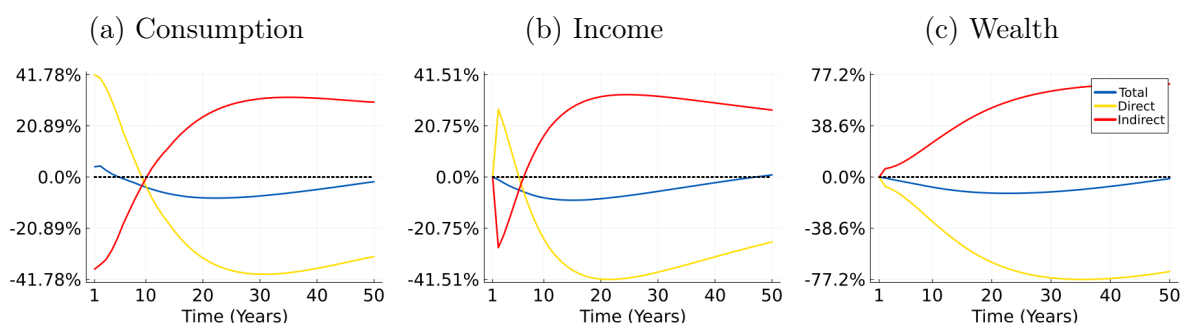
⁸Note that the interest rate is increased due to the increased aggregate capital demand. This sudden increase in interest rate is motivating all households and workers in particular to increase their savings, which in turn increases their wealth holdings and thus increases aggregate capital supply.

In particular, sole-proprietors' consumption tends to increase in the short run because sole proprietors are allowed to self-select themselves into better occupations, which allows them to have more income and as a result more consumption. Notice that the effect on sole-proprietors' consumption reverses in the long term after the reform due to the reverse in both direct and indirect effects.

The change in the long-run effect on sole-proprietors' consumption is explained by the dynamics of sole-proprietors' income. Let us decompose the short-run total effect of financial liberalisation on sole proprietors' income of up to 18% from Figure 3.6b. The short-run total effect is explained fully by the contribution from the indirect effect because the contribution from the direct effect is negligibly small. Notice that the long-run effect of financial reform on sole proprietors' income is neutral, because both direct and indirect effects neutralise each other in the long run, resulting in a slightly positive total effect.

However, Figure 3.6c shows there is a negative total effect of financial liberalisation on sole-proprietors' wealth holdings. Let us decompose this long-run total effect, which decreases down to -32%, into the indirect and direct components. The indirect effect contributes negatively down to -51 percentage points, whereas the direct effect contributes positively up to 18 percentage points. This result means that the total negative effect of financial reform on sole-proprietors' wealth is explained primarily by their ability to change their occupation and to be more productive as workers, which requires fewer assets to hold to account for precautionary savings.

Figure 3.7: The decomposition of the financial liberalisation and occupational mobility effects on welfare statistics among employers



Notes: Each figure shows the decomposition of the total effect into two effects (direct and indirect) in corresponding statistics at time $t = 1..50$ conditional on those households being employers at time 0. The total effect is the effect of financial liberalisation with occupational mobility. The direct effect is the effect of financial liberalisation without occupational mobility. The indirect effect is the difference between the total effect and the direct effect.

The third set of results is the decomposition of the financial liberalisation effects on

employers. Figure 3.7a shows that there is a slight short-run increase of 4% in employers' consumption. The decomposition shows that this short-run increase is mostly explained by the combination of opposite direct (+42 percentage points) and indirect (-38 percentage points) effects. In the same way, the long-term decrease in employers' consumption by -8% is explained by the combination of opposite direct (-41 percentage points) and indirect (+37 percentage points) effects. The point here is that the negative direct effect of financial reform on employers' consumption is significantly softened by the indirect effect of occupational mobility's presence, which can be interpreted through income dynamics.

The total effect of financial liberalisation on employers' income is a decrease by down to -13%, see Figure 3.7b. However, the decomposition of employers' income gives an interesting insight into its dynamics: the contributions from the direct and indirect effects have the opposite signs both in the short- and long term. On the one hand, the short-run negative total effect on employers' income is explained by the negative contribution from the indirect effect. This short-run negative effect is interpreted as follows: the initial sudden rise in the cost of capital outweighs the increase in capital rental income for employers, which results in lower total employers' income. On the other hand, the long-run negative total effect on employers' income is explained by the negative contribution from the direct effect. The long-run negative effect is then explained as follows: as interest rate starts to decrease, employers tend to earn less capital rental income. However, employers with low and medium managerial skills can increase their earnings by switching their occupation to one that requires less wealth.

The decrease in employers' wealth down to -14% is evident from 3.7c. The decomposition of the total effect on employers' wealth confirms the intuitive guess that this decrease is mostly explained by the negative contribution of the direct effect of financial reform down to -77 percentage points. In other words, financial liberalisation leads to the lower requirement of wealth holdings to have an optimal choice of capital, leading to lower wealth holdings. However, this decrease is softened by a positive contribution from the indirect effect of up to 63 percentage points. We can infer that the ability to switch occupations allows for a smaller reduction in income compared to the case when there is no occupational mobility. The smaller reduction of employers' income, in turn, leads to a smaller reduction of savings and, as a consequence, wealth.

