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Other people's money: essays on capital market frictions

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Chapter 1

Introduction

Finance studies the exchange of money for repayment promises—finance is about using *other people's money*. In canonical complete-markets models, financial exchange is no different from the exchange of money for a loaf of bread, say, and the first welfare theorem of economics pertains.¹

In reality, financial trades can be more problematic: they are trades over time and carry an element of risk, as unforeseen contingencies may arise. Furthermore, financial exchange causes *principal-agent* problems, as borrowers cannot be perfectly controlled by financiers. Capital markets, in other words, are not complete contingent markets.

It follows that canonical models need to be modified by recognizing capital market frictions such as those driven by imperfect information, imperfect enforcement and political intervention. This dissertation investigates capital market frictions across three themes.

The first theme of this dissertation is **sovereign debt**, the topic of chapter 2. Recent experience in the EU shows that enforcement of repayment promises is complex when the borrower is a state. Furthermore, governments are better informed about their repayment capacity than creditors are. Chapter 2 argues

¹Specifically, if complete contingent contracts are available and markets are free (i.e. in an Arrow-Debreu world), the resulting market allocation is efficient.

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that enforcement and information frictions explain why sovereign borrowers issue simple debt contracts that frequently lead to debt crises and debt renegotiations. Such contracts are optimal because they save on costly audits by creditors.

The second theme of this dissertation concerns pensions, the topic of chapter 3. It is often argued that **collective pension funds**, such as found in the Netherlands, can enhance the welfare of their participants. Chapter 3 highlights one rationale for pension funds based on credit constraints (i.e. a capital market friction). Chapter 3 next explores an agency problem (i.e. a second friction) that may limit pension funds' ability to increase welfare.

The third theme of this dissertation concerns **political intervention in capital markets**, the topic of chapter 4. Financial liberalization and expanded access to capital are historically seen as signs of greater freedom. Yet many democratic countries choose to restrain the resource allocation called for by a free capital market. Chapter 4 argues that democracies may choose to resist free capital markets depending on demographical context, the concentration of wealth, and the rate of technological progress. In effect, democracies favor income stability over economic growth when the population is older, when the concentration of wealth is uneven, and when the rate of technological progress is high. The rest of this introduction gives summaries of the three main chapters, and describes their methodology, before concluding with avenues for future research based on the current work.

1.1 Summaries

Each of the chapters 2-4, is a stand-alone contribution and can be read independently of the other chapters. Each chapter starts with an introduction, then presents a model and results, before ending with a conclusion. Proofs are generally relegated to the appendix, unless they are short. In the following, I will try to give a brief, non-technical summary of each chapter.

1.1.1 Sovereign Debt

Chapter 2 is based on Bersem (2012) and focuses on sovereign debt. Debt is a financial contract in which a borrower receives some money and agrees to pay it back at a later date. When the borrower does not repay, creditors obtain certain rights vis-à-vis the borrower's assets, e.g., they may obtain the right to seize and sell the collateral that the borrower posted. Such rights facilitate financial trades and allow the proper functioning of financial markets. Indeed, credit markets are largest in countries where creditor and investor rights are strongest (La Porta et al., 1997;1998).

Sovereign debt is the debt contracted by sovereign borrowers, i.e., states like Greece. Creditor rights are typically difficult to impose on sovereign borrowers. No court can force an unwilling sovereign debtor to repay. Rather, the repayment of sovereign debt is a political question, decided upon by governments based on economic and political considerations—creditors of Greece were duly reminded of this simple fact in the March 2012 default.²

Still, sovereign debt markets are huge: there was more than \$34 trillion of outstanding sovereign debt in 2009; thereby, sovereign debt accounted for about 40% of the value of global bond markets (Source: Bank of International Settlements, BIS).³ The literature on sovereign debt has spelled out, both theoretically and empirically, how positive repayment can be sustained, even in the absence of a court. Reinhart and Rogoff (2009) summarize this literature as, 'concerns over future access to capital markets, maintaining trade, and possibly broader international relations all support debt flows.' Chapter 2 builds on the sovereign debt literature by taking as given that positive repayment can be sustained; the chapter seeks to extend the sovereign debt literature by asking an obvious complementary question: what is the form of the optimal borrowing agreement?⁴

²This enforcement problem is known, in the literature, as the *willingness-to-pay problem* (Eaton and Gersovitz, 1981).

