The Macroeconomics of Saving, Debt and Financial Development

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ACRONYMS

ATM	Automated teller machine
ELF	Ethno linguistic fractionalization
EU	European Union
FD	Financial development
GDP	Gross domestic product
GMM	Generalized method of moments
IMF	International Monetary Fund
INE	Instituto Nacional de Éstadistica
IPO	Initial public offering
LIS	Luxembourg Income Studies
NUTS	Nomenclature des unités territoriales statistiques; Nomenclature of territorial units for statistics
OLS	Ordinary least squares
OECD	Organisation for Economic Co-operation and Development
PSID	Panel Study of Income Dynamics
SIC	Standard industrial classification
SWIID	Standardized World Income Inequality Database
UN SNA	United Nation System of National Accounts
VIF	Variance inflation factor
2SLS	Two stage least squares

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CHAPTER 1

Introduction

Savings and debt as well as the financial intermediation in between are at the heart of every economic system. When an economic system is under stress, disrupted or accused of malfunctioning, it is essential to investigate the core mechanisms and established patterns of this system. The financial crisis of 2008 and the following recession represent this type of disruption that provides cause to examine the fundamentals of our economic system. Thus, this dissertation challenges common wisdom and established theories on private-sector saving and debt as well as the role of financial intermediation in view of the financial crisis and the following recession in recent years.

Economic agents who save provide funds to economic agents who take on debt and invest. Saving and debt are thus inevitably interlinked. The household sector thereby typically has a surplus of savings over investments and provides these funds to the overall economy, whereas the corporate sector is believed to invest more than it saves and consequently borrows from the household sector. These patterns are standard for the institutional sectors in a market-based economy. There would likely not be any significant private investment without the pooling of savers' funds by financial intermediaries. When more funds are pooled in terms of the share of the population that participates in financial intermediation and in terms of the volume of funds that are intermediated (e.g., private credit or bank deposits relative to GDP), financial intermediaries are more effective in conducting their inherent task. The role of these three parties – savers, borrowers and financial intermediaries – has been and will continue to be at the core of debates surrounding the financial crisis. In the following three chapters of this dissertation, I examine these three parties from different perspectives.

All chapters are based on empirical research. I thereby build the regression estimations based on unique cross-country panel datasets that were partially assembled by me, based on the aggregation of micro-level data (chapter 2) and datasets that represent a combination of different existing macro-level datasets (chapters 3 and 4). Common wisdom regarding the three parties and theories establishing the underlying rationale are challenged in this dissertation. I thereby study time horizons that are directly linked to the financial crisis (chapters 2 and 3) and long-term developments occurring over the course of five decades (chapter 4). Chapter 2 investigates the saving behavior of the corporate sector prior to the financial crisis and over a longer-term horizon, as the corporate sector was accused of excessive saving. Herein, I challenge the widely established saving glut hypothesis with a focus on corporate savings. Similar to the allegedly

unusual behavior of the corporate sector, the behavior of the household sector was also atypical before the crisis. Households in many Western economies reduced their saving rates prior to the financial crisis and amassed large amounts of debt. Household sectors consequently became net borrowers. The effect of this debt and the deleveraging following the financial crisis on the aggregate demand channel and unemployment are investigated in chapter 3. Chapter 4 is also motivated by the debates that arose during the course of the financial crisis; this chapter examines how financial intermediation evolved during the last five decades and how this financial development affects income inequality.

The contribution of this dissertation to the existing literature is manifold. By incorporating aggregated firm-level data in a macro-level analysis of corporate savings, chapter 2 shows that the System of National Accounts ought to be amended by an alternative measure of gross savings. Furthermore, examining the link between household sector debt and unemployment, chapter 3 confirms existing empirical research on the United States and Australia for Europe and particularly Spain and provides a basis for the analysis of the increase in unemployment following the financial crisis. Chapter 4 tests established theories and rejects older empirical research on the link between financial development and income inequality and can thus assist policy makers in understanding this nexus and addressing potential inequality issues. The timeliness of this dissertation and the relevance of the topics investigated are demonstrated, for example, by recent coverage of the chapters in *The Economist*. A special report on the world economy ("For richer, for poorer", The Economist (Oct. 13, 2012)) focuses on inequality issues. Another article discusses academic research regarding the magnitude of [the traditional definition of] corporate savings ("Dead Money", The Economist (Nov. 3, 2012)). Furthermore, unemployment in Spain is at the center of European business news (e.g., "The euro zone isn't working", The Economist (Oct. 31, 2012)). Thus, this dissertation addresses highly topical macroeconomic issues that are relevant for the public, policymakers and academia. The following three paragraphs provide a brief motivation and summary of chapters 2, 3 and 4.

Chapter 2

When one analyzes the financial crisis, one reason for the initial burst of the American housing and subprime bubble can be found in the low interest rate in the years preceding the crisis. This low interest rate was caused by, among other factors, a "global saving glut". Ben Bernanke

postulated this global saving glut (cf. Bernanke (2005)) and thought of it as increasing saving rates around the world. Subsequently, it was primarily the corporate sector that was blamed for having excessively saved. In chapter 2, I investigate this global saving glut with regard to the corporate sector. I find evidence to confirm this hypothesis when using standard national account figures and when corporate savings consist of retained profits. However, listed companies in many advanced economies changed their payout behavior in the 1990s and 2000s from dividends to share repurchases, which are another medium for distributing profits to shareholders. In this chapter, I aggregate share repurchases from listed companies in 30 OECD countries and correct the official corporate sector saving rate for aggregated share repurchases. This method leads to the rejection of the saving glut hypothesis for the corporate sector and shows that the corporate sector on aggregate did not significantly change its saving behavior relative to GDP in the "global saving glut" period. The study of the drivers of the corporate saving rate reveals that the most important determinants of the aggregate corporate saving rate are the lagged saving rate and profits. The first contribution of this chapter to the literature is that private-sector saving is normally studied as a whole or with a focus on household saving, but the corporate sector, which is typically neglected, is at the center of this research. Second, share repurchases have been investigated in detail in the finance literature, but to the best of my knowledge, there have been no attempts to aggregate share repurchases for a large number of countries and to study the macro effects of this changing payout behavior. Third, this research clarifies that the corporate sector cannot be charged with having excessively high gross savings in its original sense because the sector did not change its saving behavior significantly relative to the reference period of the global saving glut.

Chapter 3

As stated, the household sector is typically the net lender of capital to the entire economy. However, households in the United States and many European countries loaded their balance sheets with excessive amounts of debt prior to the financial crisis. Realizing that these debt loads cannot be sustained in the context of the financial crisis, the household sector began a deleveraging process. The theoretical foundation for this deleveraging is exemplified in the work of Eggertsson and Krugman (2012). Deleveraging began earlier in the United States than in Europe, and the effects of this deleveraging on consumption or via the aggregate demand channel on employment have been subject to studies by Dynan (2012) and Mian and Sufi (2012). Chapter

3, which is adapted from Jauch and Watzka (2012), closely follows the approach of Mian and Sufi (2012) and investigates the effects of household debt at the country level in Europe and at a regional level in Spain. At the European country level, we confirm that increases in household debt are linked to an increasing contribution of household sector consumption expenditures to GDP growth, and decreases in household debt are associated with a lower contribution of household sector consumption expenditures to GDP growth. Furthermore, economies with a high level of household debt or high increases in household debt exhibit a steeper decline in employment or increases in unemployment in the economic downturn. To prove that there is a direct link from household debt via the aggregate demand channel to unemployment, we investigate Spanish provinces. On a regional level, we can separate local from national demand shocks. Because household debt is heterogeneous across provinces, provinces that experience a higher debt level relative to GDP should observe a steeper decline in consumption. This consumption is linked to local demand and thus local non-tradable sector unemployment. Differentiating between non-tradable and tradable sectors consequently enables us to confirm the negative effects of household deleveraging; in our estimation, this deleveraging caused one-third of the increase in Spanish unemployment from November 2007 to November 2010. This chapter contributes to the recent field of empirical deleveraging studies by first investigating Europe and then considering Spain, which is one of the economies that experienced especially high increases in unemployment. Our European and Spanish findings confirm the results for the United States and Australia. Thus, chapter 3 provides a fact base for policymakers with regard to the reasons for the increase in unemployment and for macro-prudential regulators who are concerned with potential negative implications of household sector debt.

Chapter 4

Although chapter 3 discusses the potential negative effects of household debt, household debt may also have beneficial effects. In fact, access to finance is viewed as especially positive because it enables individuals to borrow, to pursue investments in human capital or to found businesses. Hence, greater debt and easy access to credit can be viewed as financial development that improves career and business opportunities for all individuals and thus fosters income equality in a society. This reasoning is key in the theories proposed by Banerjee and Newman (1993), Galor and Zeira (1993) and Greenwood and Jovanovic (1990). Chapter 4, which is adapted from Jauch and Watzka (2011), examines this effect of financial development on income

inequality and tests the aforementioned theories. Existing empirical research that investigates the financial development income inequality nexus has confirmed the theories that greater financial development reduces income inequality. We use a broader dataset in terms of countries and a broader time horizon to estimate the relationship with more appropriate estimation techniques and a consistent measure of inequality. Using the same OLS approach that was used in previous research confirms Kuznets curve with respect to the effect of economic development on income inequality and the lowering effect of financial development on income inequality. However, when we control for time and country-specific effects, among other factors, and use appropriate standard errors, the results lead us to reject the Kuznets curve. Furthermore, we find that increased financial development is followed by a more unequal distribution of income. These findings are robust to different econometric specifications, different measures of financial development and different subsamples of the dataset. Although financial development may lead to more equal opportunities, it does not lead to a more equal outcome regarding income. The contribution of this chapter to the literature is that, to the best of our knowledge, we use the largest and most comparable cross-country dataset on income inequality to study the effects of financial development. This approach enables us to correct for data issues and a lack of coverage in previous research. The findings are important with regard to policy measures that aim to reduce income inequality because we show that more finance does not necessarily need to be a supportive factor, but it rather enables talented individuals to extract higher incomes.

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CHAPTER 2

The Global Saving Glut Revisited – Corporate Savings and the Role of Share Repurchases

Abstract

Given that at the time that the "global saving glut" was announced, the global saving rate showed one of its lowest values in the past three decades, this study seeks to investigate corporate saving patterns, which are alleged to be significant contributors to the saving glut. I build a unique dataset with aggregated share repurchases organized on the country level to examine how the corporate saving rate would actually behave if the System of National Accounts was adjusted for changing firm payout behaviors, i.e., the increasing distribution of funds to shareholders by substituting dividends for share repurchases. Using this newly calculated saving rate, I reject the corporate saving glut hypothesis for the G7 countries. To deepen the understanding of aggregated corporate saving patterns, I use a large, unique cross-country panel dataset. This shows that among the examined factors, the lagged saving rate and profitability have the highest impact on the corporate saving rate.

2.1 INTRODUCTION

Many different explanations of the recent financial crisis have been suggested. One proposed cause of this crisis is the global saving glut that contributed to low interest rates, particularly in the United States, and thereby encouraged risky investments that partially turned out to be bad ones. The foundations of this argument about the global saving glut were established in March 2005 by Ben Bernanke in his speech addressing "The Global Saving Glut and the U.S. Current Account Deficit" (cf. Bernanke (2005)), which introduced the notion of a global saving glut. Bernanke was correct if the global gross saving rate excluding the United States was considered on a worldwide basis and compared with the gross saving rate of the United States. The United States was by far the largest importer of capital in the world, whereas the remainder of the world possessed a savings surplus and exported capital. These large inflows of capital into the United States helped maintain interest rates at historically low levels. The wide range of literature that addresses the global imbalances generated by the existence of various exporting or surplus countries, such as China, Japan and Germany, and one large importer, the United States, relates to this discussion. A discussion of different explanations for the global imbalances is for example given by Eichengreen (2006). The saving glut is frequently interpreted in terms of saving differences between the United States and the rest of the world, primarily Asia (cf. Chinn (2005)); in Bernanke's view, these differences are closely linked to global imbalances with respect to current accounts. However, one can also consider the saving glut from a pure savings perspective and ask how much capital is provided by the institutional sectors and countries in the world to maintain fixed capital investments (i.e., to compensate for depreciation) and to increase the global stock of capital through new investments.

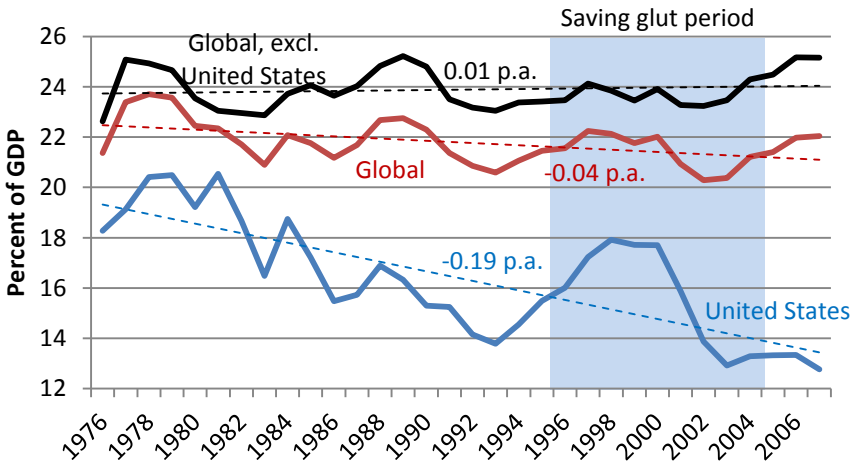
I examine this gross saving rate on a truly global basis and find a different picture than the saving glut theory would imply. The saving rate[1] on a global basis had been trending downward for the past three decades. In particular, this rate peaked in the late 1970s and declined in long cycles. The peak of the saving rate cycle in the 1970s is higher than the peak of the saving rate cycle in the 1980s; similarly, the peak saving rate is higher in the 1980s than in the 1990s, and the peak saving rate in the 1990s is greater than the peak saving rate in the 2000s. Therefore, the saving

[1] Throughout this article "saving rate" and "savings" always refer to gross savings. The concept of gross savings includes the consumption of fixed capital (depreciation). This consumption represents the difference between gross savings and net savings. The difference between gross savings and net lending primarily represents gross fixed capital formation (investment) (cf. Lequiller and Blades (2006), p.193).

glut prior to the recent financial crisis is certainly not due to an increase in the global saving rate above its long-term average, as the global saving rate decreased by approximately 1.2 percentage points of GDP between the 1970s and the 2000s. Excluding the United States, the global saving rate reached its peaks of 1977 and 1989 again in 2006. The trend line for this rate indicates an increase of just 0.01 percentage points per year. At the time of Bernanke's speech, this rate was just above its average of the preceding decades and its trend had been stable for the preceding 30 years (cf. figure 2.1).

Figure 2.1

Global gross saving rate including and excluding the United States



Global gross saving rate

Years	High	Low
1970s	23.7	21.4
1980s	22.7	20.9
1990s	22.3	20.6
2000s	22.0	20.3

Data source: World Bank – World Development Finance.

Decomposing the saving rate in terms of the institutional sectors of the world economy, namely, households, corporations and governments, as for example done by the McKinsey Global Institute (2010), reveals the increasing importance of the corporate sector with respect to the global supply of capital. Government sector savings are of minor importance on a global basis. In recent decades, household saving rates declined in the developed world, with the steepest decreases in Italy, Japan, the United Kingdom and the United States, and increased in emerging markets, such as China and India. In contrast to the developments in the household sector, the corporate sector increased its share of total savings and its relative saving rate in both developed and emerging economies. This sector accounts for approximately 2/3 of the supply of capital in the developed world today. Various entities responded to Bernanke's speech by arguing that corporations were leading the global saving glut (cf. The Economist (2005) or Loeys et. al

(2005)) and the increasing importance of corporate saving was leading to the conventional wisdom of excessive corporate savings. This point of excess corporate savings was made clear in analyses by André et al. (2007) and the International Monetary Fund (2006), which indicated that corporate savings were increasing; in fact, corporate savings surpassed corporate fixed capital investment in large OECD countries during several years of the early 2000s. Thus, the corporate sector became a net lender to the economy with high net financial surpluses. It was commonly assumed that the increase in corporate savings was merely a short-term phenomenon that would quickly fade (cf. Loeys et al. (2005); International Monetary Fund (2006)).

One consideration that has not been thoroughly accounted for and has traditionally been regarded as a secondary concern is the impact of share repurchases on corporate savings. A reason for not including share repurchases in analyses of saving data is that share repurchases are part of corporate saving according to the official definitions of the System of National Accounts (SNA).[2] The magnitude of aggregated share repurchases around the world has not been a focus of economic research despite the fact that theoretical and empirical explanations for share repurchases have become available. One contribution of this paper is to close this gap by aggregating share repurchases on a country level and calculating a new saving rate that reflects these aspects of corporate saving.

Drivers of corporate gross saving can be determined from the supply and the demand side. The primary supply-side driver for corporate saving is corporate profits; a certain fraction of these profits are distributed to a firm's shareholders, and the remainder is retained within the corporation, i.e., corporate saving. The primary demand-side driver for corporate saving is the need for internal capital. Because capital markets are not perfect, firms must utilize internal funds for a certain fraction of their investments. This requirement creates a demand for corporate saving. In addition to corporate saving for current investments, other considerations also increase the demand for corporate saving. Corporate savings can be used to increase corporate cash holdings, reduce debt, or repurchase shares from shareholders. Cash holdings can be used for future investment, as insurance against future lending restrictions from capital markets, and as a buffer that allows a firm to pay out a constant amount of dividends to its shareholders during

[2] Share repurchases are incorporated into the financial accounts in the SNA as a source of changes in shareholders' equity. However, these changes are net figures that also include delistings and IPOs (cf. United Nations' (2000) Handbook of National Accounting, p. 61ff.).

times of unstable profits. Debt reductions reduce a firm's interest expenses and increase its ability to take on future debts when needed (cf. Achavarya et al. (2005)). Share repurchases are the fourth demand-side motivation for engaging in corporate saving, as defined by the SNA, although share repurchases are a substitute to dividends, and the funds that are used for these repurchases do not remain within the corporation.