In this subsection, I have presented the results of the decomposition experiment. The experiment disentangled the effects of financial reform into two parts: a direct effect and an indirect effect. The direct effect is the effect of financial reform that stems purely from the increase of capital available to be rented to each entrepreneur. The indirect effect is the effect of financial reform that stems from occupational mobility. There are

three main takeaways from this experiment. The first takeaway is that the presence of occupational mobility amplifies positive effects and contributes up to 60% of the total effect on workers' consumption, income and wealth following a financial reform. The second takeaway is that sole proprietors benefit from the indirect effect mostly in the short term and from the direct effect in the long term. The last takeaway is that negative effects on employers' consumption, income and wealth are driven by the direct effects of financial reform, but, most importantly, these negative effects are softened in their severity by the indirect effects. These takeaways point towards the conclusion that occupational mobility contributes positively to both short- and long-term outcomes of financial reform by either amplifying positive effects for workers and sole proprietors or softening negative effects for employers.

3.3 Productivity during the reform

This final subsection investigates the reasons behind the increase in output after the financial liberalisation. Firstly, the percentage change in output is decomposed to identify the main components of this change. Secondly, the marginal products of the production input factors are analysed. Finally, I investigate to what extent the improved allocation of skills across occupations improves output.

Let us start with the decomposition of the output increase. The decomposition is performed by undertaking a variant of the Solow decomposition procedure, see [Kumar and Russell \(2002\)](#). In particular, let us define M as the aggregate managerial input of all sole proprietors and employers; K as aggregate capital and L as aggregate labour.⁹ Thus, let us assume that aggregate output Y can be computed from some aggregate production function:

$$Y = \text{MFP} \times M^\gamma K^\eta L^\theta, \quad (3.16)$$

where $\gamma + \eta + \theta = 1$ ¹⁰ and MFP is considered to be a Multi-Factor Productivity term. MFP measures the quantity of aggregate output that cannot be accounted for by aggregate managerial input, capital and labour. By construction, MFP is calculated as:

$$\text{MFP} = \frac{Y}{M^\gamma K^\eta L^\theta}. \quad (3.17)$$

Equation 3.17 gives us a direct interpretation of MFP as a measurement of the economy's

⁹Note that all aggregate values of managerial, capital and labour inputs are calculated as the total sum of respective quantities across all households.

¹⁰The parameters for shares of managerial, γ , capital, η , and labour, θ , inputs in the aggregate production function follow the calibration undertaken in [Annicchiarico et al. \(2013\)](#). Note that the same set of parameters for the production function is used in all specifications of individual production functions.

efficiency — a ratio of “actual” aggregate output to “potential” output. Here “potential” output is a hypothetical construct representing the goods produced by a single firm that takes aggregate management, capital and labour values of all sole proprietors and employers.

Therefore,

$$\frac{Y_t}{\widehat{Y}} = \frac{\text{MFP}_t}{\widehat{\text{MFP}}} \times \left(\frac{M_t}{\widehat{M}}\right)^\gamma \times \left(\frac{K_t}{\widehat{K}}\right)^\eta \times \left(\frac{L_t}{\widehat{L}}\right)^\theta, \quad (3.18)$$

where the symbols with hats represent the respective values at the stationary equilibrium before the financial liberalisation.

The identity decomposes the percentage change in aggregate output, Y_t , in time t from the stationary equilibrium value of output, \widehat{Y} , into: (i) the percentage change in MFP — i.e., the efficiency of the economy to utilise the existent production technology through the distributed market mechanism (the first term on the right); (ii) the percentage change in aggregate management (the second term); (iii) the percentage change in aggregate capital (the third term); and (iv) the percentage change in aggregate labour (the fourth term).