³Greece alone had €350 billion of debt, before its March 2012 default—the biggest sovereign default in history.

⁴Optimal in the sense of minimizing agency costs.

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Sovereign borrowers can be described as borrowers who can repudiate their repayment obligations at any time, i.e., repay nothing; and, whose exact repayment capacity is hard to observe for outsiders, as it depends on the specific political economic calculus of the government in office. The main question of chapter 2 is how to extend credit to such a borrower. Common sense—and knowledge of history—suggest that creditors need to be careful.⁵

Chapter 2 shows that, given enforcement and information constraints, the optimal borrowing agreement is a contract that specifies (i) a fixed payment, or *face value*, in high income states, and (ii) a default if the sovereign's willingness-to-pay falls short of the face value, where (iia) default is partial rather than complete, and (iib) the default repayment depends on the power that creditors have to punish repudiation. This result explains three salient facts of sovereign borrowing. First, the result explains why sovereign borrowers, choose to issue simple debt instruments instead of more contingent contracts, as Shleifer (2003) and others have argued they should (cf. Borensztein and Mauro, 2004). Such contracts are not optimal, because the auditing requirements would be prohibitively costly, i.e., the agency costs are too high for such contracts.

Furthermore, as Reinhart and Rogoff (2009) document, some countries default at very low debt-to-GDP levels; other countries continue to repay their debt at very high debt-to-GDP levels.⁶ Chapter 2 explains this empirical finding by pointing to four factors that determine the government's repayment decision: (i) the available budget, (ii) the economic costs of repudiation (i.e. creditor power), (iii) the political costs of default, and (iv) creditor coordination costs.

Finally, conditional on default, there is a wide dispersion on how much creditors recover from the sovereign borrower (Sturzenegger and Zettelmeyer, 2006). Chapter 2 explains this empirical finding by pointing to creditor power as the relevant determinant of recovery. The most powerful creditor is the International Monetary Fund (IMF); historically, the IMF takes priority over all other creditors.

⁵Reinhart and Rogoff (2009) survey eight centuries of financial crises, among which there are many sovereign debt crises.

⁶A similar picture emerges for other measures of a sovereign's ability to pay.

It follows that, even if rates on IMF loans are lower than on other loans, IMF lending is not concessionary: the IMF simply expects to be repaid with higher probability, and to recover more in case of a default.

Chapter 2 shows that an increase in the costs of repudiation, be they political or economic costs, lowers the interest rate on sovereign debt through a commitment effect: higher costs of repudiation commit the sovereign to repay the debt at face value in more states of the world; thus, reducing sovereign risk.

1.1.2 Collective Pension Funds

Chapter 3 is based on Bersem and Hollanders (2012) and focuses on collective pension funds. A pension is a payment stream that people receive upon retirement, i.e., when they leave the labor force. Rather than leaving it to individuals to save for their retirement, most advanced economies have pension systems in which individuals are required to participate. Common to such systems is that people contribute in their active working years, which entitles them to a pension benefit upon retirement.⁷ But there is considerable variation between countries in how the pension system operates, how it is financed, and how pension benefits are determined.⁸

For example, some countries, like Germany, operate pay-as-you-go (PAYG) pension systems, where the active working population pays for the current retirees. Other countries, like the Netherlands, operate additional prefunded schemes, in which people *save* through pension contributions and receive a pension benefit that is set according to the pension contract. Roughly, one can distinguish two types of pension contracts: *defined-contribution* (DC) type contracts, where the pension benefit depends explicitly on investment returns (e.g. the famous 401(k)

⁷This seems an obvious requirement, but note that the first generation in a pay-as-you-go (PAYG) pension system receives a pension without having paid contributions.