Each of these reasons has been studied on its own in theoretical and empirical research; however, share repurchases are a rather new topic that has not yet been extensively investigated and the aforementioned studies focus on a firm-level. In this chapter, I present different theories about corporate savings and then combine the rationales of these theories to estimate the magnitude of corporate savings on an aggregate level. I calculate an adjusted corporate saving rate by subtracting share repurchases and compare this adjusted rate with the official corporate saving rate. I test and reject the hypothesis of a corporate saving glut by aggregating share repurchases on a national level for the G7 countries. This study contributes to literature on saving behavior by investigating an institutional sector that is frequently neglected. In particular, the study presented in this chapter contributes to the extant literature by incorporating share repurchases on a national level for a large set of countries, which has to the best of my knowledge not been done before.

The chapter is structured as follows. Section 2.2 provides an overview of related literature. In section 2.3, the hypothesis of a corporate saving glut is tested. Section 2.4 explains the hypotheses and theories underlying the empirical approach and presents the empirical analysis with respect to the aggregate corporate saving rate. Section 2.5 repeats the assessments of corporate savings on the firm level and section 2.6 concludes the chapter.

2.2 OVERVIEW OF RELATED LITERATURE

To the best of my knowledge, there is no significant research addressing the saving behavior of the corporate sector across a large set of countries. Consequently, in this analysis, I integrate different streams of literature that relate to this analysis. First, studies addressing macro saving behavior serve as a starting point for this analysis. Second, finance literature that assesses firm behavior is used to identify the motivation and theoretical background underlying the derivation of a regression equation for corporate saving.

Research on saving rates usually investigates household saving or total private sector saving, which combines household and corporate saving. In this context, corporate saving includes both financial and non-financial corporate saving. A main paper on private saving is written by Loayza et al. (2000), who claim to have built the world's largest macroeconomic dataset regarding saving.[3] The authors analyze determinants of private saving rates based on a dataset containing up to 150 countries for a maximum time period of 30 years. They identify the lagged saving rate as the most important determinant of the saving rate. Although this study and Loayza et al. (1998) provide a very detailed investigation of private saving, corporate saving alone and the relationship between household and corporate saving are not thoroughly investigated. Callen and Thimann (1997) study determinants of household saving in OECD countries. One reason for choosing the household instead of other institutional sectors is that "most fundamental household saving, per se, is important because this is the component of saving—rather than public or corporate saving—that economic theory tells us [the] most about." (Callen and Thimann 1997, p. 4). However, the limitations of economic theory with respect to corporate saving do not justify neglecting the study of corporate saving behavior on a macro level, particularly given that the corporate sector accounts for the majority of the aggregated savings in the world. The common argument that economists offer for not examining the corporate saving rate in isolation is that households own corporations and integrate corporate saving decisions into their own saving decisions. According to this view, which is also known as piercing the corporate veil, the private saving rate is ceteris paribus constant, and increases in corporate saving are offset by equivalent decreases in household saving.

Empirical analyses are inconclusive with respect to the extent of this phenomenon. Poterba (1987) concludes that households only partially pierce the corporate veil, a conclusion that is supported by Auerbach and Hassett (1991). One argument explaining this result is that the propensity to consume out of income that is received in the form of dividend payments differs from the propensity to consume out of a change in wealth if profits are not paid out. These changes in wealth might also be only temporary. Furthermore, as Poterba (1987) notes, the ownership structure of shares is highly skewed within the United States. If rich people have a lower propensity to consume than the poor people and the largest fraction of dividends accrues to the top 10 percent of the wealth distribution, a change in corporate saving is not mirrored by a

[3] The World Saving Database is available at the World Bank website (http://go.worldbank.org/CBSLXPRUN0).

change in household saving. This is particularly true if the wealth distribution is more skewed than the income distribution. Moreover, figure A2.1 in the Appendix shows the time trend of corporate and household savings for selected countries. If households pierced the corporate veil, changes in one sector should be offset by changes in the other sector. Among the examined countries, this expectation only holds true for Japan.

Corporate net lending, which reflects corporate savings less corporate investments, is a topic that has been examined in greater detail than corporate saving (cf. International Monetary Fund (2006), Loeys et al. (2005) and André et al. (2007)), as corporations in OECD countries exhibited positive net lending in many years of the previous decade. André et al. (2007) provides a good descriptive overview of the development of corporate net lending and changes in corporate gross saving from 2001 to 2005. These authors conclude that most of the increase in net lending is unlikely to be persistent and that the underlying causes of this increase vary by country. In Japan, for instance, the observed increase in net lending was motivated by a desire to reduce excessive debt burdens, whereas in the United Kingdom, this increase was triggered by the increasing importance and profitability of the financial sector and in Germany, this increase was indicative of the increased competitiveness of industrial companies.

Few studies addressing the aggregated corporate saving rates of single countries exist. One of these studies is the investigation of Aron and Muellbauer (2000), who examine corporate saving in South Africa from 1966 to 1997 and note that corporate saving is "underresearched". They estimate a coefficient of 0.5 for the lagged saving rate and conclude that it takes one year to correct for half of the difference between a particular saving rate and the normal saving rate. Bayoumi et al. (2010) address Chinese corporate saving, investigating the allegedly excessive savings of Chinese firms. Based on a comparison of listed Chinese firms with firms from 51 other countries from 2002 to 2007, Bayoumi et al. (2010) reject the hypothesis that listed Chinese firms demonstrate a higher saving rate than the global average. Moreover, they explain that high saving rates in China reflect extensive corporate investment; in fact, this investment caused China to be the only country in their sample that displayed negative net savings[4] over the entire period that these researchers examined. However, the companies that were investigated reflect only one third of all enterprise profits in China. The saving rate may thus be comparable on a listed firm level,

[4] Bayoumi et al. (2010, p.5) calculate the net saving rate as gross savings/asset - investment/assets. In the SNA terminology, net savings refers to gross savings less depreciation.

but the aggregated corporate gross saving rate in China is still among the highest in the world. Kuijs (2006) takes a different perspective on the Chinese corporate saving rate and argues that it is among the highest in the world. However, the years used for comparison are 2004 and 2005 for China and these two years are indeed characterized by high corporate saving rates compared to previous and following years. Furthermore, the data for the countries of comparison, such as Japan, Korea and the United States, are from 2002, which are lower than in 2004 or 2005. Kuijs (2006) explains the high saving rates with the high investment rates that are mainly financed internally. A potential contradiction between Bayoumi et al. (2010) and Kuijs (2006) can be explained by the difference between the firm- and country-level analysis. On a firm-level the saving rates are in line with other countries, because the ratios are built over assets. On an aggregate level, the rate over GDP is higher than in other countries because the share of capital intensive industries in the economy is higher for China.

The second block of literature I introduce presents a micro or finance-based view of corporate savings and firm behavior. André et al. (2007) mention the importance of payout behavior for gross saving, as gross saving is calculated as profits less dividends. The need to integrate share repurchases into considerations of corporate saving is based on the increasing relevance of these behaviors across all of the OECD countries.[5] Grullon and Michaely (2002) highlight the importance of share repurchases in the United States, where share repurchases surpassed dividends as a method of distributing cash to shareholders for the first time in 1999. They find evidence for their hypotheses that share repurchases are a substitute for dividends. This substitution effect is my motivation for treating share repurchases and dividends in a similar manner by subtracting these repurchases from gross savings. The European Central Bank (2007) confirms the growing importance of share repurchases in the euro area and claims that excess profits prior to the financial crisis were the main driver of this habit. Von Eije and Megginson (2008) investigate patterns of share repurchases in Europe and argue that most of the observations for the United States can also be found with some time lag in Europe. Based on these findings, I incorporate share repurchases into my analysis of corporate savings.

There are many reasons for the increasing importance of share repurchases. The rationale behind share repurchasing programs and a critique of these reasons is not a focus of this chapter.

[5] Cf. table A2.1 in the Appendix for an overview of the magnitude of share repurchases in OECD countries.

However, I nonetheless wish to list the following primary reasons that drive the increasing popularity of these repurchasing programs. First, executives of listed companies typically receive shares of the company as an aspect of their compensation. Therefore, companies repurchase their own shares from the market to ensure that shares are available for distribution to these executives. Moreover, because the value of the shares executives receive as remuneration is linked to the share price performance, these executives have an incentive to conduct price nursing via share repurchase programs. Furthermore, in certain countries, capital gains are taxed differently than dividends. Therefore, increasing shareholder wealth through repurchases instead of dividends may provide tax advantages for shareholders. Share repurchases also gained importance during a period of high corporate profits because share repurchase programs provide a method for paying out these profits without changing dividends and raising shareholders' expectations regarding future dividends too much.

The macroeconomic measure of corporate gross savings is reflected by the financial term of "retained earnings", i.e., profits after taxes and interest less payouts. One influential reference that addresses corporate savings is the work of Lintner (1956), who writes about the distribution of profits among dividends, retained earnings and taxes. Lintner argues that companies smooth their dividend payments and that dividends therefore depend on both current profits and past dividends. There are many uses of retained earnings. As discussed above, retained earnings may be used for share repurchases. Furthermore, companies utilize retained earnings to finance investments, repay debt, or increase their cash holdings. While the former represents a payout to shareholders, the latter three purposes for retained earnings have different determinants. As Myers and Majluf (1984) reveal, internal funds are required to conduct investment; moreover, their well-known pecking order states that firms prefer internal funds to external funds for financing investments. Among the many existing empirical studies supporting this pecking order theory, I want to highlight the survey results of Graham and Harvey (2001). Various researchers, including Bates et al. (2006), Almeida et al. (2004) and Opler et al. (1999), study reasons for cash holdings and use firm-level data to assess different time periods in the United States. Through examinations of different theories and motives, such as the transaction, precautionary, tax and agency motives, they find that cash holdings increase with idiosyncratic risk, cash flows, growth opportunities and financing frictions. The work of Acharya et al. (2005) is closely linked to the studies about cash holdings. However, these researchers exhibit a narrower focus on the

relationship between cash holdings and the repayment of debt; they find that this relationship depends on the hedging needs that are created by financial constraints.

The contribution of this study is threefold. First, single- and cross-country analyses of the corporate sector are scarce. Moreover, the few studies that are available typically examine the entirety of the corporate sector, including both financial and non-financial corporations. In this study, I investigate the non-financial corporate sector alone as financial corporations differ in their behavior from the real economy. Second, share repurchases have attracted increasing interest in recent years. However, to the best of my knowledge, no attempt has been made to aggregate share repurchases on a country level for a large set of countries and to combine this examination with the macro analysis of saving patterns. Third, the adjusted saving rate provides new insights regarding the saving glut hypothesis.

2.3 THE CORPORATE SAVING GLUT – THE CASE OF THE G7 COUNTRIES

In the time span that Bernanke referred to in his speech about the global saving glut (1996 – 2004), all of the G7 countries exhibited either increased or constant corporate saving rates. However, this conclusion changes dramatically if the saving rate is adjusted for additional corporate payouts via share repurchases.[6] After this adjustment, the aggregate saving rate of the G7 countries remains unchanged during the time span of interest, and only Japan and Canada exhibit a permanent increase in corporate saving rates. A formal test of the saving glut hypothesis confirms that there was indeed a corporate saving glut in the largest economies of the world for the years from 1996 to 2004 if the United Nations System of National Accounts (UN SNA) definition for the corporate saving rate is used. However, this hypothesis must be rejected if a more appropriate measure of aggregated corporate savings that includes an adjusted rate for share repurchases is employed (cf. tables 2.1 and 2.2).

[6] A detailed description of share repurchases and the adjustment of the saving rate is given in section 2.4.2.

Table 2.1

Average non-financial corporate saving rates in the G7 countries, as a percentage of GDP

Type of corporate saving rate	Total period (1987-2007)	Before saving glut (1987-1995)	Saving glut (1996-2004)	Change between the prior period and the saving glut period
UN SNA definition	10.03	9.46	10.34	+9.3% (0.88 p.p.)
Adjusted	9.35	9.24	9.61	+4.0% (0.37 p.p.)

By the UN SNA definition of corporate saving, during the period of the saving glut, corporations increased their saving relative to GDP by 9%, or almost a full percentage point. However, after accounting for share repurchases and employing a saving rate that is adjusted for more modern firm payout behaviors, this change diminishes to a modest increase of 4% or less than 0.4 percentage points.

A formal test of the hypothesis H_0: $saving\ rate_{Before\ Saving\ Glut} = saving\ rate_{Saving\ Glut}$ against H_A: $saving\ rate_{Before\ Saving\ Glut} \neq saving\ rate_{Saving\ Glut}$ supports this perspective (cf. table 2.2). Based on the tests that are presented in table 2.2 and the average saving rates shown in table 2.1, I confirm the hypothesis that the corporate sector did not cause the global saving glut.

Table 2.2

Tests of the saving glut hypothesis (H_0: No saving glut)

	p-values of median tests			
Type of corporate saving rate	G7 countries aggregated	G7 countries pooled	G7 countries aggregated (until 2007)	G7 countries pooled (until 2007)
Original (UN SNA) saving rate	0.001	0.212	0.009	0.036
Adjusted saving rate	0.157	0.373	0.318	0.545
# of observations	18	126	21	147
years - before saving glut (#)	1987-1995 (9)	1987-1995 (63)	1987-1995 (9)	1987-1995 (63)
years - saving glut (#)	1996-2004 (9)	1996-2004 (63)	1996-2004 (9)	1996-2004 (63)
years - after saving glut (#)	---	---	2005-2007 (3)	2005-2007 (21)

represents the number of observations.

As the saving rate during the saving glut years is not normally distributed, I use a nonparametric k-sample test on the equality of medians. Using the UN SNA definition, this test strongly rejects

the null hypothesis that both distributions are drawn from a population with the same median value for the aggregated saving rate of the G7 countries, thus confirming the saving glut hypothesis. However, if this test is used to assess the adjusted saving rate, I obtain a p-value of 15.7% and cannot reject the null hypothesis. Pooling the saving rates of all countries provides a larger number of observations. For the 126 country-year observations the saving glut hypothesis can also not be rejected. Again, correcting for share repurchases gives a p-value of 37.3% and strengthens this paper's hypothesis that the corporate sector did not contribute to a saving glut. The inclusion of all of the years until the start of the crisis increases the sample size to 147 observations and accounts for the particularly high saving rates that were observed prior to the crisis. It is particularly apparent for the sample that includes these pre-crisis years that an examination of standard national account figures produces different conclusions than the results that are generated from more reasonable economic assumptions underlying the adjusted saving rate. The hypothesis that all of the saving rates are drawn from a sample with the same median cannot be rejected for the adjusted corporate saving rate. Thus, if corporate saving measures are examined in a detailed manner that incorporates an adjustment for all corporate payouts, tests with four different samples confirm my rejection of the commonly held perspective that a corporate saving glut occurred prior to the recent financial crisis. Figure 2.2 illustrates the adjusted and unadjusted saving rates for all G7 countries from 1980 until 2008, providing a visualization of the differences between these two measures of corporate savings for the by then largest economies in the world.

Figure 2.2

Non-financial corporate sector saving rates in G7 countries

The dotted line indicates the saving rate of non-financial corporations, as measured by the SNA. The solid line indicates the adjusted saving rate, which is calculated as the official saving rate less share repurchases.

Figure 2.2(a): Canada, Japan, the United States and the G7 as a whole

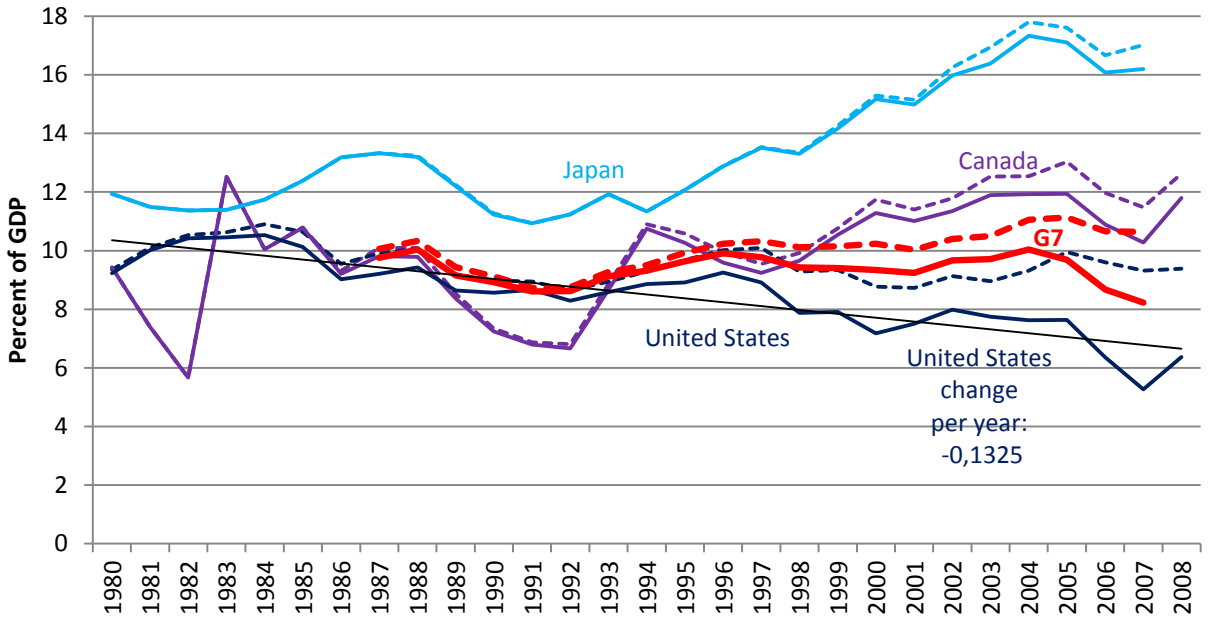
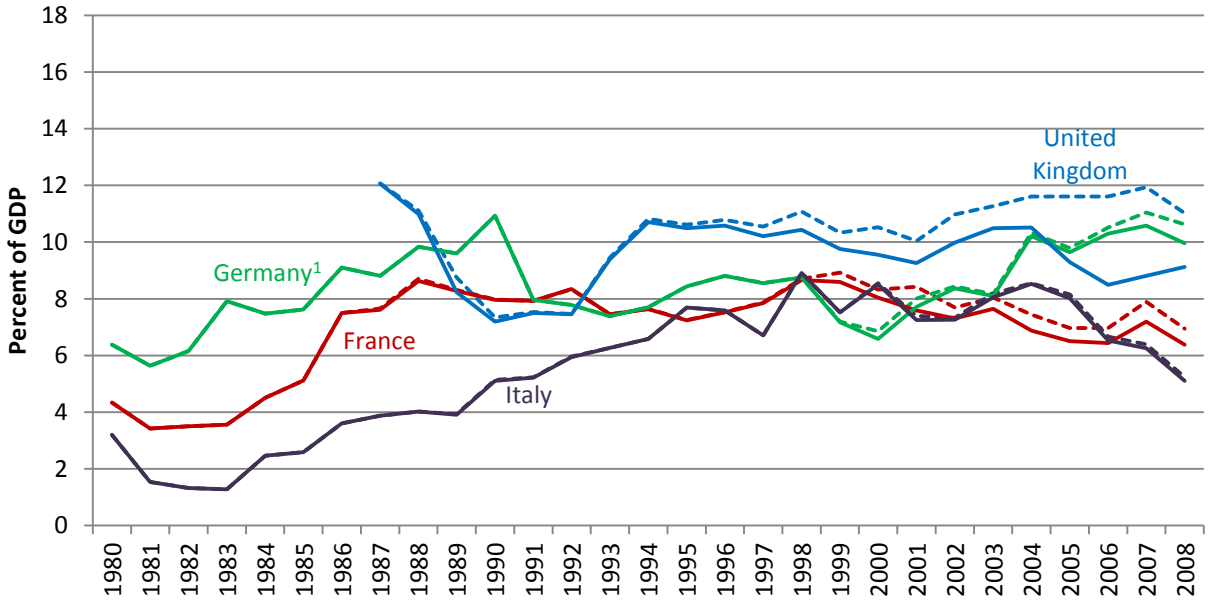


Figure 2.2(b): European G7 countries



[1)] Data prior to 1991 are based on West Germany.
Data source: UN SNA, Bureau of Economic Analyses (BEA), World Saving Data Base, Worldscope.