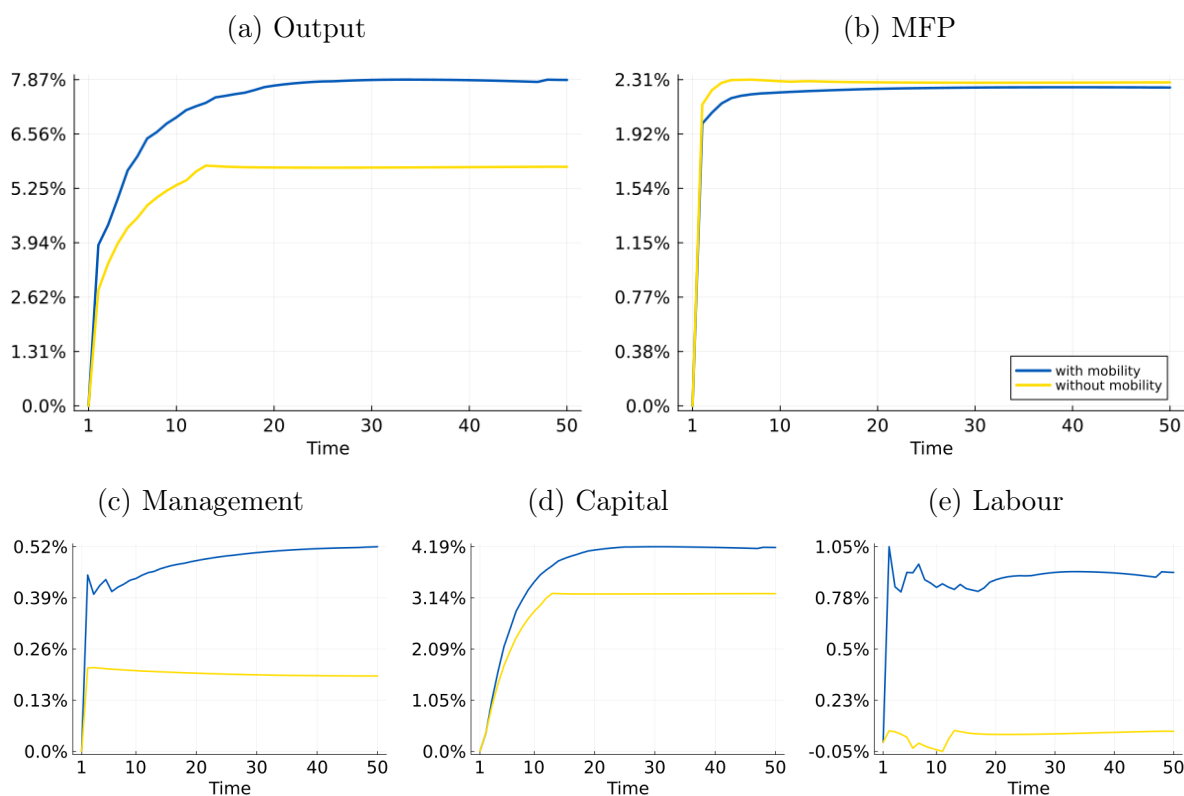
Figure 3.8 shows the results of the Solow decomposition procedure: the decomposition of output’s transitional values after financial reform in the economy with occupational mobility and the decomposition in the economy without occupational mobility. This approach allows us to identify all sources of output increase.

The Solow decomposition procedure is applied to the output increase of up to 7.85% total increase in aggregate output after the financial reform for the economy with occupational mobility, see Figure 3.8a. Note that output increases only up to 5.67% after the financial reform when there is no occupational mobility. Thus, we can deduce that the presence of occupational mobility contributes up to 2.18 percentage points to the output increase when there is occupational mobility during financial liberalisation. Also, note that most of the effect of financial liberalisation on the output is realised within the first 20 years.

Firstly, let us investigate the contribution from MFP based on the results from Figure 3.8b. MFP contributes up to the same 2.25 percentage points to aggregate output increase both with and without occupational mobility within the first 2-5 years. This result suggests that the increase in MFP indeed captures the increase in the efficiency of the economy to utilise the production technology. This increase in efficiency is achieved by minimising the financial friction which prevented some sole proprietors and/or employers from choosing capital without hitting the borrowing constraint.

Secondly, the contribution from the increase in aggregate managerial input to the aggregate output increase is considered. Figure 3.8c shows that the increase in managerial

Figure 3.8: Output percentage change decomposition



Notes: Figure shows the results of two output decompositions: i) blue - the decomposition of output's transitional values after financial reform in the economy with occupational mobility and ii) yellow - the decomposition in the economy without occupational mobility.

input after financial liberalisation, when there is no occupational mobility, contributes up to 0.19 percentage points to the aggregate output. Whereas, the presence of occupational mobility additionally increases aggregate managerial input, which results in up to 0.33 additional percentage points to output increase after financial liberalisation. Note that the contribution from the increase in aggregate managerial input takes only 1 year after the reform to contribute to the production in both models with and without occupational mobility.

Next, Figure 3.8d illustrates the contribution to the output increase from the increase in aggregate capital. Aggregate capital increase contributes up to 3.23 percentage points to the aggregate output increase when there is no occupational mobility. However, the presence of occupational mobility during financial liberalisation results in an additional increase in aggregate capital, which, in turn, results in an additional 0.94 percentage points increase in aggregate output. The additional contribution is attributed to the delayed effect of increased production efficiency, which contributes to capital accumula-

tion. Moreover, the aggregate capital contribution explains the lion's share of output's increase. At the same time, the contribution of capital increase is much slower than all other contributions, because it takes 10-20 years to fully affect the output increase.

Finally, from figure 3.8e, we see that in the economy with occupational mobility the financial reform immediately increases aggregate labour. The increase in aggregate labour contributes up to 0.91 percentage points to output's increase within the first year post-reform. Note that when there is no occupational mobility, aggregate labour does not change. Therefore, there is no contribution to the output increase from the labour component, when there is no occupational mobility.

Table 3.3: Output percentage change decomposition in the long-run

Contribution	Output	MFP	Management	Capital	Labour
Total	7.85%	2.25pp	0.52pp	4.17pp	0.91pp
Direct	5.67pp	2.25pp	0.19pp	3.23pp	0.00pp
Indirect	2.18pp	0.00pp	0.33pp	0.94pp	0.91pp

Notes: Bold values are the contributions to the aggregate output increase in percentage points from a particular (direct or indirect) effect through a particular (increase in MFP, increase in aggregate managerial input, increase in aggregate capital or increase in aggregate labour) channel.