⁸World Bank (1994) gives a useful categorization of pension systems into three pillars: a *state pension*, aimed at poverty reduction, and financed through taxes; an *occupational pension*, aimed to maintain the standard of living, and prefunded; and a *private pension*, allowing for individual supplements, also prefunded.

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plans in the U.S.), and *defined-benefit* (DB) type contracts, where the pension is set according to a formula that may depend on average pay, years of employment, age at retirement, and other factors (e.g. the second pillar in the Netherlands).

Prefunded DB pension schemes run into trouble when they are *underfunded*, i.e., when pension liabilities, which are fixed, exceed pension assets, which may fluctuate. Such pension shortfalls are an inherent risk—and recurring feature—of funded DB pension schemes.⁹ After the 2008 credit crisis, more than half of the pension funds in the Netherlands were underfunded. The decline in pension wealth led to controversy over who should pay to restore the solvency of the pension system—Dutch regulations required a return to solvency within 5 years.¹⁰ In recognition of the intrinsic tensions in DB pension systems with mismatch risk, DB pension schemes are being replaced with DC pension schemes, cf. Goudzwaard et al. (2009). This then leads to the question how such DC schemes perform. Chapter 3 explores one rationale for a DC pension scheme that has received little attention in the literature: that pension funds exist to lift credit constraints and implement the optimal optimal life-cycle investment strategy of participating generations.¹¹

The literature on modern life-cycle investment theory shows that individuals' optimal investment strategy depends on their age: the young—who have human capital as well as financial capital—should invest their financial capital in a riskier manner than retirees—who have only financial capital (Bodie, Merton, and Samuelson, 1992). With their human capital, the young are naturally hedged against stock market risk. Typically, these models require the young to take a leveraged position in the stock market, i.e., to borrow and invest the proceeds in the stock market. If the young face credit constraints, this strategy is not feasible and pension funds have a role to play: pension funds can implement the young's

⁹For example, General Motor's defined-benefit pension plans reported a shortfall of \$35 billion in 2011; this exceeded GM's market value.

¹⁰By cutting entitlements, pension funds decrease their liabilities; by raising contributions—while keeping entitlements fixed—pension funds increase their assets.

¹¹The notable exception is Bovenberg et al. (2007) ; Teulings and de Vries (2006) mention but do not pursue this rationale for pension funds.

preferred investment strategy by extending them credit.¹² There are two reasons why pension funds are better placed than private sector lenders to extend credit to the young: (i) participation is mandatory, reducing the adverse selection problem; and (ii) pension funds have access to a tax on human wealth, which allows them to enforce repayment. In effect, the pension fund helps to secure the human capital of participants as collateral (Bovenberg et al., 2007).

Chapter 3 shows that implementation of optimal investment strategies can in fact be achieved by a DC pension scheme, where participants pay contributions into a *generational account* (e.g. yearly), and pension funds invest these contributions on behalf of participants. The ability of pension funds to increase welfare is dependent on the assumption that pension funds can collateralize the human capital of participants. Recent experience in the Netherlands shows that this assumption cannot be taken for granted, as it may prove impossible to raise contributions after a low stock market outcome—and in particular in a recession. It follows that the DC pension scheme we describe may run into the same problems as a DB pension scheme with mismatch risk, and that the ex-ante optimal risk level at the pension fund cannot be separated from the ex post contribution policy.

Indeed, one suggestive interpretation of the distributional conflict witnessed in the Netherlands is that pension funds—which, de facto, run a combination of DB and DC pension contracts—took risk on behalf of the young, assuming that contributions could be raised in case of a pension shortfall. When this proved infeasible, a controversy over who should pay for the shortfall was the result. This *ex post* distributional conflict leads to an *ex ante* governance conflict at the pension fund: older participants wish to limit risk taking such that they are repaid in every contingency.