By the SNA definitions assumptions, the United States exhibited the same corporate saving rate in 2008 and 1980, but the adjusted saving rate reveals to us that the yearly decrease in this saving rate was as high as -.13 percentage points of GDP over the course of almost 30 years. The high saving rate in Japan can be explained by an extended phase of reducing the debt burdens that were built up during the Japanese asset bubble in the late 1980s and by the high share of depreciation caused by a high capital stock. Canada's increase in corporate saving is linked to a surge in commodities and the increasing share of the corporate sector in Canada's GDP. European corporate saving rates remained in a narrow band during the 1990s and early 2000s but widened after 2005 based on diverging developments in the European G7 nations with respect to economic profitability. The corporate saving rates of France and Italy were especially low in the early 1980s. This phenomenon reflects the high rate of inflation that existed in these countries during the years in question; these inflation rates discouraged corporate saving because corporations experienced significant gains from lowering their real debt burden.[7]

It may be argued that the integration of statistics from more countries, particularly China, could change the results that are presented above. However, the G7 countries accounted for more than 60% of global GDP in each of the examined years and are therefore a valid proxy for the world economy. Furthermore, Chinese figures are subject to frequent changes, and the Chinese economy was not yet of such a big importance during the time frame that Bernanke referenced, as its share in the world economy was below 5% in 2004. Moreover, Bayoumi et al. (2010) reveal that listed Chinese corporations do not exhibit a higher saving rate than companies elsewhere. Chinese aggregated corporate saving rates are for example comparable to the United Kingdom from 1995 to 2003, falling below the United Kingdom's rates from 1996 to 1998 and surpassing it in 2000 and 2001. 2004 is the only year, in which China's saving rate clearly exceeded its counterpart in Europe.

These findings alter the understanding of the roles of different sectors prior to the financial crisis and have significant implications. First, during the alleged saving glut, the corporate sector did not provide significantly more capital relative to GDP to the global investment market than it did during the preceding time period. Second, many firms, especially corporations in the United States, have been heavily decreasing their supply of capital instead of keeping the rate constant.

[7] André et al. (2007) calculate inflation adjusted gross saving rates. I refrain from this adjustment but include the inflation rate as an explanatory variable in the econometric analysis of this study.

Third, the declining saving rate of American households, which was below 3% of GDP from 2005 to 2007, is moderated and less steep if it is adjusted to account for changes in wealth that result from corporate share repurchase programs. If households in the top income decile have a higher propensity to save than the other 90% of households, and because the top 10% also hold the largest fraction of common stock,[8] a large part of the share repurchases can be attributed to household saving from a wealth perspective. This, however, does not alter the problem of too low household savings from a distributional perspective, because the majority of households does not benefit from the share repurchases and the resulting increase in wealth. Fourth, the System of National Accounts needs to be complemented by other metrics of corporate saving that reflect changing firm payout behavior. This topic has been extensively studied on a micro level but was neglected on an aggregated level when looking at savings.

In a next step, I address part of the research needs resulting from the findings presented above by investigating the determinants of the aggregate corporate saving rate and the changes in these determinants in the context of an adjusted saving rate.

2.4 AN EMPIRICAL ANALYSIS OF THE AGGREGATE CORPORATE SAVING RATE

2.4.1 Hypotheses and theory

The empirical analysis is based on a selection of theoretical models. There are various theories that explain demand for internal funds, e.g., investment needs or cash holdings. But those theories do not cover the entire aspect of corporate savings, so that it becomes necessary to combine the explanations of several models. A starting point for the empirical analysis in this study is Lintner's model of the distribution of corporate income among dividends, retained earnings and taxes. Following Lintner (1956), I choose profits and the lagged saving rate as main determinants of the saving rate and supplement these two by further explanatory variables. In his simple model,

$$(2.1) \qquad Div_{i,t} = \alpha_i + \alpha_1 Profits_{i,t} + \alpha_2 Div_{i,t-1} + \varepsilon_{i,t}$$

dividends (Div_t) are determined by profits ($Profits_t$) and by previous year's dividends (Div_{t-1}). Lintner argues that firms actively decide their dividend policy and that savings are therefore determined by the residual value of firm profits after this distribution of dividends. The rationale

[8] Poterba (1987) states that the top decile of the wealth distribution holds 85% of common stock.

for Lintner's equation is the belief that because shareholders prefer a stable dividend, managers only partially adjust dividends to firm profits. Thus, although dividend payout ratios are not held constant, they are smoothened to avoid raising expectations regarding payouts if exceptionally high profits are realized in the current year. A constant stream of income via dividends reduces income uncertainty among shareholders and increases the credibility of firm managers who are able to provide a consistently positive firm performance.

However, the decision about the amount of dividends to be paid out is at the same time a decision regarding the amount of earnings that are retained in order to conduct investments, increase cash holdings, reduce debt or buy back shares. Given an increasing stock turnover rate,[9] a reduction of dividend payout ratios and the increasing share of listed companies that do not pay dividends at all,[10] the argument that savings are merely a residual no longer holds true, and the investigation of corporate saving patterns is therefore necessary.

Using the distribution of a firm's profits between dividends and savings, (2.2), I reformulate Lintner's model, (2.1), to derive a basic saving equation, (2.3):

$$Profits_{i,t} = Dividends_{i,t} + Savings_{i,t} \tag{2.2}$$

$$Saving_{i,t} = \propto_i + \beta_1 Saving_{i,t-1} + \beta_2 Profits_{i,t} + \varepsilon_{i,t} \tag{2.3}$$

As argued above, this saving or dividend-smoothing based on Lintner is insufficient for estimating a more realistic savings equation. Consequently, to estimate the determinants of saving, I integrate further theories about the demand for internal funds.

Current investment needs: According to the pecking order theory of Myers and Majluf (1984), a firm prefers to use internal funds instead of external funds for its investments. Thus, investment (*Inv*) is added to the list of explanatory variables. I expect a positive sign for the coefficient of this variable, given that higher investment is associated with a higher need for financing, and part of this financing is typically internally funded. The investment variable incorporates current investments.

[9] The stock market turnover rate in the U.S. increased from 0.61 to 3.5 between 1988 and 2009; in the United Kingdom, this rate increased from 0.75 to 2.67 between 1988 and 2007 (cf. database by Demirgüc-Kunt and Beck (2009)).

[10] Eugene F. Fama and Kenneth R. French (2001) report that 2/3 of listed American companies paid cash dividends in 1978 but that only 1/5 of listed American companies paid dividends in 1999.

Future investment needs: Growth expectations further influence future investments and future capital requirements. To cope with future financing needs, firms that do not wish to rely on perfect capital markets must stockpile cash. In firm-level analyses, Tobin's q is frequently used as a proxy for future investment opportunities. Because this paper conducts its estimations on a country level, I use GDP growth (*GDPg*) as a proxy of future investment needs. Higher levels of GDP growth should be accompanied by higher saving rates because of the positive investment outlook and show a positive sign in the analysis. Another indicator is the change in GDP growth (*d_GDPg*). Declining growth rates signal decelerating lower future investment demand and therefore lower capital demand; similarly, increasing growth rates may be regarded as an indicator of higher capital demand. Thus, the sign of this regressor is also expected to be positive.

Risk and uncertainty: In addition to the influence of investment outlook, corporations also demonstrate a higher demand for capital when they increase their pile of cash during periods of higher idiosyncratic risk and higher macro uncertainty. Although idiosyncratic risks are diminished at the aggregate level in the macro analysis of this study, the inflation rate (*cpi*) is used as measure of macro-level uncertainty. The expected positive sign results from a precautionary motive. The higher the uncertainty, the more funds companies will set aside to maintain their liquidity. The cash can then be used to smooth dividend payments if profits are lower than expected and to invest if a more uncertain market outlook leads financial markets to restrict their provision of funds. However, inflation also produces an opposing effect. Higher inflation rates increase the costs of holding cash and lower the incentives to save. This negative effect is reinforced by the impact of inflation on corporate debt. The higher the rate of inflation, the more debt is inflated away and the lower are the incentives to save. Thus, the overall sign of the inflation variable is unclear and depends on which of the aforementioned effects prevails.

Changing payout behavior/share repurchases: A further reason to increase savings are share repurchases (*Buybacks*), which are added to the model as a regressor. Grullon and Michaely (2002) show that share repurchases are a substitute for dividends and are conducted out of funds which would otherwise have been used to pay out dividends. Because share repurchases are carried out through retained earnings, this method of corporate payout increases the saving rate. The quantity of share repurchases has been constantly increasing since the 1990s and reached its peak prior to the financial crisis in 2007. In fact, in 2007, aggregate share repurchases have reached 4% of GDP in the United States. Share repurchases are an important factor for explaining

the increase in corporate saving and should therefore exhibit a positive sign in the regression estimation. Many motivations for share repurchases exist. In addition to the need to pay out funds to shareholders without increasing dividends and shareholders' expectations of steady streams of income, managers also have a high incentive for share repurchases because these transactions increase the stock price and their remuneration is dependent on the performance of a firm's stock.

Institutional factors: Additional explanatory power for the demand for internal funds comes from institutional factors. One of these factors is the depth of financial markets. More advanced financial markets provide easier access to external financing and therefore involve lower requirements for internal funds. The reliability of financial markets and the banking system is crucial for planning the stock of cash that is held by a corporation. If external funds were always available at a fair rate, there should not be a need to hold on to cash reserves. The ratio of private credit by deposit money banks and other financial institutions to GDP (*finsystem*) is a widely accepted proxy for the development of financial markets.[11] Because pooling funds from savers and channeling these funds to borrowers is the inherent task of financial intermediaries, increasing credit provision is associated with deeper financial markets. Furthermore, lower spreads and less expensive risk-adjusted credit terms are indicators of the sophistication of financial markets and conditions for increasing credit provisions. The depth of financial markets should have a negative impact on the saving rate since firms need to rely less on internal financing.

2.4.2 Dataset

Macro-level variables

To test the aforementioned hypotheses regarding the determinants of the saving rate, I use a unique panel dataset that is based on multiple sources. The main source for all of the savings-related data that are used in this chapter is the UN SNA.[12] The UN SNA provides saving data by institutional sector, including information on the non-financial corporate sector for 64 countries. I use a maximum time length of 39 years (1970-2008), depending on data availability. To increase the number of countries that are included in the assessed data and to derive a more balanced panel dataset, I append relevant statistics for Australia, Canada, New Zealand and the United States

[11] A more detailed description of this proxy can be found in chapter 4.
[12] http://data.un.org/Browse.aspx?d=SNA.

from national sources because the UN SNA data for these nations either do not span the entire study period or are incomplete with regards to the different variables. The total country sample comprises 68 countries, including 30 out of the 34 OECD countries.[13] The same data sources are used to obtain additional sector-specific variables, such as gross operating surplus (*profits*), consumption of fixed capital (*depreciation*) and gross fixed capital formation (*investment*). The sector variables exclude the financial sector because this sector behaves differently than the real sector in terms of saving and investment decisions. Furthermore, it is the corporate sector and not the financial sector that is accused of having excessively saved, whereas financial institutions are blamed for having accumulated overly high leverage and therewith too much debt. All of the variables from the UN SNA are obtained as levels but are transformed to ratios over GDP to exclude size effects, transform the data to stationary series and render the data comparable across countries.

The World Development Indicators by the World Bank serve as the second source for cross-country data for the 1970 to 2008 time period. All data on inflation (*cpi*), GDP growth (*GDPg*) and change in GDP growth (*d_GDPg*) for the 68 countries are based on this database. The data are again utilized in terms of percentages. Information regarding institutional factors, such as the depth of financial markets (*finsystem*), is based on the updated financial institutions database of Beck and Demirgüc-Kunt (2009), which is available through the World Bank. Beck and Demirgüc-Kunt provide the ratio of private credit by deposit money banks and other financial institutions to GDP. This ratio serves as a proxy for the importance of financial intermediation in a country and the availability of external financing. According to Beck and Demirgüc-Kunt (2009, p.6), this metric "is a standard indicator of the finance and growth literature".

Micro-level variables – share repurchases

A major contribution of this paper is the integration of share repurchases into macro-level research. Because information regarding share repurchases on an aggregate level is not available through any database, firm-level data regarding share repurchases were collected and aggregated to derive comparable data on the country level. These firm-level data are based on the

[13] Statistics for the OECD countries of Iceland, Israel, Luxembourg and Turkey are not available.

Worldscope database from Thomson Financial.[14] Share repurchases are defined as *Purchase of common and preferred stock* based on the firms' cash flow statements (Worldscope source code 4751). Because the focus of this analysis is on the non-financial sector, I exclude all banks, insurance companies, holdings and other investment offices with SICs of 6000 to 6499 and 6700 to 6799 from the aggregation of share repurchases. Worldscope claims to cover 95% of global market capitalization and has full coverage of the United States and Western European markets. The time series that is covered by Worldscope begins in 1980 and lasts until 2010. As share repurchases were of minor importance prior to 1980 in the United States[15] and nonexistent in many other countries, I assume the aggregate quantity of share repurchases to be 0.0% of GDP prior to 1980 for the entire dataset. Worldscope offers data for all of the OECD countries and a total of 66 countries. As not all countries with information on non-financial saving are covered by Worldscope, I further reduce the dataset to all of the available OECD countries. This gives a more homogenous and less unbalanced dataset. More details on share repurchases on an aggregated level (table A2.1) and on a firm level (table A2.2) are provided in the Appendix.

All of the variables that are used in the analysis are transformed into ratios with respect to GDP, if applicable. Total levels of saving are not of particular interest to this analysis; I assume that the size of a single firm affects its options to be active in the financial markets and therefore impacts its saving decisions but that the size of an economy does not influence its aggregated saving patterns in a systematic manner. The inclusion of total nominal GDP as a size variable in my analysis confirms this hypothesis because *size* did not turn out as significant. The dataset is unbalanced as not all countries provide the relevant variables for the entire time period. Unbalanced panel data are problematic if there is a systematic reason for the exclusion or inclusion of certain country years in the estimation. Following Stock and Watson (2007, p. 351), I argue that the unbalanced panel is not an impediment in this situation because the length of the data series for each country is random. There is no relation between saving patterns and the provision of data for OECD countries when countries like Canada, France and the United States provide data for the entire time period but Ireland, Switzerland and the United Kingdom do not

[14] I am grateful to the Economic Business Data Center of the ifo institute and the Ludwig-Maximilians-Universität München for supporting this research by providing access to Worldscope.

[15] Grullon and Michaely (2002) compute the value of repurchases/earnings-ratios for listed American US companies and find an average value of 3% for this proportion between the years 1972 and 1979, with a maximum of 5.4% in 1973. During this period, dividends were an average of 12 times higher than share repurchases, and share repurchases were an average of 0.1% of GDP.

provide data prior to 2002, 1990 and 1987, respectively. Table A2.1 in the Appendix provides an overview of the years covered, the maximum and minimum saving rates, and the magnitude of share repurchases for each country.

2.4.3 Descriptive analysis

To build the dataset for the analysis, I begin with a balanced dataset that addresses a relatively short time period and includes countries without gaps in the data (N=20, T=10). Increasing the dataset in width and length alters the correlations of most variables only to a minor extent, which supports me in increasing the number of observations that are used in this analysis at the cost of the balanced panel. Two subsets of OECD countries with N=22 and N=30 are used for the analysis. The larger sample includes Eastern European and Latin American countries. The time period covers the years from 1979 to 2008 (T=30).[16]

Table 2.3

Correlation matrix of dependent and independent variables

The adjusted saving rate (saving rate less share repurchases) is labeled *Saving_New*. The prefix *L* indicates the first lag of a variable. The number of observations is 565 and covers 30 OECD countries over the years from 1979 to 2008. Correlation coefficients that are insignificant at the 5% level are written in *italics*.