Table 3.3 summarises the decomposition of output increase in the long run. I interpret the results as follows. The output increase of 7.85% is decomposed according to these contributions:

1. capital increase due to the direct effect: 3.23 percentage points;
2. increase in MFP due to the direct effect: 2.25 percentage points;
3. redistribution of households towards being workers, i.e. labour increase due to the indirect effect: 0.91 percentage points;
4. redistribution of households towards being entrepreneurs, i.e. increase in managerial input due to the indirect effect: 0.33 percentage points;
5. secondary capital increase due to greater efficiency gain in accumulation, i.e. capital increase due to the indirect effect: 0.94 percentage points
6. improved time allocation between skills for employers, i.e. increase in managerial input due to the direct effect: 0.19 percentage points;

So how does the financial liberalisation increase output? Immediately after the reform, the efficiency of aggregate production increases, because the use of individual production technology is less constrained by borrowing limits. When employers are less constrained in their choice of capital, they can afford to hire more labour and thus allocate more of their time towards managerial input. At the same time, the removal of the borrowing constraint improves the occupational self-selection process, which in turn increases both aggregate labour and aggregate managerial input. So far, there is a more efficient production that uses more management and labour input and thus produces more output. After that, the increased output gets to be partially transformed into an increase in aggregate capital, which in turn provides even more capital input into production. The increased aggregate capital improves the self-selection process even further, which in turn raises it even further.

The next question that I investigate is what drives these contributions: an increase in aggregate quantities or an increase in factor productivity. To answer these questions I consider the marginal product of each factor input. For example, the marginal product of managerial input at time t is calculated as the ratio of aggregate output, Y_t , to aggregate managerial input, M_t , adjusted for the share of managerial input into production γ :

$$\text{MPM}_t = \gamma \frac{Y_t}{M_t}. \quad (3.19)$$

The marginal product of capital input at time t is calculated as the ratio of aggregate output, Y_t , to aggregate capital input, K_t , adjusted for the share of capital input into production η :

$$\text{MPK}_t = \eta \frac{Y_t}{K_t}. \quad (3.20)$$

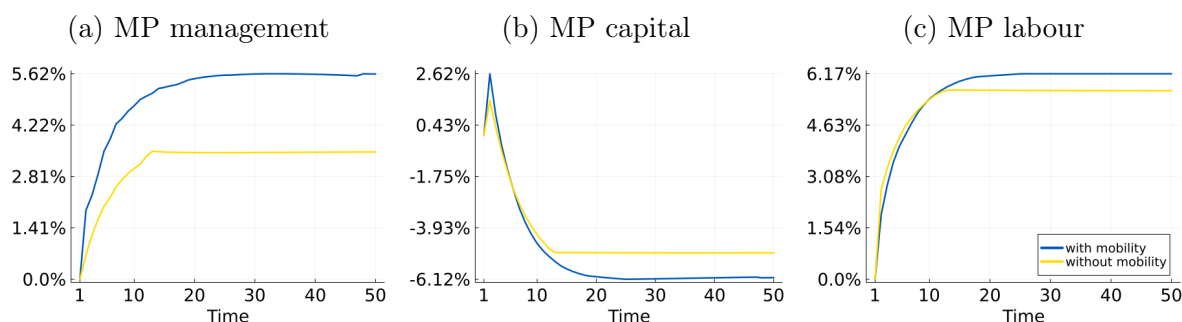
Similarly, the marginal product of labour input at time t is calculated as the ratio of aggregate output, Y_t , to aggregate labour input, L_t , adjusted for the share of labour input into production θ :

$$\text{MPL}_t = \theta \frac{Y_t}{L_t}. \quad (3.21)$$

From figure 3.9a we see that the marginal productivity of managerial input increases by up to 3.5% after the financial reform when there is no occupational mobility present. However, the presence of occupational mobility amplifies the effect of financial reform by an additional 2.12 percentage points. These results mean that management's contribution to output's increase can be partially explained by the increase in productivity of management input.

Figure 3.9b shows that the sudden financial reform temporarily increases the marginal productivity of capital. However, after a short period of time, the law of diminishing