¹²Bovenberg et al. (2007) provide a review of different rationales for pension funds; the review discusses alleviation of borrowing constraints as one possible rationale.

1.1.3 Political Intervention in Capital Markets

Chapter 4 is based on Bersem, Perotti, and von Thadden (2012) and focuses on political intervention in capital markets. Capital markets, also denoted financial markets, are markets where banks and other financial intermediaries trade financial securities; they are markets through which the financial sector moves money from point A, where it is, to point B, where it is needed. In the ideal type of the free capital market, capital moves naturally towards its most profitable use and, by allowing the financing of new ventures, keeps alive the process of *creative destruction*, whereby old firms and organizations are constantly challenged and replaced by new ones (Schumpeter, 1942). In reality, however, the functioning of capital markets varies greatly between countries: it is much harder to obtain financing for new, daring, disruptive ideas in some countries than it is in others.

(Wurgler, 2000) has shown that industries with better growth prospects are able to invest more in countries that are more financially developed; these are also the countries in which declining sectors shrink faster.¹³ Rajan and Zingales (1998) show that industries that are more reliant on external finance, grow faster in countries where financial markets are more developed. Indeed, this was already observed by Walter Bagehot in his famous book *Lombard Street: A Description of the Money Market*.¹⁴

“Political economists say that capital sets towards the most profitable trades, and that it rapidly leaves the less profitable non-paying trades. But in ordinary countries this is a slow process.”

But what can account for these differences? As Rajan and Zingales (2003) point out, markets rely on the political goodwill for their infrastructure (which includes, e.g., the rule of law and how it is enforced).

¹³Wurgler (2000) finds, furthermore, that (i) a high degree of minority investor protection, and (ii) a lesser extent of state ownership in the economy are both associated with a better allocation of capital; evidence suggestive of the importance of political influence on capital markets.

¹⁴Bagehot was an English banker and editor to *the Economist* newspaper. *Lombard Street* (1873) describes the world of finance, and the role of central banks, in common language.

The main contribution of chapter 4 is to explain why unrestricted capital mobility may be opposed in democracies as a result of the wealth and age distribution in a country's population. The starting insight of the chapter is that labor is less mobile than capital: while capital can easily be redeployed—think of land or real estate—it is hard to retrain workers once they have acquired specific skills. The result is a political conflict between generations (old vs. young); and within generations (workers vs. the capitalists). Capitalists favor the reallocation of capital to its most productive use. Old workers, who have outdated skills, resist the reallocation of capital to newer sectors, as this leads to a fall in their productivity and wages; old workers seek a political alliance to restrict capital mobility. Chapter 4 identifies young workers as the decisive class in society. What makes them pivotal is not their number—they are a minority just as every other voter class—but the fact that their preferences are the least extreme.

The preferences of the young worker depend crucially on the voting process: If capital market frictions can be repealed in the future, young workers will not favor them; but, if capital market frictions are permanent, young workers form an alliance with old workers to restrict capital mobility. The intuition is that young workers trade off lower wages when young against a job guarantee (i.e. higher wages) when old. Young voters prefer to restrict capital mobility more if technological obsolescence is high, as this increases the wage drop when old.

Chapter 4 shows that opposition against capital markets can be sustained if frictions are hard to reverse. There are clear examples of institutional frictions in capital markets which are hard to reverse. Bankruptcy law, for example, defines specific conditions to the assignment of assets from declining sectors. While in some countries—such as the United Kingdom—bankruptcy law is designed to protect financial interests, in others—like France and Italy—it explicitly instructs the liquidator to reassign capital in a manner which protects employment.

1.2 Methodology

This dissertation studies financial contracting across different themes. The literature in finance has long recognized how the neoclassic paradigm of enforceable complete contracts needs to be modified by recognizing frictions such as those driven by imperfect information, imperfect enforcement, and political intervention. This dissertation fits into this research agenda.