Variable	Saving	LSaving	Saving_New	LSaving_New	Buybacks	Profits	Inv	GDPg	d_GDPg	cpi
Saving	1.000									
LSaving	0.899	1.000								
Saving_New	0.984	0.876	1.000							
LSaving_New	0.893	0.979	0.894	1.000						
Buybacks	0.110	0.144	*-0.071*	*0.011*	1.000					
Profits	0.353	0.305	0.341	0.345	0.073	1.000				
Inv	0.372	0.379	0.406	0.418	-0.178	0.258	1.000			
GDPg	0.211	0.175	0.221	0.197	*-0.051*	0.160	0.349	1.000		
d_GDPg	0.096	*-0.019*	0.103	*-0.005*	*-0.038*	*0.009*	*-0.060*	0.503	1.000	
Cpi	-0.251	-0.285	-0.225	-0.270	-0.144	*0.012*	0.172	0.015	*-0.092*	1.000
Finsystem	0.089	0.129	*0.004*	*0.061*	0.468	0.037	*-0.076*	-0.245	-0.078	-0.400

There is a high correlation between the current and the lagged saving rate for both the original and the adjusted saving rate. This result indicates the stationarity of the saving rate and shows the

[16] In particular, the correlations of *Inv* and *cpi* with *Saving* and *Saving_New*, respectively, increase by slightly more than 0.1 when the dataset is increased from N=22, T=20 to N=30, T=30. The shift to the larger dataset reduces the correlation of *finsystem* with *Profits*, *Inv*, *GDPg* and *cpi* by slightly more than 0.1.

importance of including the lagged saving rate as a regressor. Share repurchases are only slightly correlated with the saving rate. While profits, investment and GDP growth are correlated as expected, inflation is associated with a lower saving rate. Contrary to the hypothesis of inflation as a proxy for uncertainty and the precautionary motive, higher inflation appears to produce greater costs from holding internal funds than benefits from insuring against uncertainty; thus, because an inflationary environment causes the costs of holding cash and the benefits of reducing the real value of debt to outweigh the value of precautionary motives, inflation is negatively related to saving. The high correlation of the depth of financial markets with share repurchases builds on the fact that share repurchases are particularly prevalent in advanced financial markets. The adjusted saving rate exhibits the same properties as the saving rate except with respect to the correlations with share repurchases and the depth of financial markets. The latter of these factors is no longer correlated with the adjusted saving rate, whereas the former factor demonstrates a negative correlation. All of the variables exhibit relatively high variations across time and across countries and are therefore suited for panel analyses.[17]

2.4.4 Econometric specification and estimation

Based on the theories and hypotheses described in section 2.4.1, the model of interest is as follows:

$$Saving_{i,t} = \alpha_i + \beta_1 Saving_{i,t-1} + \beta_k X_{i,t} + \beta_j Yeardummy_t + \varepsilon_{i,t} \quad (2.4)$$

where $X_{i,t}$ is a vector of further explanatory variables as explained above: *profits, share repurchases (Buybacks), inflation (cpi), investment (Inv), GDP growth (GDPg), change in GDP growth (d_GDPg) and the depth of financial systems (finsystem). Yeardummies* are added to capture time effects that are common for all countries. Econometric issues that need to be addressed in this type of estimations are nonstationarity, heteroskedasticity and endogeneity.

Nonstationarity: A potential problem of nonstationarity can be neglected as the saving rate is calculated as ratio over GDP and is bound between 0 and 1. It can consequently be regarded as stationary.

[17] Cf. table A2.3 in the Appendix for a further description of the variables.

Heteroskedasticity: The Breusch-Pagan/Cook-Weisberg test strongly rejects the hypothesis of homoskedasticity so that I use robust standard errors in all estimations to deal with heteroskedasticity.

Endogeneity: The issue of endogeneity is more severe: The econometric specification with a lagged dependent variable combined with the characteristics of this macro-level dataset (rather small N and large T) is not ideal for econometric analyses. There are country-inherent characteristics, like firm structure, sector mix and institutional factors that are not covered by the regressors in the estimation equation. A fixed effects model is a good choice to allow for this obstacle. Fixed effects models require exogenous regressors and thus do not work properly in combination with a lagged dependent variable as the lagged dependent variable is vulnerable to endogeneity and therefore violates an OLS assumption. This endogeneity causes a bias that increases for greater correlation coefficients. However, because the bias caused by the lagged dependent variable diminishes with increasing time periods, fixed effects models can still be used under certain circumstances. As shown by Alvarez and Arellano (2003), a fixed effects model can be used if one accepts a bias of the magnitude 1/T. Because panel data estimation methods are mostly developed for micro data ($N \rightarrow \infty$ and small T), the asymptotic properties of those estimators do not fit macro panels (moderate N and moderate to large T) very well. I still use the fixed effects model as the bias diminishes to 6% as $T \rightarrow 18$.[18] This has to be kept in mind when interpreting the coefficients. In his description of the Arellano-Bond and Blundell-Bond GMM estimators, which are typically used for dynamic panel data, Roodman (2009) states that "If T is large, dynamic panel bias becomes insignificant and a more straightforward fixed effects estimator works". To compare the fixed effects model with a GMM model, I use the Arellano-Bond estimator. Both the Arellano-Bond and Blundel-Bond estimators require the number of instruments to be smaller than the number of groups. Overfitting a model by including too many instruments brings those GMM estimators closer to an OLS estimator, which is acceptable if the large number of instruments results from a large number of years (cf. Alvarez and Arellano, 2003). Overfitting is apparent for this panel dataset with 30 OECD countries and more than 20 years of observations, given that the number of instruments is increasing quadratically in T for a standard GMM setting (cf. David Roodman, 2007). As Alvarez and Arellano (2003) argue, the

[18] Although T=30, due to the unbalanced nature of the dataset, the average number of years for N=22 is 20, and the average number of years for N=30 is 18.

convergence to an OLS estimator is desirable if it is caused by a large T because the endogeneity bias is reduced by the number of time periods. Therefore I choose the Arellano-Bond estimator, albeit with the realization that this estimator will generate a bias that in this case approaches 1/N (cf. Alvarez and Arellano, 2003). Both regressions produce similar results, as shown in table 2.4.

Table 2.4

Regression analysis of the saving rate

I estimate different models to examine the impact of the independent variables on the saving rate for the time horizon and country set covered in these data. T=30 and represents the years from 1979 to 2008. N=30 represent all OECD countries except for Iceland, Israel, Luxemburg and Turkey. N=22 is a further reduced subset of OECD countries that excludes all Eastern European and Latin American OECD countries. The Arellano-Bond model is estimated with the dynamic panel data command *xtdpd*. *LSaving*, *Buybacks* and *Profits* are treated as endogenous, and GMM-type instruments are used. Robust standard errors are used in all estimations.

	Fixed effects model				**Arellano-Bond**	
	Non-dynamic		Dynamic		Dynamic	
Variable	N = 22	N = 30	N = 22	N = 30	N = 22	N = 30
LSaving	-	-	.6808***	.6195***	.6711***	.6264***
Buybacks	.2128	.3691	.0741	.2071	.0820	.1966
Profits	.2545*	.3454**	.1211**	.1731**	.1276**	.1723**
Inv	.0007	.1520	-.0547	.0063	-.0427	.0083
cpi	-.0007	-.0008	-.0001	.0001	-.0003	.0000
GDPg	.0025*	.0009	.0005	-.0003	.0005	-.0004
d_GDPg	-.0001	.0003	.0018***	.0014***	.0018***	.0014***
finsystem	-.0164 **	-.0159 *	-.0064***	-.0069**	-.0063 ***	-.0065**
constant	.0775***	.0183	.0283**	.0060	.0261**	.0109
# of observations	475	588	460	565	460	565
within-R^2	0.47	0.48	0.73	0.68		
between-R^2	0.07	0.13	0.95	0.77		
overall-R^2	0.19	0.22	0.86	0.76		
Test for 2nd-order auto-correlation					0.05	0.09

***, **, * denote statistical significance levels at 1%, 5% and 10%.

Before interpreting these results, I refer to a study by Judson and Owen (1999) who show that GMM produces an underestimation of coefficients, whereas an OLS estimator overestimates the coefficient of the lagged dependent variable and underestimates the coefficients of the other regressors. Furthermore, the inclusion of a lagged dependent variable suppresses the explanatory power of the other regressors. Therefore I estimate a model without the lagged saving rate for comparison. The lagged dependent variable can be regarded as conveying the long-run effects of

the other regressors and showing the persistence of the saving rate, independent from the most recent macroeconomic developments.

Including the lagged saving rate in the regression increases the R^2 values of the N=22 and N=30 estimations from .19 and .22, respectively, to .86 and .76, respectively. The high coefficient of *LSaving* indicates that approximately two thirds of the saving rate is predicted by factors from previous years. The current saving rate determines 24% of the saving rate in three years for the larger sample of countries (32% for the smaller sample of countries). Profits also have a large influence with 17% and 12%, for the N=30 and N=22 estimations, respectively. When the ratio of profits to GDP increases by 1 percentage point the saving rate increases by .17 percentage points. Not taking previous years saving into account would double the impact of profits on the saving rate. Changes in the rate of GDP growth do have a significant but only minor influence. *Finsystem*, the proxy for the depth of the financial system and the availability of credit, is as expected and has a negative and significant impact. Every increase of 10 percentage points in the ratio of private credit to GDP decreases the corporate saving rate by .06 percentage points. Most surprisingly, share repurchases as well as investment, both key uses of internal funds, do not influence the magnitude of corporate saving on an aggregated basis in the dynamic and non-dynamic models. On an aggregate level, the corporate sector's capital supply to the economy is independent of its actual capital needs but reacts to institutional settings, operating surpluses and changes in the rate of GDP growth. The main difference of including Eastern European and Latin American countries in the analysis is a lower impact of the lagged saving rate and a higher influence of profits, showing that these countries exhibit less stable saving rates. The results of the Arellano-Bond approach for the N=22 country sample show a high level of 2^{nd}-order autocorrelation that can just be rejected at the 5 percent level. This means that the use of lagged instruments is not valid and that we cannot properly interpret the estimation results.

Table 2.4 presents the effects for the non-financial corporate saving rate as measured by the SNA. In a second step I amend the definition of savings in order to derive a more accurate description of savings. Savings in this logic are all funds that are kept within a firm to fulfill an inherent task, i.e., to invest, to prepare for uncertainty by increasing cash holdings or to decrease outstanding debt. The derivation of this adjusted saving is described in the data section in detail. Nominal share repurchases are aggregated per year on the country-level, then a ratio of the aggregated share repurchases over GDP is build and this is subtracted from the standard corporate sector

saving rate to derive the adjusted saving rate. The estimation for this adjusted saving rate is shown in table 2.5.

Table 2.5

Regression analysis of the adjusted saving rate

I repeat the regressions that are presented in table 2.4 but use the adjusted saving rate *Saving_New* as the dependent variable. The GMM-type instruments in the Arellano-Bond model are *LSaving_New* and *Profits*. Robust standard errors are used in all estimations.

	Fixed effects model				**Arellano-Bond**	
	Non-dynamic		Dynamic		Dynamic	
Variable	N = 22	N = 30	N = 22	N = 30	N = 22	N = 30
LSaving_New	-	-	.6507***	.5977***	.6335***	.5951***
Profits	.2800*	.3616***	.1320***	.1833***	.1405**	.1820**
Inv	.0437	.1690***	-.0451	.0142	-.0399	.0181
cpi	-.0008	-.0009***	-.0002	.0001	.0003	.00020
GDPg	.0021**	.0007	.0003	-.0004	.0004	-.0005
d_GDPg	.0001	.0004	.0018***	.0014***	.0018***	.0015***
finsystem	-.0189 **	-.0179 ***	-.0077**	-.0078**	-.0072**	-.0073**
constant	.0646**	.0163	.0230***	.0067	.0277***	.0132
# of observations	475	588	460	565	460	565
within-R^2	0.42	0.45	0.68	0.65		
between-R^2	0.12	0.16	0.87	0.72		
overall-R^2	0.20	0.22	0.82	0.73		
Test for 2nd-order autocorrelation					0.10	0.14

***, **, * denote statistical significance levels at 1%, 5% and 10%.

The regression analysis for the adjusted saving rate produce similar results as the regression analysis of the original saving rate. All regressors in the models with N=30 keep their signs and the only regressors that change their signs in the N=22 models are insignificant. The same regressors are significant in both sets of dynamic analysis, albeit with slight changes in the t-values. Differences arise in the coefficients. Compared to the original saving rate, the impact of the lagged saving rate decreases and profits and the depth of the financial system are of higher importance. Contrary to my expectations, the exclusion of share repurchases, which are regarded as a measure to distribute additional profits to shareholders, does not smooth the saving rate but instead reduces the influence of the previous year's saving rate and increases the impact of the

more volatile profits. However, the magnitude of the differences between the coefficients is small.

The only specification that has different significant independent variables for the original and adjusted saving rate is the non-dynamic model in the case of 30 countries. In the estimation for the adjusted saving rate, investment and inflation turn out to be significant. This result is in line with the expectations. When I measure the saving rate as savings that are indeed maintained within the corporate sector, investment is highly significant and its impact is approximately 50% lower than the impact of profits.[19] This result gives further support to amend the saving rate definition of the SNA for share repurchases, since one would expect that investment has to have an impact on retained earnings of the corporate sector.

2.5 FIRM-LEVEL ANALYSIS AS ROBUSTNESS CHECK

Investigating the aggregate saving rate does not completely reveal the behavior at the firm level. To study which part of firm level behavior disappears by looking at the aggregate saving rate, the estimation of the macro level is repeated on a firm level for selected countries as a robustness check. All of the macro variables are from the sources that are described in section 2.4.2. The firm-level data are again based on Worldscope and cover the three largest European economies, namely, France, Germany and the United Kingdom. The examined time period is 1980 to 2010, and the number of companies that are examined is 4399. I proceed as in section 2.4, and exclude companies with SIC 6000 to 6499 and 6700 to 6799. The regression equation is as follows:

$$Saving_{i,t} = \alpha_i + \beta_1 Saving_{i,t-1} + \beta_l X_{i,t} + \beta_h Z_{i,t} + \beta_j Yeardummy_t + \varepsilon_{i,t} \quad (2.5)$$

where $X_{i,t}$ is a vector of macro variables *(inflation (cpi), GDP-growth (GDPg), change in GDP-growth (d_GDPg) and the depth of financial systems (finsystem))*, and $Z_{i,t}$ is a set of firm-level

[19] Extending the dataset to the maximum number of countries with information on share repurchases and aggregate corporate saving rates yields a dataset with 60 countries and approximately 900 country-year observations. This broader dataset has a similar coefficient for the lagged saving rates (both, the original and the adjusted saving rate) as the OECD countries. However, profits are insignificant, investment is significant and the coefficient of *finsystem* doubles. The implication of this result backs the theories that corporations need to rely more on internal financing in countries with less developed financial systems. But I abstain from elaborating on these results because the inclusion of the less developed countries reduces the average number of observations per country, which harms our econometric approach.

variables (*profits/assets*, *capex/assets*[20], *share buybacks/assets*) instead of country-level variables. *Yeardummy* is again added to capture time effects. Following Bayoumi et al. (2010), all of the firm-level ratios are calculated over assets and not profits because profits can be negative, hindering proper estimation procedures. Profits are calculated by adding *net income* (Worldscope source code 01551), *dividends* (#04551) and *depreciation* (#01151). *Capex* (#04601) and *assets* (#02999) are taken as provided by Worldscope. Share buybacks (#04751) are set to 0 for a firm if no value for these buybacks is reported in Worldscope. The number of observations is reduced by building the ratios, excluding the top and bottom 1‰ of the saving/assets and capex/assets ratios and integrating the macro variables into the estimation that are not available for the whole time span from 1980 to 2010 for the three countries. Depending on the estimation process, the sample used comprises approximately 1,600 firms and 14,800 to 16,000 firm-year observations.

Combining firm-level and macro variables produces certain drawbacks. Firm-level data are restricted to listed firms and do not represent the entire economy. Furthermore, listed firms are likely to be multinationals. Thus, data for these firms are likely to include profits and investments from foreign activities and therefore will not perfectly match the respective macro variables that are bound to a country's borders. This explains part of the deviation from the results that are presented in tables 2.4 and 2.5. Furthermore, there is a higher variation in firm data than in macro data. The aggregated data are likely to be stickier due to the averaging effect over the whole economy. Table 2.6 presents the results for the firm-level estimations.

[20] Capex stands for capital expenditure, i.e., investment.

Table 2.6

Firm-level analysis of the corporate saving rate

Compared with the models that are presented in tables 2.4 and 2.5, the firm-related variables are constructed as ratios over assets. All of the models are estimated with *xtdpd* because a fixed effects model would lead to high biases due to the low value of T for these models. *LSaving*, *LSaving_New*, *Buybacks/Assets* and *Profits/Assets* are treated as GMM-type instruments. Robust standard errors are used in all estimations.

		UN SNA saving rate definition		**Adjusted saving rate**	
Variable		Aggregated model	Including size var.	Aggregated model	Including size var.
Firm-level	LSaving	.0525	.0517		
	LSaving_New			.0516	.0413
	Buybacks/Assets	-.0307	.0099		
	Profits/Assets	.7102***	.5930***	.7347***	.6709***
	Capex/Assets	.0405**	.0441**	.0534***	.0558***
	Log_Assets		-.0241***		-.0198**
Macro-level	cpi	.0017	.0006	.0011	.0002
	GDPg	.0009	.0016	.0009	.0012
	d_GDPg	.0026	.0010	.0023	.0011
	Finsystem	.0028	.0202	.0082	.0223
	Constant	.0304**	.4732***	.0170	.3837**
	# of observations	15,990	15,990	14,842	14,842
	# of groups	1,607	1,607	1,550	1,550
	Test for 2nd-order autocorrelation	0.33	0.41	0.23	0.22

***, **, * denote statistical significance levels at 1%, 5% and 10%.

The profit and investment ratios are the significant explanatory variables of the saving rate on a firm level. Compared with the macro level, the lagged dependent variable does not significantly influence the current saving rate. These findings are in line with the conclusions of the finance literature presented in section 2.2 of this chapter. Approximately two thirds of every additional unit of profit are retained within the firm. Higher investment and capital demand lead to higher savings, but the effect of these factors (4%) is relatively low. In highly developed financial markets, such as the countries in this sample, external financing should be available at fair rates; this condition explains the low coefficient of the investment variable. The results change only marginally if the adjusted saving rate is considered. The impact of profits is slightly lower and capital expenditures are slightly more important. The largest and most surprising difference between the two measures of saving is the coefficient of a firm's size. Larger firms should experience easier access to capital markets and bank lending. We should therefore observe a significant negative coefficient for *log_assets* because larger firms should experience less

financing frictions and thus experience a lower requirement to save. However, this link is only apparent for the original saving rate and disappears if the saving rate is adjusted for share repurchases. Moreover, none of the included macro variables significantly influences a firm's saving rate. A firm's saving decision is based on its own profits and investment needs, but does not respond to inflation or overall GDP growth. This might occur on the one hand because firms that are included in the dataset are largely multinationals that are less dependent on the national economic environment compared to smaller domestic companies and on the other hand because these firms may be more dependent on sector-specific dynamics than on the status of the overall economy of their home country.