Figure 3.9: Percent-change to input factors' marginal products



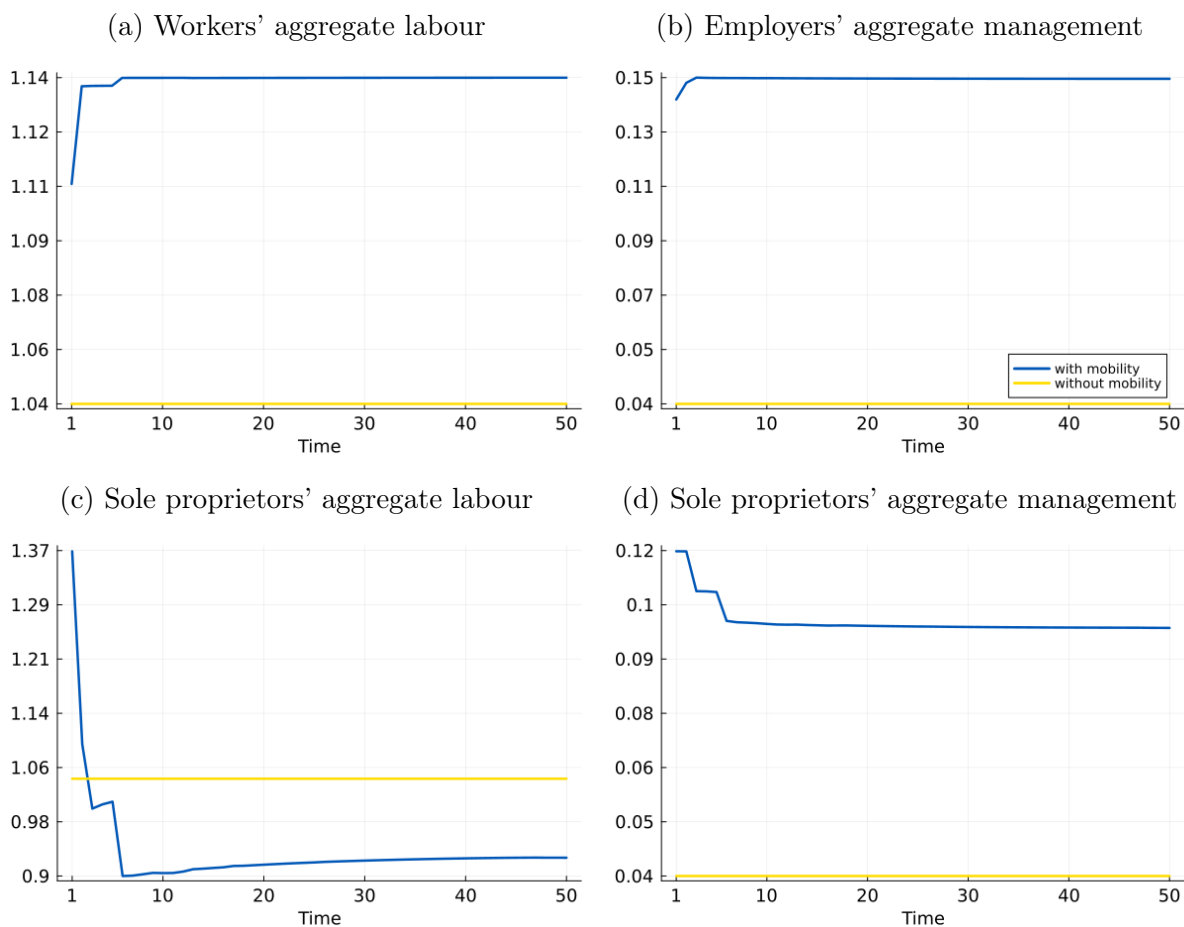
returns kicks in and the marginal product of capital tends to decrease for both cases of occupational mobility presence/absence, with a slightly larger fall in the case of occupational mobility. These results, coupled with the fact that aggregate capital tends to increase, see figure 3.2f, suggest that the main driver behind capital's contribution to output's increase is capital deepening, i.e., increased capital accumulation.

The marginal product of labour input increases by up to 5.6% in the case where there is no occupational mobility and by up to 6.2% in the case where there is occupational mobility, as shown in figure 3.9c. These results suggest that labour's contribution to output's increase can be partially explained by the increased marginal productivity of labour.

The only result left to show is that both aggregate labour and aggregate management tend to increase after the financial liberalisation. From figure 3.10 we see that, in the model with occupational mobility present, workers' aggregate labour and employers' aggregate management do increase. Note that sole proprietors' aggregate labour and management decrease after financial reform, however, if we take into consideration that the share of sole proprietors decreases over time, their contributions to aggregate labour and management tend to decrease as well. Thus, the contributions of labour and management to output's increase are explained by the increases in marginal products and the increases in aggregate levels. The latter explains the importance of occupational mobility for the success of financial liberalisation.

The effect of occupational mobility on the economy in general and during the process of financial liberalisation is evident through the allocation of skills across occupations. In general, occupational mobility allows households with high working skills to self-select into being workers, which results in a greater level of aggregate labour. At the same time, households with high managerial skills can self-select into being employers, which increases aggregate management. Financial liberalisation amplifies these effects because it relaxes the borrowing constraint that would otherwise have distorted this self-selection process.

Figure 3.10: Aggregate skills for occupations



This improved self-selection into occupations drives further increases in aggregate labour and management, as well as capital and the efficiency of the usage of these resources, which leads to better productivity and, as a consequence, to a rise in equilibrium output.

4 Conclusion

This chapter investigates the mechanism of the financial reform which is modelled as a sudden removal of financial friction in entrepreneurial borrowing constraint. To do that, the version of the original model is developed which has no occupational mobility present. This model splits all households into three groups of fixed size according to usual occupations: workers, sole proprietors and employers. After that, the model is solved for both general stationary equilibrium and transitional dynamics. The main reported results are the comparison between stationary equilibria as well as transitional dynamics of models with and without occupational mobility.