Each chapter of this dissertation presents one economic model, a set of ideas about some specific aspect of capital markets. They cover the design of sovereign debt, pension finance, and the process of capital reallocation. They are motivated by empirical observations which are hard to square within the neoclassical paradigm.

The presentation of the models in this dissertation is formal: built on a specific set of pertinent assumptions, each chapter derives rigorously a specific set of implications. In choosing the approach for each chapter, the guiding force was the nature of the question at hand. With Occam's razor in mind, I've tried to make the models as simple as possible, but not simpler. It is important to state as a reminder that economic models are an abstraction, like a map, but that the map is not the territory.¹⁵

1.2.1 Overview

Chapter 2 (*Incentive-Compatible Sovereign Debt*) seeks to make a positive contribution by explaining why sovereign borrowers issue very simple debt contracts. After all, national economies and thus fiscal capacity have specific risk exposures, which may be best hedged in their financing. Yet this is almost never the case. We pursue an explanation driven by the institutional constraints imposed by sovereignty, which limits direct contractual enforcement, and the superior information held by governments over private parties. We show how the optimal government debt contract resolves these constraints in a simple form.

¹⁵John Kay - 'The Map is not the Territory: An Essay on the State of Economics.'

Chapter 3 (*Collective Pension Funds*) seeks to make a normative contribution by showing what features of pension funds may enhance welfare. Pensions can improve intergenerational risk sharing by increasing the ability of the young to sustain capital investment. They could not achieve the same privately, as adverse selection and moral hazard limits their ability to borrow against their human capital to invest in risky, high return assets. The analysis is built on a simple modeling of the underlying tension between generations in the process.

Chapter 4 (*Sand in the Wheels of Capitalism*) seeks to explain why democratic societies may oppose free capital markets. Financial liberalization and expanded access to capital for new enterprises are historically seen as signs of greater freedom. Yet many democratic countries choose to restrain or contain the process of free resource allocation called for by prices set on a free capital markets. The literature has shown that such choices may affect growth and the rate of innovation. The model here shows that the redistributive effect of a technological shock creates a strong political demand to limit capital reallocation away from obsolete sectors. It shows that income stability may be chosen above economic growth when certain conditions allow the creation of persistent frictions to capital reallocation. So the model offers an endogenous explanation for the existence of avoidable financial frictions.

In the following I discuss the methodology of each chapter in more detail, before concluding with avenues for future research.

Chapter 2 (Incentive-Compatible Sovereign Debt)

Chapter 2 uses financial contract theory to model the interaction between a sovereign borrower and potential financiers (Hart, 2001). Specifically, I use a version of the costly state audit model, which goes back to Townsend (1979) and Gale and Hellwig (1985).

The basic setup is familiar from corporate finance models: an agent seeks financing from a group of financiers. There are gains from trade. The question is whether they can be realized, and if so with what contract.

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Two frictions complicate the trade: (i) there is asymmetric information that can be resolved only at a cost; and (ii) there is no court to enforce repayment by the agent. The second assumption is made to capture that the agent is sovereign, rather than a corporation. Other assumptions particular to this sovereign finance model: the cost of audit is borne by the agent, future income is an endowment.

The optimal contract I derive saves on audit costs and implements the second-best allocation. (The first-best cannot be achieved due to prevailing enforcement and information frictions.) Chapter 2 argues that this contract matches some empirical facts of sovereign borrowing.

Chapter 3 (Collective Pension Funds)

Chapter 3 models the interaction between individuals of different age using an overlapping-generations (OLG) model, which goes back to Samuelson (1958).

Chapter 3 focuses on optimal investment and, by fixing savings, abstracts from individuals' labor supply and consumption decision, as in Gollier (2008). There is a capital market to which all individuals have access. The problem reduces to choosing an optimal investment strategy. The question is whether this strategy can be implemented.

Chapter 3 introduces a friction: future savings cannot be used as collateral, which implies that the young are credit constrained. The assumption captures that human capital does not collateralize loans for adverse selection and moral hazard reasons (Constantinides et al., 2002). A pension fund can improve on the market allocation if (i) participation is mandatory; and (ii) it has access to a tax on human wealth. In effect, the pension fund works as a commitment device for the young to pledge their human capital as collateral to older generations.