2.6 CONCLUSION

This study confirms the hypothesis of a global saving glut, although this confirmation only applies if corporate savings are measured through the methodology of the System of National Accounts. The investigation of corporate saving in this study show that in the G7 countries between 1996 and 2004, an average of 7 percent of corporate savings were not retained within the corporate sector to conduct investment, increase cash holdings or reduce debt; instead, these savings were distributed to shareholders via share repurchases. In 2007, the share of corporate savings that was distributed to shareholders via share buybacks even reached 23% for the G7 countries. Adjusting the saving rate for this changing payout behavior consequently leads to the rejection of the hypothesis that the corporate sector experienced a saving glut between 1996 and 2004. The reasons for different payout behaviors (dividends vs. share repurchases) are not investigated in this study, but I demonstrate that share repurchases gained importance on an aggregate level in OECD countries and were responsible for a corporate saving glut with regards to the official aggregated corporate saving rate. Declining household saving rates in advanced economies should also be regarded under this aspect. There is no income flow to households, but households benefit from increased wealth by share repurchase programs. However, this increased wealth may be temporary in nature and furthermore benefits only the small fraction of the population who owns shares. Adjustments for payout behavior do not generally alter the significance of the factors that determine the corporate saving rate both on an aggregate level and on a firm level because they produce only marginal changes in the coefficients of these factors.

The non-dynamic specification of the adjusted saving rate for the case of N=30 shows the only divergence from the results of the traditional saving rate. Yet, this change is important since it shows that once the saving rate really measures retained earnings, investment needs turn out to be a significant determinant of corporate savings. While share repurchases have large aggregate effects and may affect the behavior of managers who nurse the share price by share repurchase programs, the effect on the determinants of the saving rate is limited.

Aggregate corporate saving rates are most dependent on previous years' saving rates; the next most important determinants of corporate saving rates are profits, changes in the rate of GDP growth and the depth of the financial system. If policy makers want to change the capital supply of the corporate sector, they need to keep in mind the following two observations: First, the aggregate saving rate is sticky, and adjustments to this rate occur over several years. Second, profits are the most important lever for affecting these rates, a conclusion that is confirmed by the micro-level analysis of this study. In OECD countries, efforts to encourage or discourage investment produce at maximum slight effects on corporate propensities to save. To counter a potential saving glut, politicians should foster their nation's financial systems, as the depth of financial systems produces a significant and negative effect on corporate savings, but foremost it is the profit share of the corporate sector that has the highest impact on corporate savings. Furthermore, the next revision of the System of National Accounts should consider new classifications for corporate payout behavior. Share repurchases that even surpass the volume of dividend payments for some country-year observations merit different treatment than normal corporate savings and should be regarded as a payout to shareholders not only in the finance literature but also in other economic contexts.

The contribution of this paper to the literature is that to the best of my knowledge, it is the first cross-country analysis of the corporate saving behavior of the non-financial corporate sector for a large set of countries. Furthermore, this study is the first to aggregate share repurchases on a country level for several countries and to include this in the study of corporate savings. The saving glut hypothesis is frequently adopted by the media, and this paper establishes certain facts that supplement the common beliefs about this hypothesis. The field of share repurchases, corporate savings and the saving glut offers a wide range of interesting topics that should be addressed by future studies. Among these is the effect of share repurchases on current account imbalances or how a reversion towards more dividend payments would affect household saving.

The latter issue is particularly interesting because of the contrast between highly volatile stock market performances and the anticipated stability of the direct flow of money through dividends.

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APPENDIX

Table A2.1

Non-financial corporate saving rates and share repurchases in OECD-countries

Data on share repurchases is based on firm data from 1980 to 2010. Years that are not mentioned in the table reflect years without any share repurchase in the respective country.

	Non-fin. corporate saving rate					Share repurchases			
	Years	T	Min	Max	Mean	years	1st year	Max	Mean
Australia	1988-2009	22	2.5%	10.2%	6.6%	1993-2008	0.0%	0.9%	0.1%
Austria	1995-2008	14	9.7%	12.7%	11.4%	1993-2009	0.0%	0.3%	0.1%
Belgium	1985-2008	24	10.4%	15.2%	12.4%	1999-2009	0.0%	0.2%	0.1%
Canada	1970-2009	40	5.7%	13.0%	9.9%	1984-2008	0.0%	1.2%	0.4%
Chile	1996-2008	13	5.3%	10.5%	8.6%	1988-2008	0.0%	0.5%	0.1%
Czech Republic	1995-2008	14	11.2%	16.0%	13.9%	2001-2008	0.0%	1.5%	0.2%
Denmark	1981-2009	29	9.5%	15.4%	13.0%	1988-2009	0.0%	1.1%	0.3%
Estonia	1994-2008	15	3.2%	19.2%	12.8%	2002-2008	0.0%	0.1%	0.0%
Finland	1975-2009	35	2.9%	16.6%	12.1%	2000-2009	0.0%	0.2%	0.0%
France	1970-2009	40	3.4%	8.9%	6.7%	1987-2009	0.1%	0.8%	0.2%
Germany	1991-2008	18	6.9%	11.0%	8.7%	1988-2009	0.0%	0.7%	0.1%
Greece	1995-2008	14	4.4%	13.2%	9.1%	2000-2009	1.0%	2.2%	0.8%
Hungary	1995-2008	14	7.4%	12.1%	10.4%	1992-2008	0.0%	2.0%	0.2%
Ireland	2002-2008	7	7.7%	10.1%	8.9%	1984-2009	0.1%	1.1%	0.2%
Italy	1980-2008	29	1.3%	8.9%	5.6%	1987-2009	0.0%	0.1%	0.1%
Japan	1980-2007	28	10.9%	17.8%	13.5%	1985-2007	0.0%	0.8%	0.2%
Mexico	1993-2008	16	3.7%	11.9%	9.7%	1986-2008	0.0%	1.0%	0.3%
Netherlands	1980-2008	29	9.5%	16.5%	12.6%	1988-2009	0.1%	2.7%	0.6%
New Zealand	1999-2007	9	9.7%	16.7%	13.3%	1986-2008	0.0%	0.8%	0.2%
Norway	1978-2007	30	11.0%	15.8%	13.0%	1987-2008	0.0%	0.8%	0.2%
Poland	1995-2008	14	5.7%	10.7%	8.6%	1998-2008	0.0%	0.1%	0.0%
Portugal	1995-2009	15	3.0%	9.7%	7.4%	1989-2009	0.0%	0.8%	0.2%
Slovakia	1995-2008	14	12.7%	16.6%	14.7%	2006-2007	0.0%	0.0%	0.0%
Slovenia	1995-2008	14	0.0%	12.4%	9.6%	2002-2009	0.1%	0.2%	0.1%
South Korea	1975-2009	35	6.4%	15.1%	10.9%	1988-2009	0.0%	1.3%	0.4%
Spain	1995-2008	14	5.1%	12.0%	9.5%	1985-2009	0.0%	0.6%	0.1%
Sweden	1993-2009	17	7.5%	14.1%	11.8%	1991-2009	0.0%	2.1%	0.5%
Switzerland	1990-2007	18	10.5%	16.9%	13.8%	1992-2008	0.0%	4.0%	1.3%
United Kingdom	1987-2008	22	7.3%	12.1%	10.4%	1986-2009	0.0%	3.1%	0.8%
United States	1970-2008	39	8.0%	10.9%	9.5%	1980-2008	0.1%	4.1%	1.1%
Average		21	6.7%	13.4%	10.6%		0.1%	1.2%	0.3%

Data source: UN SNA, World Bank and National Statistic Agencies for non-financial saving data; Worldscope for share repurchases.

Table A2.2

Share repurchases on a firm level

Table A2.2 includes active and inactive companies. Only countries with more than 100 companies in the Worldscope database are included in this table.

Country	# of companies	# of companies with share repurchases between			Share of companies that uses share repurchases
		1980 and 1999	2000 and 2010	1980 and 2010	
Australia	2,072	68	465	484	23%
Austria	106	1	47	47	44%
Belgium	162	1	68	68	42%
Brazil	388	38	123	136	35%
Canada	1,750	219	465	517	30%
Chile	213	4	26	28	13%
China	2,518	5	114	118	5%
Denmark	203	41	107	113	56%
Finland	130	22	60	64	49%
France	895	29	364	370	41%
Germany	1,101	17	250	254	23%
Greece	305	1	78	78	26%
Hong Kong	1,078	161	334	402	37%
India	2,325	43	424	441	19%
Indonesia	418	7	52	57	14%
Israel	248	13	86	90	36%
Italy	301	19	135	138	46%
Japan	3,985	106	1,636	1,652	41%
Kuwait	183	0	116	116	63%
Malaysia	1,049	29	258	271	26%
Mexico	134	50	83	91	68%
Netherlands	205	50	118	126	61%
New Zealand	156	7	28	30	19%
Norway	239	16	87	89	37%
Pakistan	164	2	1	3	2%
Philippines	253	32	73	83	33%
Poland	373	4	72	74	20%
Russia	295	3	89	89	30%
Saudi Arabia	125	0	9	9	7%
Singapore	688	11	154	159	23%
South Africa	393	23	147	154	39%
South Korea	1,266	207	796	816	64%
Spain	163	37	113	119	73%
Sweden	470	11	103	106	23%
Switzerland	289	26	217	217	75%
Taiwan	1,569	24	430	433	28%
Thailand	559	3	64	65	12%
Turkey	243	1	8	9	4%
United Kingd.	2,403	316	1,060	1,117	46%
United States	9,687	3,214	5,094	5,694	59%

Table A2.3

Overview of variables in dataset

All variables are generally suited for a panel data analysis as there are (1) high variations across the dataset (overall), (2) high variations between the countries (between) and (3) high variations within the countries (within). N gives the overall number of observations for each variable. n gives the number of countries and T-bar gives the average time period covered per country per variable. All variables but cpi, GDPg and d_GDPg are given as ratio over GDP.

Variable		Mean	Std.Dev.	Min	Max	Observations
Saving	overall	0.107	0.032	0.000	0.192	N = 598
	between		0.024	0.056	0.147	n = 30
	within		0.020	0.011	0.170	T-bar = 19.9
Saving_New	overall	0.104	0.031	0.000	0.192	N = 598
	between		0.024	0.055	0.147	n = 30
	within		0.020	0.008	0.168	T-bar = 19.9
LSaving	overall	0.106	0.031	0.000	0.192	N = 578
	between		0.024	0.056	0.146	n = 30
	within		0.020	0.011	0.170	T-bar = 19.3
LSaving_New	overall	0.104	0.031	0.000	0.192	N = 578
	between		0.024	0.056	0.146	n = 30
	within		0.020	0.008	0.168	T-bar = 19.3
Buybacks	overall	0.002	0.005	0.000	0.041	N = 900
	between		0.002	0.000	0.010	n = 30
	within		0.004	-0.008	0.035	T = 30
Profits	overall	0.210	0.058	0.000	0.436	N = 606
	between		0.062	0.120	0.407	n = 30
	within		0.025	0.078	0.320	T-bar = 20.2
Inv	overall	0.125	0.034	0.001	0.252	N = 598
	between		0.031	0.074	0.197	n = 30
	within		0.017	-0.004	0.191	T-bar = 19.9
GDPg	overall	2.841	2.868	-14.570	12.280	N = 854
	between		1.052	1.711	6.323	n = 30
	within		2.669	-14.520	10.630	T-bar = 28.5
d_GDPg	overall	-0.047	2.675	-15.060	16.340	N = 847
	between		0.283	-0.353	0.828	n = 30
	within		2.665	-14.982	16.526	T-bar = 28.2
cpi	overall	8.228	23.803	-13.850	555.380	N = 828
	between		9.345	1.332	46.645	n = 30
	within		21.831	-37.627	516.963	T-bar = 27.6
finsystem	overall	0.803	0.433	0.087	2.107	N = 827
	between		0.339	0.176	1.474	n = 30
	within		0.277	0.047	2.198	T-bar = 27.6

Table A2.4

Firm-level correlation matrix of dependent and independent variables

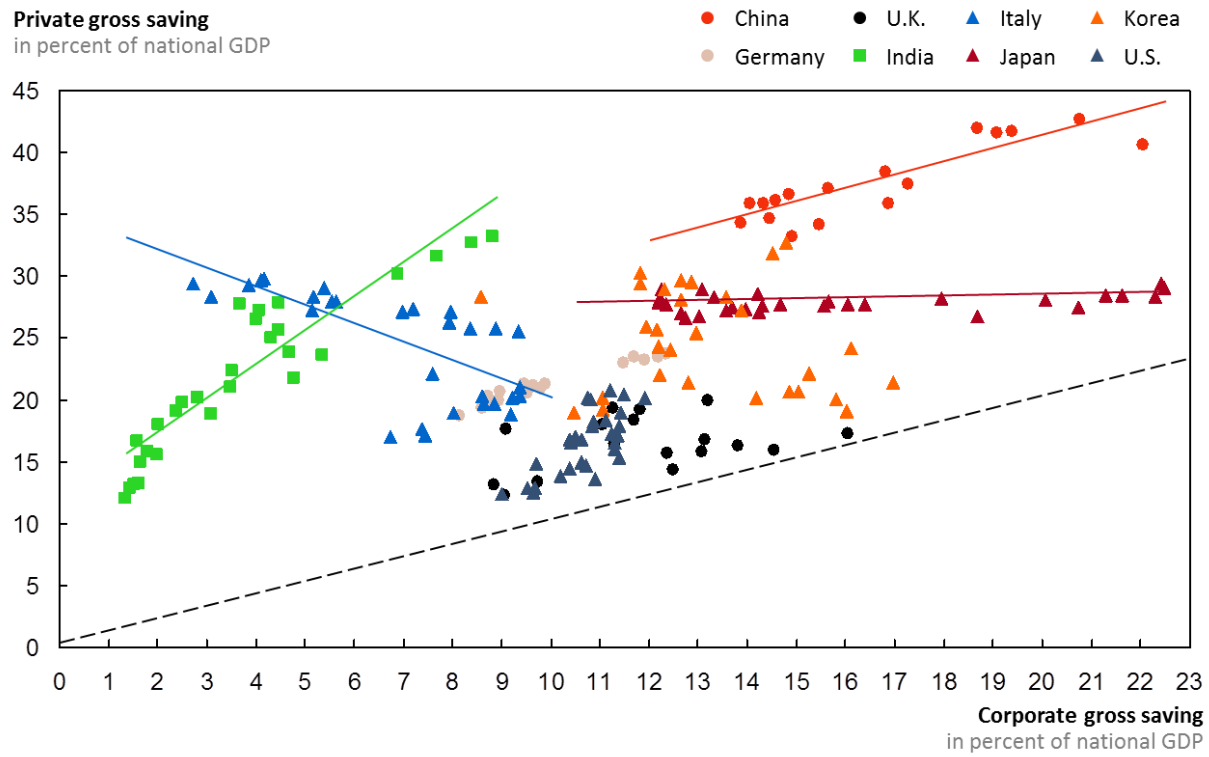
The adjusted saving rate (saving rate less share repurchases) is labeled *Saving_New*. The prefix *L* indicates the first lag of a variable. The number of observations is 14,842. Correlation coefficients that are insignificant at the 5% level are written bold in *italics*.

Variable	Saving	LSaving	Saving _New	LSaving _New	Buybacks/ Assets	Profits/ Assets	Capex/ Assets	Log-assets	cpi	GDPg	d_GDPg
Saving	1.000										
LSaving	.481	1.000									
Saving_New	.943	.442	1.000								
LSaving_New	.435	.924	.422	1.000							
Buybacks/ Assets	.101	.085	-.235	.007	1.000						
Profits/ Assets	.567	.220	.542	.202	.035	1.000					
Capex/ Assets	.198	.219	.199	.215	-.017	0.118	1.000				
Logassets	-.076	-.122	-.082	-.130	.023	*-.002*	-.005	1.000			
cpi	.066	.063	.059	.060	.018	.04	.086	-.058	1.000		
GDPg	.092	.040	.086	.053	.011	.053	.099	-.02	.252	1.000	
d_GDPg	.064	.010	.066	.029	*-.011*	.033	.049	-.012	.114	.780	1.000
Finsystem	-.024	.020	-.059	-.027	.106	-.047	-.095	-.074	-.068	-.356	-.382

Figure A2.1

Piercing the corporate veil? – private and corporate sector saving

Private sector (household and corporate) saving rates on the vertical axis and corporate sector saving rates on the horizontal axes are shown as percentage of GDP and cover the years 1980 to 2008. The dashed line shows the values at which corporate savings would make up 100% of private savings.



Data source: UN SNA, Reserve Bank of India, BIS, National Statistic Agencies.

CHAPTER 3

The Effect of Household Debt on Unemployment – Evidence from Europe and Spanish Provinces

Abstract

Most European countries faced steep and persistent increases in unemployment following the financial crisis of 2007-08. With this study we seek to investigate whether some part of these increases can be attributed to indebted households who reduced their consumption in order to restructure their balance sheets. We establish a link between household debt and aggregate demand based on a cross-country study of 18 European countries and show how household sector debt affects unemployment via the aggregate demand channel. We strengthen the results with an analysis of Spanish provinces. The level of household sector debt in Spanish provinces is highly significant in determining the increase in provincial unemployment from 2007 to 2010 via the aggregate demand channel. We find that on aggregate, approximately 1/3 of the increase in Spanish unemployment can be traced back to high household debt levels.

3.1 INTRODUCTION

Many countries in the world are now in their sixth year of economic crisis. The downturn began in the United States with the subprime crisis. Low interest rates and rising house prices, together with an unregulated subprime mortgage market, encouraged an increasing number of Americans to fulfill their lifelong dreams of buying their own apartments or houses or moving into larger and fancier homes. In 2006-2007, the housing bubble burst, first home owners, then banks and finally real sector companies came under distress. This subprime crisis led to the global financial crisis in 2007-2008, which, in most of the economies of the developed world, was followed by a deep recession beginning in 2008-2009. This recession was accompanied by increasing unemployment rates and debt-financed government programs intended to support the economy. Today, in 2012, many economies around the world continue to suffer from high unemployment rates and debt levels that exceed the pre-crisis levels.

All of the episodes of this long-lasting crisis period are closely linked to debt. First, households realized their over-indebtedness after the real estate bubble burst. Then, issues with financial sector debt and leverage led to a systemic financial crisis. Since 2010, it is government debt that worries rating agencies, investors who have purchased government bonds and the public, who ultimately guarantees public debt through the tax basis. To non-economists, it appears obvious that substantial debt loads are a source of worry. A larger nominal amount of debt leads to higher debt service burdens. The more a household, bank, corporation or state has to pay in interest, the less money is available for consumption and investment if the household or organization's income remains constant. Once the debt service becomes too high, bankruptcy occurs.