The analysis of the occupational mobility contribution to the effects on aggregate economy, inequality and productivity after financial liberalisation is split into three parts. The first part of the analysis is concerned with occupational mobility's long-term impact on the outcome of financial liberalisation. In particular, I find that the presence of occupational mobility during the reform leads to higher equilibrium wage rates while minimally affecting interest rates. This is attributed to mobility weakening employers' ability to suppress wages and enabling efficient skills matching. The presence of occupational mobility significantly improves economic outcomes, including higher aggregate outputs, consumptions, incomes, and capital levels, driven by skill allocation and entrepreneurship. However, achieving full elimination of borrowing constraints requires greater financial liberalisation in the presence of mobility. Equilibrium aggregate values of consumption, income, and wealth within occupations are generally higher with mobility, except for employers' consumption and wealth, which are lower but with higher income. Overall, occupational mobility enhances the positive impacts of financial liberalisation, fostering a more inclusive and dynamic economic environment.

The second part of the analysis describes the mechanism of how the financial reform is conducted and decomposes the effect on the welfare measures among occupations. Specifically, the effect of financial liberalisation is split into two interconnected parts: the direct and indirect effects. On the one hand, there is a direct effect of financial liberalisation, which springs from the relaxation of borrowing constraints and leads to increased capital utilisation, resulting in higher output, income, wealth, and consumption. On the other hand, an indirect effect emerges as financial constraints are relaxed, enabling more productive but constrained households to transition to more efficient roles. This transition enhances the overall productivity of the economy, which in turn leads to increases in output, income, wealth, and consumption. To disentangle these two effects, an experiment is proposed involving two economies undergoing the same financial reform, with one having occupational mobility and the other not. The results reveal that the presence of occupational mobility significantly amplifies the positive effects of the reform on workers, contributing up to 60% of the total effect on their consumption, income, and wealth. For sole proprietors, the indirect effect is more pronounced in the short term, while the direct effect dominates in the long term. In the case of employers, the direct effects of financial reform negatively impact their consumption, income, and wealth, but these negative effects are partially offset by the indirect effects. In summary, occupational mobility plays a crucial role in shaping the outcomes of financial reform, enhancing the benefits for workers and sole proprietors, while mitigating the negative consequences for employers. These findings underscore the importance of considering occupational mobility when designing

and evaluating economic reforms to achieve more equitable and efficient outcomes.

Lastly, the third part of the analysis focuses on the dissection of output increase as a result of financial liberalisation. In particular, a decomposition analysis is employed to investigate the factors driving the increase in output following the financial liberalisation. A variant of the Solow decomposition method is utilised, breaking down the change in output into distinct components, including Multi-Factor Productivity, changes in aggregate management, capital, and labour. The analysis reveals that financial reform has a substantial impact on output, with Multi-Factor Productivity contributing to efficiency gains, with changes in management and labour participation also playing vital roles. Capital accumulation emerges as a significant driver of output increase after the reform. Further, I distinguish between increases in aggregate quantities and productivities through marginal product analyses, showing that higher productivity of inputs contributed to output growth. The presence of occupational mobility is found to be crucial in explaining changes in aggregate labour and management. In summary, this analysis provides a comprehensive understanding of the multifaceted effects of financial reforms on output, emphasising the importance of efficiency gains, labour and management changes, and capital accumulation, all while considering the role of occupational mobility.

Bibliography

- Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.
- Annicchiarico, B., Di Dio, F., Felici, F., and Monteforte, L. (2013). IGEM: A Dynamic General Equilibrium Model for Italy. Working Paper, Department of the Treasury, Italian Ministry of the Economy and of Finance, 4(April):1–54.
- Antunes, A., Cavalcanti, T., and Villamil, A. (2008). Computing general equilibrium models with occupational choice and financial frictions. Journal of Mathematical Economics, 44(7-8):553–568.
- Atkinson, A. B. and Morelli, S. (2011). Economic crises and inequality. UNDP-HDRO occasional papers, (2011/6).
- Ballarino, G., Braga, M., Checchi, D., Filippin, A., Leonardi, M., and Meschi, E. (2012). Gini Country Report Italy. (September).
- Bekaert, G., Harvey, C. R., and Lundblad, C. (2005). Does financial liberalization spur growth? Journal of Financial economics, 77(1):3–55.

- Borella, M. and Belloni, M. (2018). Self-Employment in Italy: The Role of Social Security Wealth. SSRN Electronic Journal, (April).
- Buera, F. J. (2008). Persistency of poverty, financial frictions, and entrepreneurship. Unpublished Manuscript, University of California at Los Angeles.
- Buera, F. J. and Shin, Y. (2013). Financial Frictions and the Persistence of History: A Quantitative Exploration. Journal of Political Economy, 121(2):221–272.
- Cingano, F. (2014). Trends in income inequality and its impact on economic growth.
- Eichengreen, B. (2001). Capital account liberalization: What do cross-country studies tell us? The world bank economic review, 15(3):341–365.
- Galbraith, J. K. and Kum, H. (2005). Estimating the inequality of household incomes: a statistical approach to the creation of a dense and consistent global data set. Review of Income and Wealth, 51(1):115–143.
- Heath, M. R. M. (2015). What has Capital Liberalization Meant for Economic and Financial Statistics. International Monetary Fund.
- Heathcote, J., Storesletten, K., and Violante, G. L. (2005). Two views of inequality over the life cycle. Journal of the European Economic Association, 3(2-3):765–775.
- Heil, M. (2019). Finance and productivity: A literature review. Contemporary Topics in Finance: A Collection of Literature Surveys, pages 151–182.
- Jappelli, T. and Pistaferri, L. (2009). Income Inequality in Italy ? (May).
- Krueger, D., Mitman, K., and Perri, F. (2016). Macroeconomics and Household Heterogeneity. Handbook of Macroeconomics, 2:843–921.
- Kumar, S. and Russell, R. R. (2002). Technological change, technological catch-up, and capital deepening: Relative contributions to growth and convergence. American Economic Review, 92(3):527–548.
- Lucas Jr, R. E. (1978). On the size distribution of business firms. The Bell Journal of Economics, pages 508–523.
- Martin, R., Sunley, P., Gardiner, B., and Tyler, P. (2016). How regions react to recessions: Resilience and the role of economic structure. Regional studies, 50(4):561–585.