Credibility of the commitment device is crucial for the result. Chapter 3 argues that when this assumption becomes problematic—in light of recent experience in the Netherlands—it reduces the scope for pension funds to increase welfare.

Chapter 4 (Sand in the Wheels of Capitalism)

Chapter 4 models the economic and political interaction between different generations with an OLG model that is extended with a simple majority vote (Persson and Tabellini, 2000). Redistributive effects of policy on labor and capital returns are at the heart of political economy explanations for the structure of the economy.

Chapter 4 assumes vintage human capital, which means that the labor market is segmented. This assumption captures the difficulty of retraining workers once they have specific skills. A realistic second type of heterogeneity arise because the capital is largely owned by a subset of the population (the *capitalists*). The capital market reallocates capital across firms, operating under conditions set by political decisions.

The economic rationale for capital reallocation is that new sectors, where the young work, are more productive than older sectors. The old wish to block capital reallocation as it reduces their wages. The political conflict exists as long as capital and labor are complementary factors of production; as long as human capital is less mobile than physical capital; and as long as human capital risk cannot be fully insured.

In each period, a vote takes place: individuals can choose a capital market friction, which slows down the subsequent reallocation of capital in the economy. The question is whether such a friction will be chosen under majority rule.

In the Chapter we study different specifications of the political model, both in terms of possible voting strategies (open-loop, subgame perfect, and markov perfect) and in terms of the persistence of the chosen policy (persistent vs. reversible). Our aim is to understand by what type of policies capital market frictions can be sustained. We show that capital market frictions are politically sustained when redistributive effects are strong, only and only if persistent frictions can be established.

As usual in political economy models, one may wonder why economically suboptimal outcomes cannot be resolved by bargaining. Shouldn't it be possible to compensate the old workers for allowing capital reallocation? Prohibiting

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this type of efficient bargaining is the hold-up problem associated with the relinquishment of power, a core issue in political economy and the source of much inefficiency (Acemoglu, 2003).

1.3 Future Research

Chapter 2 (*Incentive-Compatible Sovereign Debt*) is the starting point of an extensive theoretical and empirical research agenda in sovereign debt. Empirically, the cross-sectional implications of the model must be subjected to rigorous statistical testing. Do shifts in political power or ultimate holdings of sovereign debt lead to the secondary price responses that the model predicts? Recent events in the European Union suggest that they do, as shifts in political power were consistently followed by secondary market responses. Theoretically, the framework must be extended to develop a fully dynamic model of sovereign debt; a model that endogenizes the cost of repudiation and allows the study of repayment and refinancing decisions in one unifying framework.

Chapter 3 (*Collective Pension Funds*) explores one rationale for prefunded pension funds; future work must include others. In particular, I've abstracted from intergenerational risk-sharing between non-overlapping generations. It is an important open question whether such risk-sharing is best achieved via government debt and tax policies, as in Ball and Mankiw (2007), or via pension funds, as in Gollier (2008). The current framework can be extended to study both in a dynamic OLG setting and compare, by calibration, the performance of different pension schemes.

Chapter 4 (*Sand in the Wheels of Capitalism*) predicts that opposition to free capital markets is strongest in democracies with narrow capital market participation, and with older populations. Broad capital market participation is found in some democracies, in particular those with funded pension schemes. Empirical tests must show if capital reallocation is less restricted in democracies with fully funded pension systems. Ageing populations form another testing ground

for our theory. Empirical tests must show if capital reallocation is more restricted in democracies with older populations. Finally, as noted, capital market frictions cannot be bargained away. By broadening capital market participation, however, capitalists could change the young worker's preference. This is a possible extension of the theory reminiscent of Rajan (2010), who argues persuasively that credit expansion has historically been used to assuage the concerns of a group that is left behind.

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