This situation may also be viewed differently. The debt of one person, corporation or state is wealth of another person, corporation or state. If John Doe must service a debt of 10,000 dollars and pays interest of 10% on that debt, he loses 1,000 dollars that he could otherwise spend. However, if Jane Doe lent 10,000 dollars to John, she now has an additional 1,000 dollars to spend. The same is true for a government. When the government must pay more interest on its debt, the lender receives these higher interest payments and spends the money. Thus, in a closed economy or more precisely if the net foreign asset position and the resulting net income are insignificant, the majority of the interest should be paid and received within the country, with the

two amounts canceling each other out. Based on this line of argument, do we really need to care about debt levels or is the public debate falling for a zero-sum game?

This paper contributes to the academic and public debate regarding the relationship between debt and aggregate demand and its effect on unemployment. Theory might give reasons for believing that the debt levels itself need not be a source of concern, though even the theoretical evidence is far from conclusive. Nevertheless, although the research in this area remains controversial, the amount of empirical work being conducted on this relationship is increasing. Two recent and very influential analyses that will be discussed in further detail later in this paper are the studies by Mian and Sufi (2012) and Dynan (2012). However, both of these papers focus on the United States.

This paper instead looks at Europe and investigates how the level of household debt and the changes in household debt are linked to aggregate demand in this region which translates into unemployment. The household sector is the focus of this paper because of the importance of household consumption expenditure to aggregate demand and because the household debt in many European countries increased rapidly prior to the crisis, whereas government deficits and debt levels exhibited rather modest increases or even decreases in many countries. Furthermore, there is substantial variation in the development of household debt among and within European countries. A comparison of 18 European countries shows that there is a high and significant correlation between the debt build-up prior to 2007 and the changes in employment that occurred from 2008 to 2010. The economic performance of these countries has suffered because of the end of the debt-fueled growth there and in some cases because of a decline in outstanding debt. Thus, there appears to be a link between changes in debt and aggregate demand.

The underlying transmission mechanism that is investigated in this study begins with a shock to the balance sheets of individual households. The shock for households is greater if they must expend more effort to restructure their balance sheets. The more debt a household has accumulated relative to its income before the shock occurred, the more deleveraging the household must arrange by increasing savings and reducing spending after the shock to restructure its balance sheet. Given the elasticity of employment with respect to demand, these changes generate increased unemployment.

There are at least two different theoretical mechanisms that could explain the deleveraging needs of households. First, these deleveraging needs may be a function of increased credit constraints or, to put it differently, of falling debt limits due to lower collateral values. Eggertsson and Krugman (2012) model the deleveraging needs of borrowing households using an exogenous decrease in the debt limit. If the real interest rate cannot adjust to its natural or full employment level, aggregate demand will fall. Second, the deleveraging needs of households may also be a function of changing perceptions of lifetime income or wealth. For instance, housing prices, which determine the value of one of the most important assets for most households, almost certainly affect household wealth (or indebtedness). It is now generally understood that the Spanish housing market experienced a significant boom in the early 2000s and that this boom ended rather abruptly in 2007. Thus, it appears very likely that Spanish households not only were forced to deleverage due to more tightly binding credit constraints as their collateral lost value but also suffered large decreases in their net wealth. In addition to the disruptions at the real estate market, the crisis made clear to many Spaniards that future income levels would be smaller than expected. All three, the credit constraints, the wealth effects and the adjusted expectations about life time income may explain the increased deleveraging needs of the indebted Spanish household sector. We will try to disentangle these effects in our empirical analysis by controlling for housing prices.

Importantly, because aggregate demand will decline more in regions with higher deleveraging needs than in those with lower deleveraging needs, we should see different responses in regional sectoral unemployment rates depending on whether we analyze the tradable or non-tradable sectors (cf. Mian and Sufi (2012)). More precisely, tradable sector employment (unemployment) in *each* region, which depends on the aggregate demand from *all* regions, should fall (rise) irrespective of the particular deleveraging needs of that specific region. However, the opposite should be true for the non-tradable sector. In the non-tradable sector, employment (unemployment) should fall more (rise more) in those regions that have high deleveraging needs. In a sense, by selling tradable goods, the tradable sector employment insures itself against idiosyncratic regional demand shocks. Non-tradable sector employment, however, is vulnerable to regional demand shocks. Thus, if the Spanish provinces' debt-to-GDP levels are good indicators of the deleveraging needs that followed the shock to those provinces, the demand channel predicts higher increases in unemployment in the non-tradable sector in those provinces

that had high debt-to-GDP ratios, whereas the increases in tradable-sector unemployment should be independent of those debt-to-GDP ratios.

We find that these theoretical mechanisms hold for the European country data, which we use in section 3.3. Section 3.4 presents a more granular analysis based on the regional data for Spain. This analysis supports the finding that high household debt levels decrease consumption and aggregate demand and lead to increasing unemployment. Based on this evidence of the role of debt in aggregate demand and unemployment in Spain, we calculate the magnitude of this effect using our findings for unemployment in the non-tradable sector. We find that approximately 1/3 of the increase in the aggregate Spanish unemployment between November 2007 and November 2010 is due to debt-related decreases in household spending.

The remainder of the chapter is structured as follows. Section 3.2 provides an overview of the related literature. Section 3.3 describes a cross-country study of 18 European countries. Section 3.4 presents the within-country study of Spain, including the calculation of the aggregate effect of debt on unemployment. Section 3.5 concludes the chapter.

3.2 OVERVIEW OF RELATED LITERATURE

The effect of household debt on the economy has been repeatedly examined in combination with recessions. Fisher (1933) postulated the debt deflation theory for great depressions. Mishkin (1978) empirically examined the Great Depression and considered how household balance sheets served as a transmission mechanism for changes in aggregate demand. The American recession of 1973-75 is empirically investigated by Mishkin, Gordon and Hymans (1977), who focus on the role of household debt and stock market developments. All of these papers find an important negative effect of debt on economic activity. However, whereas Fisher (1933) examines the effect on asset prices, Mishkin (1978) and Mishkin et al. (1977) focus on consumption and aggregate demand. Palley (1994) builds a model of the effects of household debt on aggregate demand based on the different propensities to consume among creditor and debtor households and applies the model to the recession of the early nineties. Palley (1994) concludes that increases in household debt fuel aggregate demand but that the servicing of this debt subsequently lowers aggregate demand. The financial crisis and economic downturn of 2007-09

have again drawn attention to the role of household sector debt. Keen (2009) emphasizes the role of debt in aggregate demand. Changes in the volume of debt as a percentage of GDP explain how much of the aggregate demand is debt financed. Keen (2009) validates the link between the household debt and aggregate demand for Australia by showing how both increasing debt and declining unemployment and decreasing debt and rising unemployment move together. The link between household debt and aggregate demand in the recent recession is evident for the United States in Mian and Sufi (2012) and Dynan (2012). Dynan (2012) uses the Panel Study of Income Dynamics (PSID) to examine the effect of household debt on consumption. She estimates the effect of leverage and that of debt service burdens on the changes in consumption that occurred from 2007 to 2009 and confirms that a significant negative impact exists even after income and wealth effects are controlled for. This approach provides a microfoundation for the deleveraging shock that depresses consumption in addition to wealth and income effects.

Overall, this chapter is most closely related to the work by Mian and Sufi (2012), which investigates the link between household sector debt levels and aggregate demand with a regional analysis. These authors use county-level data from the United States and estimate how household debt levels, measured as debt over income, influence consumption, which fuels aggregate demand. The size of the debt level is interpreted as the magnitude of the household balance sheet shock and of the need for adjustment to household-level finances. Mian, Rao and Sufi (2012) use local retail sales data to show that household debt levels affect consumption. Having illustrated the link between household debt and consumption, Mian and Sufi (2012) use the elasticity of employment to aggregate demand to measure the transmission of household debt via consumption and aggregate demand on employment and thus, to the severity of the crisis in the United States. The distinction between employment in the tradable and non-tradable sectors is important to the analysis. The demand for tradable goods is determined on a national level, which renders the shocks to the household balance sheet in one county unimportant. The demand for non-tradable goods, in contrast, is only dependent on local consumption. Thus, regional employment in tradable industries is independent of local debt levels, and employment in non-tradable industries should be highly dependent on local debt levels. Mian and Sufi (2012) confirm the validity of their model by regressing the changes in total employment, tradable employment and non-tradable employment from 2007 to 2009 on the 2006 debt to income ratio. Controlling

for structural shocks by including the shares of the construction, tradable and non-tradable industries does not change the outcome.

The International Monetary Fund (2012) and the McKinsey Global Institute (2010, 2012) reports cover more than one country. The IMF finds that larger increases in household debt lead to more severe recessions and examines country-level case studies in seeking to determine how to address large household debts and house price decreases. The McKinsey Global Institute examines deleveraging across all economic sectors and describes how historic deleveraging processes have taken place (cf. McKinsey Global Institute (2010)) and how the major economies have meanwhile progressed in their deleveraging process (cf. McKinsey Global Institute (2012)). The case studies presented in that report suggest that during an economy-wide deleveraging, a country should begin with deleveraging in the private sector while the public sector compensates for the loss in aggregate demand; then, the latter should begin deleveraging once the nation's economic growth regains its momentum.

This study contributes to the literature by using existing approaches to investigate household debt and aggregate demand in Europe and particularly in Spain and its provinces. This research can thus confirm that the previous results for the United States and Australia are also valid for a legally and culturally quite different region. Furthermore, this research indicates which portion of the increase in Spanish unemployment is traceable to the high household sector debt. Thus, this chapter provides a fact base for Spanish policy makers as well as for macro-prudential regulators who are concerned with the effects of household sector debt on the economy.

3.3 HOUSEHOLD DEBT AND UNEMPLOYMENT – A EUROPEAN PERSPECTIVE

To investigate whether there is a link between household debt and aggregate demand in Europe, one can compare the debt data for European countries to two indicators for aggregate demand. One possible measure of the effect of debt on aggregate demand is the contribution of household consumption expenditure to GDP growth. The other (more indirect) measure of aggregate demand is employment, which is suitable because of the high elasticity of employment to aggregate demand, albeit with some time delay. The hypotheses tested in this research are as follows:

> *Regions with (1) larger increases in debt or (2) higher debt levels prior to an economic downturn will experience a lower growth of aggregate demand during an economic downturn than regions with (1) smaller increases in debt or (2) lower debt levels because of household balance sheet restructuring.*

Lower growth of aggregate demand means thereby that it can also turn negative. The transmission mechanism of household debt to aggregate demand is as described by Keen (2009), Mian and Sufi (2012) or Dynan (2012). Using the permanent income hypothesis (PIH) or life cycle hypothesis (LCH), the households that expect higher future income (PIH) or that benefit from increased housing wealth (LCH) should adapt their consumption behavior and consume more. If the household's expectations regarding future income are sufficiently high, the household can rationally take on debt today to smooth consumption. When a negative exogenous shock lowers the expectations of the household, the individuals in the household will need to change their consumption and investment behavior accordingly. Households that have increased their debt more than others or that hold higher debt levels must reduce their debt by a larger amount. The household balance sheet is restructured through reductions in consumption spending. Still, it is not unquestionable that the aggregate demand is affected by the households that restructure their balance sheets. Households that have acted as lenders in the first place will have the option to consume more when the debt is repaid. Thus, in aggregate, there should be no effect on aggregate demand if the propensity to consume out of income is the same across households. Nevertheless, the aggregate demand might indeed be reduced if the debt overhang is sufficiently large and if the economy is stuck at the zero lower bound (cf. Eggertsson and Krugman (2012)).

To test our hypothesis, we compare changes in household debt as well as levels of household debt using our two measures of aggregate demand. If we find no effect on spending, the contribution of household consumption expenditure to GDP growth should be independent of debt. If debt has no influence on aggregate demand, neither changes in household debt nor the level of household debt will be linked to the changes in employment that follow aggregate demand. Both hypotheses are tested using aggregated country-level data for European economies.

3.3.1 Data sources

The cross-country study builds on 18 European countries regarding the measure of employment and 9 euro-area countries regarding the measure of household consumption expenditure's contribution to GDP growth. All of the debt data are obtained from Eurostat's annual sector accounts and are amended using data from the national statistical agencies and central banks when the Eurostat data coverage is insufficient. Household debt is used as provided by Eurostat (total financial liabilities of the household sector including non-profit institutions serving households). The GDP and disposable income data are also based on Eurostat's annual sector accounts. To establish the link between household sector consumption expenditure and its contribution to GDP growth, data from the European Central Bank are used. These data are captured on a quarterly basis but are not provided for all euro-area countries, which limits the number of observations to 9 countries. The second test of the hypotheses uses employment data from the EU's Labor Force Survey, which are sourced from Eurostat.

3.3.2 Empirical analysis

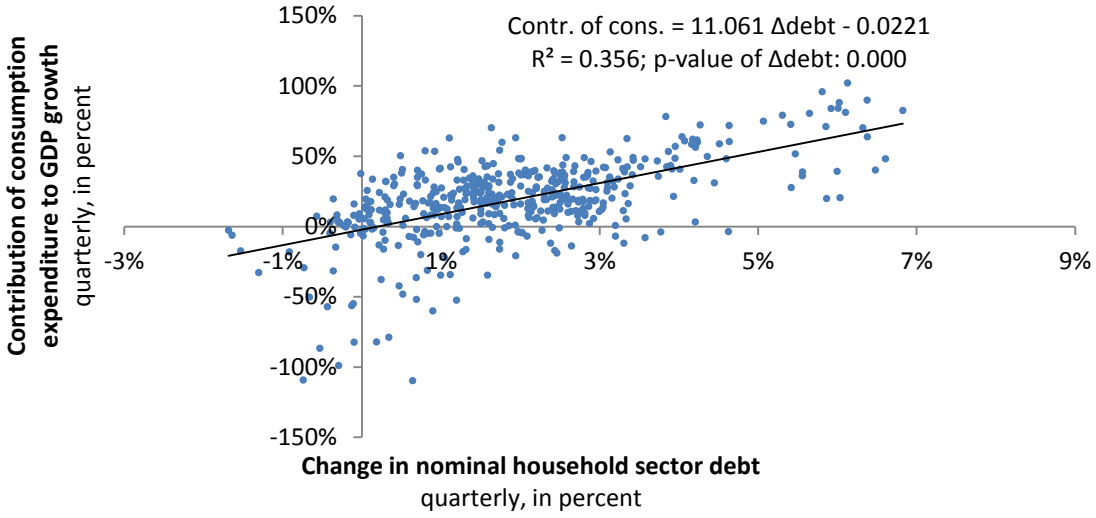
The American subprime crisis in 2007 only spread to the European real economy in 2008. There was a peak in debt issuance in 2007 and a peak in employment in 2008. Thus, 2007 serves as a starting point for our analysis of the effects of household debt on aggregate demand. We argue that debt levels and changes in debt have an effect on consumption and, consequently, on aggregate demand. The transmission channel is the necessary restructuring of the household balance sheet. In a boom period, a household takes on debt, anticipating increases in future income and asset prices. The household spends this debt on the purchase of assets, the most important of which is housing, and on consumption expenditure. When the boom period ends, asset prices stagnate or shrink, and future income streams become more uncertain. Households consequently restructure their balance sheets in accordance with their updated expectations. The restructuring of balance sheets comes along with increasing saving and decreasing consumption expenditure. The higher the debt level of the household sector, the larger the amount of debt that the sector must repay and the greater the reduction in consumption and, thus, aggregate demand. The same rule holds for changes in debt. The higher the increase in debt prior to the shock, the greater is the need to pay back debt and save after the peak of the boom. Both measures, changes in debt and the level of debt, are important. The level of debt is a good indicator because there is

a natural limit to household debt in terms of debt service. The more debt a household sector holds, the larger the debt service burden, and this burden cannot exceed disposable income if one rules out Ponzi games. The increase in debt serves as a good indicator for the magnitude of the shock because it shows how far households have deviated from their usual level of debt. If interest rates do not change, an increase in the debt-to-income ratio will alter the debt service burden proportionally. If the aggregated household sector long-term consumption behavior does not change accordingly, a short-term drop in consumption must occur to soften the process of adjustment to the previous debt-to-income ratios. This drop in consumption will dampen the aggregate demand and, consequently, will decrease employment. For there to be an effect on aggregate demand, it is not even necessary for there to be a nominal decrease in debt volume. A reduction in the debt growth rate is sufficient to reduce the aggregate demand relative to previous periods when the income levels do not change because the total amount that is available for consumption is reduced. The first method of validating this line of argument involves demonstrating the high correlation between changes in debt and the contribution of household consumption expenditure to GDP growth, as shown in figure 3.1.

Figure 3.1

Changes in household sector debt and contribution of consumption expenditure to GDP growth

Household sector debt is measured in euro. Changes in debt and the contribution of household consumption expenditure to GDP growth are measured quarterly as a moving average over four quarters. The countries included (time span covered) are Austria (2003-2011), Belgium (1997-2011), France (1996-2011), Germany (1992-2011), Ireland (2002-2011), Italy (1998-2011), the Netherlands (2000-2011), Portugal (1998-2011) and Spain (2001-2011).



Data source: National Central Banks, European Central Bank.

Most of the data points in figure 3.1 show that nominal debt is, in fact, increasing; the nominal deleveraging in countries such as Spain only began in 2010. A nominal quarterly increase below 0.5% may still be considered to indicate real deleveraging if the inflation rate is close to 2%. When we compare the extremes in this figure – e.g., increases below 0.5% and above 3.0% – it is clear that high debt growth is associated with a high share of consumption contribution to GDP growth, whereas when debt grows slowly or declines, the contribution of consumption to GDP growth is low or negative. Thus, figure 3.1 has two implications. First, mortgages, which represent the largest fraction of household sector debt, are not exclusively linked to housing expenditures. Second, an increase in household debt will be accompanied by an increasing positive impact of household consumption expenditure on GDP growth. One might expect changes in European household debt not to be closely linked to consumption because most debt is used to purchase housing assets. However, due to the positive correlation between increases in household debt and the contribution of consumption to GDP growth, even though direct mortgage equity withdrawals are of minor importance in Europe, a higher volume of real estate mortgages is still associated with a higher contribution of consumption to GDP growth. This connection may be a function of indirect effects such as wealth effects. The connection may also be explained by the PIH. The data that show increasing nominal debt stem from the years after the introduction of the common currency in Europe. The introduction of the euro, especially in the Mediterranean, led to a reduction in credit constraints. This development, together with the capital inflows from Northern Europe, fed people's expectations regarding their future incomes, which they expected to be permanently higher. These expectations, together with low interest rates, encouraged housing investments (which appeared to be more affordable) and higher consumption based on the positive economic outlook. The PIH not only holds in upward markets but is valid for downturns as well. The shock of the financial crisis, whose size varied from country to country depending on the debt-to-income ratios of the various nations as stated in our hypothesis, generated lower expectations regarding income. In turn, lower lifetime incomes required the restructuring of household balance sheets, i.e., reductions in debt through increased saving and reduced consumption.