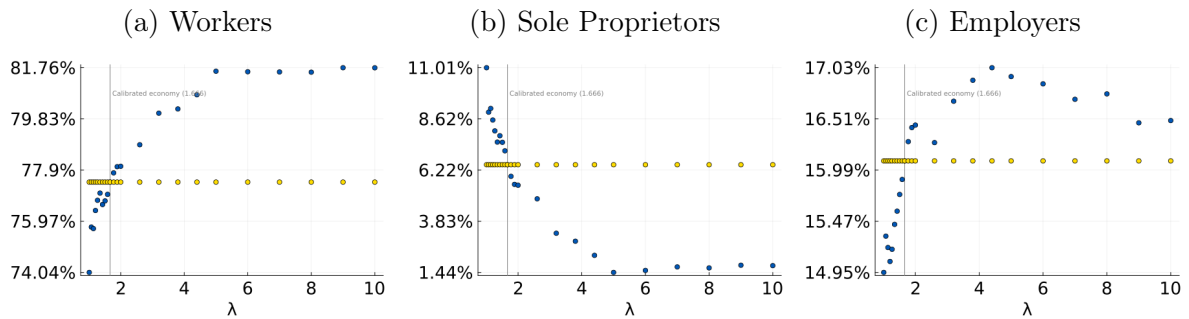
- McKinnon, R. I. (1973). Money and capital in economic development, washington, dc: The brookings institution.,(1989)“macroeconomic instability and moral hazard in banking in a liberalizing economy,”. Latin American Debt and Adjustment. External Shocks and Macroeconomic Policies, New York: Praeger, pages 99–111.
- Moll, B. (2014). Productivity Losses from Financial Frictions. American Economic Review, 104(10):3186–3221.
- Schivardi, F. and Torrini, R. (2005). Firm Size Distribution and EPL in Italy. SSRN Electronic Journal, (613).
- Shaw, E. S. (1973). Financial deepening in economic development.
- Stiglitz, J. E. (2000). Capital market liberalization, economic growth, and instability. World development, 28(6):1075–1086.

APPENDIX

3.A Comparison of occupational shares

Note that due to the absence of occupational mobility, the occupational shares are fixed at the stationary equilibrium values for the calibrated value of lambda 1.6.

Figure 3.11: Occupational shares



Notes: Blue points represent the stationary values of occupational shares when there is occupational mobility. Yellow points represent fixed occupational shares when there is no occupational mobility.

To have a meaningful comparison between economies with and without occupational mobility, occupational shares when there is no occupational mobility are fixed to represent occupational shares of the calibrated economy. In particular, from Figure 3.11, we observe that occupational shares when there is no occupational mobility do not change with the change of financial liberalisation's level.

SUMMARY AND FUTURE RESEARCH

This thesis has studied the effects of financial liberalisation on income and wealth inequality through the context of entrepreneurial occupational choice. I found that financial liberalisation leads to a decrease in the number of sole proprietors, most of whom become workers. Similarly, I found that workers gain the most from financial liberalisation both in the short- and long-run due to the increase in income. Moreover, financial liberalisation leads to a reduction in inequality among occupations. Finally, I showed that occupational mobility, the ability for households to freely switch their occupation between being a worker, a sole proprietor or an entrepreneur, significantly affects the outcome of financial liberalisation.

Each subsequent chapter builds on the previous one and creates a stronger narrative about the effects of financial liberalisation. The first chapter investigates the long-run effect of financial liberalisation on occupational choice, inequality measures and the economy's productivity. The second chapter uses these long-term outcomes and effects to build a dynamic model of financial liberalisation in order to investigate the short-run effects on occupational choice and inequality measures. The third chapter builds on the models from previous chapters by modelling the presence/absence of occupational mobility and thus investigating the role of occupational choice on the outcome of financial liberalisation, which allows me to uncover a very important mechanism behind the productivity gains from the reform.