This relationship also exists beyond the pooled euro area. A closer look at the single countries in the currency union confirms the results (cf. table A3.1). Eight of the nine euro-area countries under consideration show a high correlation between changes in household sector debt and the

contribution of household consumption expenditure to GDP growth; Belgium is the only country without this link. Furthermore, in the countries for which we have data for longer time periods, the correlation was especially strong during the last decade – in the years preceding the crisis and during the crisis itself. The next interesting result is that the countries that face the most severe problems in the euro crisis are those with the highest correlation between changes in debt and the contribution of consumption expenditure to GDP growth. Ireland, Portugal and Spain have correlation coefficients of approximately 80%, and Italy's coefficient for the period from 2000 to 2011 is 65.6%.[21] These data may suggest that debt-financed, consumption-driven GDP growth is vulnerable to shocks. The high correlation coefficients for the Mediterranean countries relative to Austria, Germany or the Netherlands may result from the debt boom after the introduction of the euro. Whereas the latter countries were used to low inflation rates and rather low interest rates, the former benefitted more from the introduction of the euro in this regard. The decreasing interest rates stimulated demand for credit that was partially provided by the northern euro countries. The increasing provision of credit and capital inflows stimulated these economies and encouraged consumption spending. This trend partially explains why the country-level correlation between the changes in credit and the contribution of consumption to GDP growth is higher for the years preceding the crisis, i.e., the years following the introduction of the euro.

Explicitly grouping the observations into those from the period prior to the crisis and those from during the crisis (cf. figure A3.1(a)) reveals that the slope of the relation between the changes in debt and the contribution of consumption expenditure to GDP growth is 1.5 times steeper during the crisis, though the explanatory power of these findings is smaller. In addition, analyzing the data from the worst-affected countries and the more stable countries (cf. figure A3.1(b)) shows that the contribution of consumption expenditure to GDP growth in the pooled, stable countries is marginal, whereas we observe a steep slope and high explanatory power of debt for the other group. Our first measure of aggregate demand thus works for these subsamples and for the euro area more generally, but its quality depends on the precise sample composition.

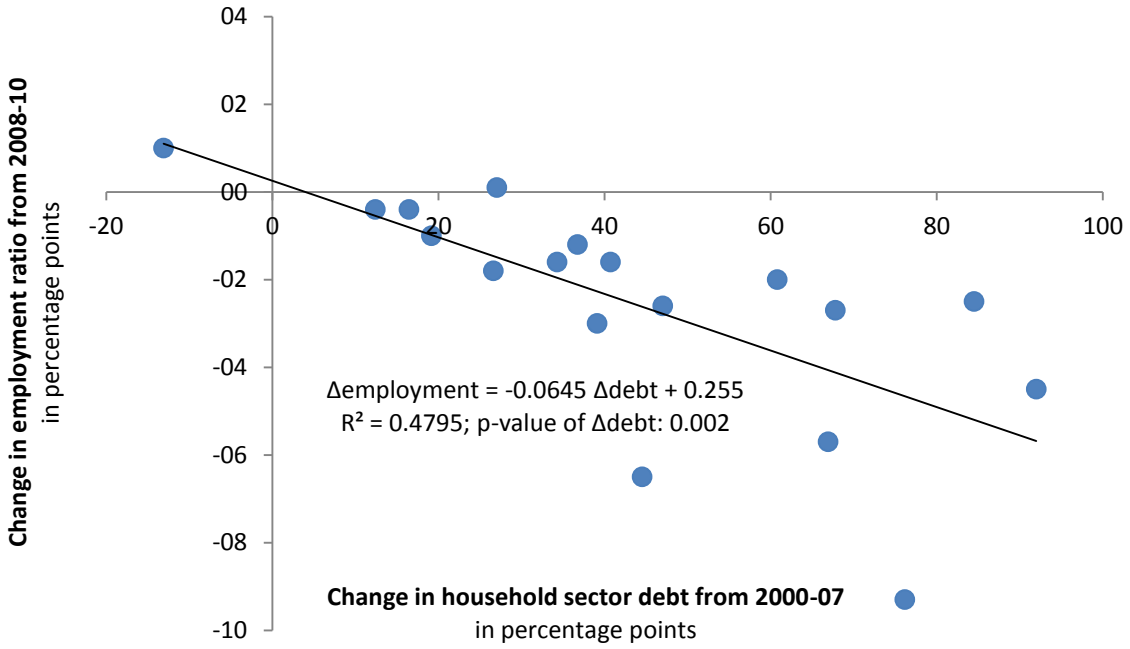
The second and more indirect measure of aggregate demand is illustrated in figure 3.2, which shows the high correlation between the changes in debt prior to the crisis and the subsequent magnitude of the changes in employment.

[21] Using quarterly data instead of smoothed moving average data also yields high and significant coefficients.

Figure 3.2

Changes in household sector debt and employment

Household sector debt is measured as the ratio of financial liabilities to disposable income. Employment is measured as the ratio of the employed population aged 15 to 64 to the total population aged 15 to 64. The number of European countries included is 18.



Data source: Eurostat.

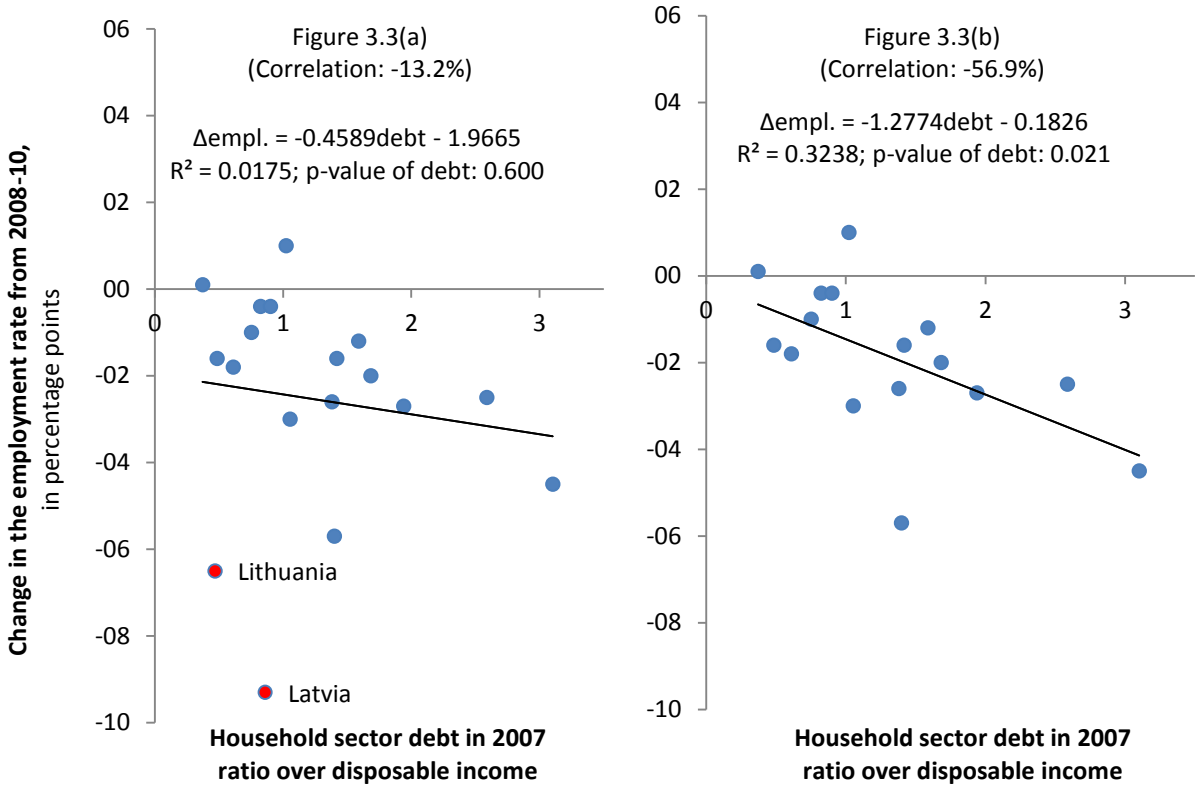
The hypothesis that a larger increase in the debt ratio leads to a stronger decline in employment is confirmed for the 18 European countries for which data for both debt and employment are available for the relevant time span. The correlation coefficient of -69.2% demonstrates the substantial negative relationship between increases in household debt and the subsequent adjustments in aggregate demand. A regression without further control variables indicates that for every increase in debt of 10 percentage points from 2000 to 2007, the employment ratio decreased by 0.6 percentage points from 2008 to 2010.

The level of household sector debt can be used in lieu of the increase in household sector debt. Household sector debt relative to disposable income prior to the crisis is depicted in figure 3.3.

Figure 3.3

Levels of household sector debt and changes in employment

Figure 3.3(a) includes the same 18 countries as figure 3.2. Figure 3.3(b) presents a country sample that excludes the outliers Lithuania and Latvia.



Data source: Eurostat.

Using the same country sample to test this paper's underlying hypothesis fails to prove the hypothesis, and it appears as though the level of household sector debt is irrelevant. However, there are two outliers in the country sample: Latvia and Lithuania. Both countries had very low levels of household debt in the 1990s and experienced a substantial increase in household debt prior to the crisis. Given the small size of our sample the outliers can have a significant effect on the outcome of the analysis, we therefore exclude Latvia and Lithuania due to their structural differences from other European countries. This step further backs the hypothesis regarding the effect of debt on aggregate demand (cf. figure 3.3(b)). Increases in debt and levels of debt during a boom are good indicators of the magnitude of the changes in aggregate demand that will occur

in the downturn.[22] The current Eurostat data do not yet include the years 2011 and 2012; otherwise, it would have been possible to precisely measure the degree of adjustment in household sector debt: whether the debt growth decreased, whether there was no debt growth at all or whether there was a nominal reduction in the debt-to-income ratio. The conclusion to be drawn from the data presented in this section is nevertheless clear. Household sector debt fuels aggregate demand in an upswing, but during a time of debt moderation, when debt growth decelerates or becomes negative, the impact on aggregate demand is severe.

This cross-country study therefore provides results that support our hypotheses. We hence confirm the results of the analyses of American household sector debt deleveraging conducted by Mian and Sufi (2012) and Dynan (2012) and by Keen (2009) for Australian household sector debt and aggregate demand. A sharp reduction in debt growth and deleveraging by European household sectors severely reduced aggregate demand.

3.4 HOUSEHOLD DEBT AND UNEMPLOYMENT – THE CASE OF SPAIN

These 18 European economies are significantly more diverse than Australia or the United States, so that these results are more likely to be affected by unobserved country characteristics. The low number of observations also hampers the use of econometric regressions. To address both issues, this section presents a regional analysis of a single country. Criticism against results from aggregation on a national level and comparison of European countries is less problematic for a comparison of more granular regional data. The case of Spain is also used in order to address one of the countries that is currently most heavily hit by the euro crisis, that experienced particularly high increases in debt and high levels of debt and that currently suffers from exceptionally high unemployment rates. Spanish households decreased their nominal debt outstanding in the 1st quarter of 2009 for the first time in over 20 years. On a yearly basis, modest deleveraging started in 2009 and paused in 2010; deleveraging accelerated in 2011 (cf. figure 3.4).

When we focus on the Spanish provinces, the number of observations increases to 50,[23] which is a more suitable number for econometric regressions. In addition, the shocks that apply to all

[22] The correlation coefficient for these two measures, the level of debt and the increase in debt, is 69% in the sample with 18 countries. Excluding the outliers Latvia and Lithuania increases the correlation coefficient to 81%.
[23] Spain has 52 provinces, but the relevant data are only available for 50 provinces.

Spanish provinces are more homogenous in nature than the shocks that apply to the 18 European countries. However, the size of the shocks among provinces in Spain does still vary. By using the provinces' debt-to-GDP ratios, we ensure that the shock is heterogeneous in size and is thus suited to our analysis. Compared to a European analysis, the Spanish economy is more homogenous in terms of institutions such as the labor market, the educational system, and credit provisioning. Because we focus on the non-tradable sector, we also benefit from the fact that structural differences across provinces are larger for industrial production and tradable goods than for consumption behavior for non-tradable goods. This difference gives further support to using provincial data from a single country. Therefore, this section focuses on regional analyses of Spain.

We will first introduce the theoretical foundation of the empirical analysis in section 3.4.2 and then describe the data, which we use in the empirical analyses (section 3.4.4), for robustness checks (section 3.4.5) and for the calculation of the share of the increase in Spanish unemployment that can be traced back to household sector debt (section 3.4.6).

3.4.1 Theoretical framework

The theoretical foundation for the investigation of the effect of household debt via the aggregate demand channel on unemployment is provided in Mian and Sufi (2012, p. 10 ff. and 29, 30). The model described here in a short version mirrors the model of Mian and Sufi (2012). Differences arise because we look at increases in unemployment at a provincial level ΔU_p and the elasticity of unemployment to a reduction in consumption and aggregate demand η instead of employment losses at a county level Y_c and the elasticity of employment with respect to output demand β.

The model setup is as follows: households spend a fraction α of their income on non-tradable goods NT and the rest of their income $1 - \alpha$ on tradable goods T. When households reduce their consumption, both, tradable and non-tradable goods are affected. Unemployment reacts to this reduction in demand and increases according to the elasticity of unemployment to a reduction in aggregate demand η.

In this model, province p is hit by the demand shock δ_p. However, the total shock to a province γ_p consists of a reduction in demand for non-tradable goods in the respective province and a reduction in demand for tradable goods from the whole country that hits this province:

(3.1) $$\gamma_p = \alpha\delta_p + (1-\alpha)\bar{\delta}$$

where $\bar{\delta}$ is the average shock for tradable goods for each province:

(3.2) $$\bar{\delta} = \frac{1}{N}\sum_{p=1}^{N}\delta_p$$

The total demand-driven increase in unemployment in province p depends on the elasticity of unemployment with respect to output, i.e. $\eta\gamma_p$. Each province is furthermore exposed to a country wide shock ε that is equal to all provinces and a structural shock s_p that just affects province p. The total increase in unemployment ΔU_p in a province can thus be written as:

(3.3) $$\Delta U_p = \eta\alpha\delta_p + \eta(1-\alpha)\bar{\delta} + \varepsilon + s_p$$

The aggregate increase in unemployment that results from the debt-driven demand shock only (3.6) can then be calculated as the sum of the increases in unemployment in non-tradable sectors (3.4) and the sum of the increases in unemployment in tradable sectors (3.5).

(3.4) $$\sum_{p=1}^{N}\eta\alpha\delta_p = N\eta\alpha\bar{\delta}$$

(3.5) $$\sum_{p=1}^{N}\eta(1-\alpha)\bar{\delta} = N\eta(1-\alpha)\bar{\delta}$$

(3.6) $$N\eta(1-\alpha)\bar{\delta} + N\eta\alpha\bar{\delta} = N\eta\bar{\delta}$$

To derive econometrically the effect of this demand shock, the structural shock in province p and the country wide shock that affects all provinces equally need to be excluded. By using a narrow definition for the non-tradable sector that focuses on regional consumption that is not likely to be prone to a regional structural shock, we aim to exclude s_p from our calculation. The change in non-tradable sector unemployment for a province that is not exposed to a regional structural unemployment shock is given by equation (3.7):

(3.7) $$\Delta U_p^{NT} = \eta\alpha\delta_p + \alpha\varepsilon$$

As a next step, country-wide shocks are excluded by taking the differences between the provinces. We thereby assume that the decile of provinces with the lowest debt level ($p_1, \dots, p_5$) does not suffer from a deleveraging shock, but that these provinces are a benchmark for developments that affect all provinces. We consequently compare all provinces to the province with the fifth-lowest debt level ($p = 5$):

$$\Delta\left[\Delta U_p^{NT}\right] = \Delta U_p^{NT} - \Delta U_5^{NT} = \eta(\alpha\delta_p - \alpha\delta_5) \tag{3.8}$$

$\Delta\left[\Delta U_p^{NT}\right]$ is set to zero for the five provinces with the lowest debt levels.

If we could directly observe the demand shock δ_p, the aggregated increase in unemployment in the non-tradable sector due to a debt-driven reduction in demand could be estimated as

$$\Delta\left[\Delta \widehat{U}^{NT}\right] = \sum_{p=5}^{N} \Delta\left[\Delta \widehat{U}_p^{NT}\right] = \sum_{p=5}^{N} \eta(\alpha\delta_p - \alpha\delta_5) = \alpha N\eta\bar{\delta} - \alpha N\eta\delta_5 \tag{3.9}$$

However, we cannot directly measure the demand shock δ_p. Therefore we proxy the size of this demand shock for each province by the level of household debt relative to GDP. Households with more debt need to reduce their spending by a larger amount. Thus, provinces with higher debt-to-GDP ratios experience larger drops in aggregate demand and larger increases in unemployment. We use our indicator of household sector debt in province p for the calculation of the increase in unemployment:

$$\Delta\left[\Delta \widehat{U}_p^{NT}\right] = \left[E\left(\Delta U_p^{NT} \middle| Debt_p\right) - E(\Delta U_5^{NT} | Debt_5)\right] \tag{3.10}$$

This approach is suitable because we have a linear relationship between household sector debt levels and changes in non-tradable sector unemployment, which is shown in the empirical analysis and figure 3.5. The increase in total unemployment that is related to the debt-related reduction in consumption can then be calculated by solving (3.9) for $N\eta\bar{\delta}$; i.e., multiplying the increase in non-tradable unemployment with the inverse of the share of non-tradable unemployment in total unemployment:

$$N\eta\bar{\delta} \approx \frac{1}{\alpha} \sum_{p=5}^{N} \Delta\, \widehat{U}_p^{NT} \tag{3.11}$$

The term $N\eta\delta_5$ is thereby neglected in (3.11) because we make the conservative assumption that the decile of provinces with the lowest debt levels did not face a demand shock from too high debt burdens. This approach is taken to the Spanish data in section 3.4.6.