Chapter 1

In this chapter, I employ a version of the DSGE model in the style of [Allub and Erosa \(2018\)](#) to study the effects of financial liberalisation on occupational choice, inequality

and productivity. In particular, I extend their model by including capital and labour market clearance conditions and, thus, I can study the stationary equilibrium effects of financial liberalisation. The model introduced the problem of occupational choice to the households such that the distribution of occupations becomes an endogenous part of the model. This extension allowed me to study the effects of financial liberalisation on occupational choice as well as income and wealth inequality between and within occupations, and changes in productivity within occupations. Calibrating the model to Italy over the period from 2000 to 2018, which had a large decrease in the share of sole proprietors that coincided with increased financial liberalisation, allowed us to study the effects of financial liberalisation on a developed economy with high occupational mobility. This chapter compared the stationary equilibria of economies with different levels of financial liberalisation. The comparison uncovered relationships between the level of financial liberalisation and corresponding equilibrium levels of income and wealth inequality among occupations. The results showed that financial liberalisation leads to positive outcomes for the economy, notably decreased income and wealth inequality between occupations. However, income and wealth inequality among workers increased as a result of financial liberalisation. Financial liberalisation is connected to improved productivity through the increase in the marginal product of labour. However, these gains come at the expense of a substantial reduction in the share of sole proprietors: from eleven down to less than two percent of households.

Chapter 2

In this chapter, I developed a version of the DSGE model with heterogeneous agents that investigates transitional dynamics of the closed economy post-financial liberalisation. In particular, the model allowed me to investigate the short-term effects and dynamics of occupational choice, changes in income and wealth inequality and the performance of the economy as a whole. In terms of the solution method, the chapter utilises and extends the [Krusell and Smith \(2006\)](#) method but applies it to a model with an endogenously determined and dynamic number of entrepreneurs.

My main finding is that sudden financial liberalisation changes transitional probabilities for occupational mobility within the first 5 years post-reform, which leads to an increased share of workers. In particular, financial liberalisation increases the cost of being an entrepreneur due to the increased interest rate and wage as an outcome of market mechanisms. This increased cost leads to a larger share of workers who benefit from the higher wage rate. I further analyse the winners and losers of the reform and find that

workers benefit the most out of all three occupation groups. In particular, I find that financial liberalisation decreases the income and wealth inequality between occupations by one and nine gini percentage points. These decreases in inequality happen due to the redistribution of wealth from employers to workers. This is a novel finding, because, generally, the removal of financial frictions in entrepreneurial financial markets is assumed to lead to improved income for entrepreneurs, as in [Giné and Townsend \(2004\)](#). However, in my model, financial liberalisation seems to benefit the workers more at the cost of entrepreneurs due to the general equilibrium effects.

Chapter 3

In this chapter, I investigate the importance of occupational mobility on the outcomes of financial liberalisation. For this purpose, I extend the model from previous chapters with the ability to enable/disable occupational mobility for counterfactual exercises. Therefore, the importance of occupational mobility is measured by comparing the outcomes of a sudden financial liberalisation with and without occupational mobility. In particular, I find that the presence of occupational mobility contributes up to half of the total impact of financial liberalisation on all outcomes: the reduction in income and wealth inequality both between and within occupations, as well as the increase in aggregate output. The main result is that one-half of the rise in productivity can be attributed to increased capital in the economy as the direct result of financial liberalisation. Whereas, the second half of the rise in productivity can be attributed to the occupational mobility that occurs as a result of the financial liberalisation. Overall, I show that the ability for households to choose their occupations is not just beneficial for households individually and for the economy overall, but it is also beneficial for the individual and general outcomes of financial liberalisation.

Future Research

This thesis has investigated the long-term effects of financial frictions (the first chapter), the short-term effects of financial frictions and inequality implications (the second chapter), and the importance of occupational mobility for financial liberalisation (the third chapter). Each of these issues is important in order to understand the full implications of financial reform and thus deserves a deeper and more extensive treatment than this thesis has provided. However, there are several avenues for further research based on the analysis of the chapters above:

One promising extension is to expand on the modelling of the financial market. For example, the model from the first chapter can include risky capital and a market for obtaining such capital in the style of [Brunnermeier and Sannikov \(2014\)](#). This extension might provide insight into differences in outcomes of financial liberalisation depending on differences in the financial market structure. Moreover, it can provide insight into the change in the number of investors and their welfare as a result of financial liberalisation.

Another important possible extension is to model the government within the second chapter's framework. The reason for such an extension is that it would allow testing of different policies to maximise the total welfare during the transitional period that follows a financial reform. Further analysis of the welfare and welfare-maximising fiscal policies in the context of financial liberalisation and occupational mobility can be beneficial for policymakers.

Finally, the third chapter modelled occupational mobility as a binary entity — it is either frictionless and fully available to all households, or it is fully absent and no households can change their occupations. Therefore, one possible extension would be to model frictions in the labour market and occupational choice simultaneously. Such an extension might provide a necessary nuance and deeper understanding of the role of occupational mobility on the outcome of financial liberalisation.

I leave these and all other possible extensions and suggestions for future research.

Bibliography

- Allub, L. and Erosa, A. (2018). Financial frictions, occupational choice and economic inequality.
- Brunnermeier, M. K. and Sannikov, Y. (2014). A macroeconomic model with a financial sector. *American Economic Review*, 104(2):379–421.
- Giné, X. and Townsend, R. M. (2004). Evaluation of financial liberalization: a general equilibrium model with constrained occupation choice. *Journal of development Economics*, 74(2):269–307.
- Krusell, P. and Smith, A. A. (2006). Quantitative macroeconomic models with heterogeneous agents. *Econometric Society Monographs*, 41:298.