3.4.2 Description of the data

The Spanish regional data are taken from the Instituto Nacional de Éstadística (INE), the Spanish Ministry of Employment and Social Security (Ministerio de Empleo y Seguridad Social), the Spanish Ministry of Public Works and Transport (Ministerio de Fomento) and Eurostat. The regional level used in the analyses is NUTS-3,[24] i.e., the Spanish *provincias* are analyzed.

Because there is no information on the overall household debt levels or the changes in household debt for the Spanish provinces, we require an alternative measure. This is found in the mortgage data for the Spanish provinces, which are provided by the INE. Mortgages account for 84% of total household debt, and this share is almost independent of the income percentiles according to the survey of household finances.[25] Thus, in this research, the volume of mortgages is a good alternative measure to total household debt. All of the mortgage data are monthly data that is available from January 2003 onwards. However, there is no information on the total level of mortgages outstanding but the monthly information indicates the number and volumes of newly issued mortgages, which we use to proxy the total level of mortgages outstanding. The mortgage data from the INE are split into different categories. This allows us to focus on housing mortgages.[26]

[24] NUTS levels (fr. *Nomenclature des unités territoriales statistiques* – Nomenclature of territorial units for statistics) are used for regional statistics in Europe. NUTS-3 is used to distribute the regional funds of the European Union.

[25] The ratio of 2008 mortgage debt to total debt ranges from a maximum of 85.3% for the top income percentile to a minimum of 82.3% for the second highest income percentile. The overall average is 84%. The differences in the income percentiles can be traced to the fact that the highest income percentile uses less than half of its mortgages for main residences, whereas the poorest 40% of households use 87% of their mortgages for main residences (cf. Bank of Spain (2011), p. 111 table 6).

[26] The two major categories are agricultural land (which had a share of 6% from January 2003 to April 2011) and urban land (which had a share of 94%). Within urban land, there are multiple categories: housing (61%), lots (11%), and other urban land (22%). "Other urban land" includes commercial properties, garages, offices, and industrial buildings, but also buildings that include dwellings. Using total mortgages instead of housing mortgages generates results that are similar to the ones presented in this section; the significance levels remain the same, although the coefficients are smaller. These results are as expected because the effect of debt taken on for agricultural or business purposes should have less of an effect on household consumption (and, thus, employment in the non-tradable sector) than debt taken on for the purpose of housing.

The mortgage data are used in the analyses in two different ways. First, because we do not have data on the level of household debt, which would allow for a straightforward calculation of the growth rate as in section 3.3, we compare the aggregated mortgage issuances from 2003 and 2004 over the 2004 GDP with the aggregated mortgage issuances from 2005 to 2007 over the 2007 GDP. This comparison leads us to approximate the growth rate from the three years preceding the crisis compared to that of the two prior years. It also enables us to investigate the effects of an increase in mortgage issuances on the subsequent changes in aggregate demand. Second, the volume of mortgages at a certain point in time can be approximated by the aggregated volume of newly issued housing mortgages in the five years preceding the crisis, i.e., from January 2003 until December 2007.[27] The household mortgage debt calculated in this indirect way is 85.3% of the total household liabilities in Spain at the end of 2007 (as documented by the Bank of Spain). This calculated debt level is a really good approximation of the actual debt level because it almost equals the total mortgage debt of households, which is at 84.1% of total household debt according to the survey of household finances (cf. Bank of Spain (2011), p. 111). The main reason why we underestimate the total household debt level is that our measure does not include credit card debt or personal loans. Our measure can be used if we assume that there is no systematic difference in the structure of household debt across regions.

For the analysis related to the debt level, we construct a ratio of debt to provincial GDP. The provincial GDP data that are used to calculate the debt-to-GDP ratios are based on Eurostat figures. The unweighted mean household sector debt-to-GDP ratio across all provinces was 63% with a standard deviation of 27%. The average GDP per province in 2007 was 20.2 billion EUR. Excluding the two most important provinces (Barcelona and Madrid) yields an average GDP of 14.2 billion EUR. Eurostat also serves as the source of the population data used in this study, i.e., the data regarding changes in the size of the workforce, which are measured as the percentage change in the population of individuals between the ages of 15 and 64.

Real estate prices are included in the analysis to determine how the effects of household debt differ across the provinces that did or did not experience booms in the real estate sector. If the increase in debt was associated with a parallel increase in real estate prices, then the adjustments

[27] Mian and Sufi (2012, p. 12 and 13) use the debt-to-income ratio in their analysis but state that using the accumulation of household debt in the five years preceding the crisis as an alternative measure would not change the results of their analysis.

in aggregate demand might result from either real estate price developments or excessive debt levels. Controlling for real estate prices thus helps us to identify the purely debt-driven aggregate demand channel. The relevant data are provided by the Spanish Ministry of Public Works and Transport. All of the prices are mean prices of residential real estate transactions by province and quarter from 2004 to 2012. The average Spanish residential real estate price in the first quarter of 2004 was approximately 124,000 EUR. The price increased to approximately 190,000 EUR in the fourth quarter of 2007 (+ 53%) and reached approximately 148,000 EUR in the first quarter of 2012 (-22% vs. peak, +19% vs. Q1/2004). The unweighted mean increase in the prices across all provinces from the first quarter of 2004 to the maximum in each province was 89% with a standard deviation of 44%.

Aggregate demand is measured using the employment and unemployment channel. Employment rates and total nominal employment figures for the provinces are obtained from the INE. The Spanish employment rate was 51.1% in the first quarter of 2005. That rate increased to 54.4% in the third quarter of 2007 and decreased to 45.3% in the first quarter of 2012. The employment and unemployment rates[28] already show a high and significant correlation with the provinces' household debt figures. To determine the effect of debt on aggregate demand, it is necessary to identify the portion of unemployment that results from consumption in the individual provinces. To identify this effect, the unemployment data[29] by economic activity on a provincial level are obtained from the Spanish Ministry of Employment and Social Security. The economic activities are split into 22 different groups. These groups are then clustered by the type of economic activity into the tradable sector, the non-tradable sector, construction or other sectors. Due to a change in the classification system for economic activities that occurred in 2009, we need to match the earlier classification system with the recoded one (cf. table A3.2). Consequently, not all of the groups are exactly matched, but the tradable and non-tradable sectors can be identified.

[28] We use the term "unemployment" for the sake of simplicity throughout this section, but the data from the Ministry of Employment and Social Security are somewhat broader and also include individuals such as seasonal workers and job seekers who are employed part time but are looking for full time jobs. In November 2007, the ratio of job seekers to total unemployed persons was 147%, indicating a future increase in unemployment. The ratio decreased to 136% in November 2010 and to 133% in September 2012. In 2007 and 2010, the majority of the excess job seekers were still regularly employed (approximately 50%).

[29] For this investigation, we use sectoral unemployment data from the regional level due to the dearth of data on sectoral employment in the provinces.

Because the demand for tradable economic activities is not bound to the place of production but to the entire economy the tradable sector faces similar shocks across all provinces. The economic activities that we classify as tradable are the extracting industries, the manufacturing industries, agriculture and fishing. All of the goods produced in these industries can generally be shipped to other provinces within Spain, although some agricultural and fishery products are linked to local markets, and the same applies to manufacturing industries that, for example, supply the local construction sector. However, employment data for the subgroups within the manufacturing sector are only available at the aggregate national level. Ideally, we would distinguish between manufacturing industries that produce for the entire Spanish market, such as the automobile industry, and manufacturing industries that only produce for local markets. Because some of the employment in the manufacturing sector is linked to the local markets, we expect to see a correlation between local spending and manufacturing. An even stricter distinction would eliminate any correlation between manufacturing, i.e., tradable goods, employment effects and household sector debt. Thus, the outcome of this exercise should be seen as rather conservative estimate for the tradable sector. If we could draw a more exact line within the manufacturing sector, the results would be even stronger.

The non-tradable industries produce goods that are linked to local consumption spending, as indicated by the 1993 definition "trade, repair of motor vehicles, motorcycles, household goods and personal items" and "private households with employed persons". (Retail) Trade activities like those conducted by grocery stores or clothing and shoe stores crucially depend on local consumption. The same is true of the personnel employed in household services. It is not necessarily true that the non-tradable sectors experience higher increases in unemployment than the tradable sectors because the employment elasticities with regards to consumption may be different and consumption on durables may be more affected. However, it is important to note that the non-tradable sector depends on aggregate demand on the *province* level, and the hypothesis to be tested builds on this link between debt and aggregate demand. To compare Spanish provinces with an average population of less than one million provides a granular view that is suited to disentangling the effect of household debt on aggregate demand.

3.4.3 Empirical analysis

The literature reviewed in section 3.2 examines mainly the effect of deleveraging on the economy. The Spanish household sector as a whole has barely begun to reduce its debt outstanding relative to GDP. However, for us to investigate the deleveraging effect, the households do not necessarily need to have reduced their nominal debt outstanding. It is sufficient that they exhibit reduced growth in liabilities and consume less than in previous periods. The case of Spain is a good example of the mechanism in question: on average, from the beginning of 2003 to the end of 2007, the liabilities of Spanish households increased by approximately 6 percent of GDP per year.[30] In the period from the beginning of 2008 to the end of 2010, household sector debt increased on average by 1 percent of GDP.[31] Under the two simplifying assumptions that households spend all of their income and the net incurrence of liabilities on consumption and investment and that their income share as well as total GDP remained approximately constant from 2007 to 2010, a reduction in the debt growth from 6 percent of GDP to 1 percent of GDP means a reduction in spending of 5 percent of GDP without deleveraging (cf. figure A3.6 for a graphical illustration). An increase in the debt outstanding can thus still go in hand with a reduction in consumption expenditure. Therefore, an analysis of the debt-consumption link should not exclusively examine nominal deleveraging.

The sharp increase in Spanish household liabilities that occurred from 2003 to 2007 and the sudden elimination of these growth rates in 2008 due to a rather stable volume of total liabilities in 2009 and 2010 makes Spain a good case for analysis. Because substantial nominal deleveraging in Spain did not begin until 2011, the effect of the debt shock on consumption in Spain should therefore be smaller than it was in the United States, where deleveraging started earlier. Figure 3.4 depicts the development of the Spanish nominal household sector liabilities. Figure 3.4 also illustrates the relationship between debt and unemployment and thus supports our hypothesis. Starting in the mid-nineties, the unemployment rate in Spain decreased parallel to an increase in household liabilities. When the average quarterly net incurrence of household liabilities was at a peak, unemployment was at a low. When the growth of debt decelerated in

[30] This percentage reflects an annual growth rate for nominal debt of 18% or an annual growth rate for the debt-to-GDP ratio of 10%.

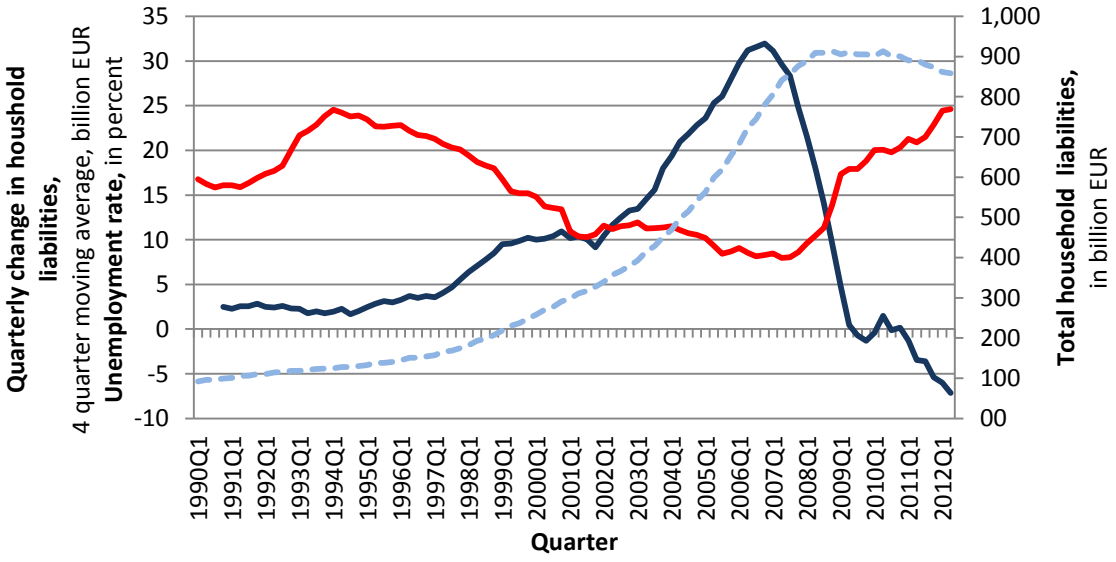
[31] This percentage is equal to an annual growth rate for nominal debt of 1% or an annual growth rate for the debt-to-GDP ratio of 1%.

2007, unemployment stopped decreasing and as the debt growth paused in 2008 and became negative in 2009, unemployment intensified.

Figure 3.4

Spanish household liabilities and unemployment

The total liabilities of the household sector, including non-profit institutions serving households, are plotted using end-of-quarter data as represented using the light blue dashed line (right axis). The net incurrence of liabilities for the sector is plotted using a four-quarter moving average in dark blue (left axis). The quarterly unemployment rate is plotted in red (left axis). The correlation between the unemployment rate and the net incurrence of liabilities is 87%.



Data source: Bank of Spain, INE.

Using the data to evaluate the hypothesis, we first examine the correlation between the increases in the provision of debt from the years 2003-04 to the years 2005-2007. Next, we examine the correlation between the level of debt in 2007[32] and the changes in unemployment in the different economic sectors from 2007 until 2010. The starting point for the employment figures is November 2007, and the end point is November 2010. We use the November figures because the real estate prices peaked in the fourth of quarter of 2007 and because the employment rate was at a high in the third quarter of 2007, which still includes the effects of tourism, i.e., part of the tradable sector. In addition, we do not wish to include year-end effects in employment or unemployment. We limit the analysis to November 2010 to capture the first-round effects of the

[32] As explained in the paragraph with the data description, we treat the aggregated mortgage issuances from 2003 to 2007 as a proxy for the debt level.

reduction in consumption. The decline in employment lost momentum in the second half of 2010, but the recession intensified again towards the end of 2011 and in 2012, along with capital flights. Using year-over-year changes, we select the data from November as the newest data in this study.

The correlation between household debt and unemployment at the province level is shown in table 3.1. The results for the total unemployment rate are similar to the results for employment at the European country level. The level of debt is highly, significantly and positively correlated with the total unemployment rate. These results do not hold for increases in debt. Spanish households reduce their consumption more based on their total debt level and the resulting debt service and to a lower extent based on changes in their debt prior to the crisis.[33] When we distinguish between economic activities, larger increases in debt are linked to higher unemployment rates in the sectors that depend on local consumption, but the relationship is much stronger for debt levels. Unemployment in the economic sectors that are classified as non-tradable is even more closely tied to household debt than is unemployment in the construction sector. Unemployment in the tradable sector has no significant correlation with the level of debt. These correlation results support the hypothesis that household debt restrains consumption because employment that is linked to local spending is also tied to local household debt, whereas employment linked to nationwide spending is not.

Table 3.1

Correlation of household sector debt and unemployment

The increase in debt is measured as the increase of the debt-to-GDP ratio from the cumulated 2003-04 level to the cumulated 2005-07 level. The level of debt is measured as the cumulative mortgage provision from 2003 to 2007 over GDP in 2007.

Sectoral unempl.	Increase in debt	Level of debt
Total	0.1901	0.5212***
Tradable	0.1383	0.2143
Non-Tradable	0.2498*	0.6490***
Construction	0.0106	0.3889***

*, **, *** denote significance at 10%, 5% and 1%.

Data source: INE, Ministerio de Empleo y Seguridad Socia, Eurostat.

[33] This relationship also holds when the increase is calculated as the increase in the average monthly mortgages issued in 2003 as compared to 2007, which reflects the second derivative of the debt level.

A further illustration of the described link is provided by a map of the Spanish provinces that shows the debt levels and the changes in non-tradable unemployment (cf. figure A3.3).

An alternative to examining the debt level and its subsequent effects on aggregate demand is to directly investigate the magnitude of the deleveraging. As described above, there are no debt data for individual provinces at the absolute household debt level. Thus, we compare the nominal volume of mortgages issued in the five years preceding the crisis to the amount of mortgages issued from the beginning of 2008 until April 2011, the latest month in our dataset. The reduction in mortgage issuance, calculated as the difference between the ratio of mortgage issuances to GDP from 2003 to 2007 and the same ratio for 2008 to 2011, is almost perfectly correlated with the debt level in 2007. The correlation coefficient of -98.3% clearly demonstrates that the debt level in 2007 is a good indicator of the subsequent developments in the debt ratio. For example, using the deleveraging effect in table 3.2. changes the sign of the correlation coefficients, but the significance levels remain the same, and the coefficients change only marginally. Still, we abstain from using the deleveraging variable because it might generate endogeneity issues because it evolves simultaneously with unemployment.

Regressing sectoral unemployment on household sector debt validates these results (cf. table 3.2). The level of household sector debt prior to the crisis has a significant positive effect on overall, non-tradable and construction unemployment and does not affect unemployment in the tradable sector. The effect of debt is approximately 10% stronger for the construction sector than for the non-tradable sector. Like the significance of household debt, the explanatory power of this household balance sheet shock is quite high, with an R^2 of 42% for the non-tradable sector. It is especially high compared to the results by Mian and Sufi (2012) who regress changes in employment on household debt levels without further control variables and obtain an R^2 of 8%. The coefficient of 0.78 implies that when the ratio of debt to GDP increases by one percentage point, the change in non-tradable unemployment from November 2007 to November 2010 is 0.78 percentage points higher. Whereas a province with a debt-to-GDP ratio of 50% experiences an increase in non-tradable unemployment of 39%, a province with a debt-to-GDP ratio of 51% experiences an increase of 39.78%.

Table 3.2

OLS regression of unemployment on household sector debt

The regressions are estimated using ordinary least squares, and heteroskedasticity-robust standard errors are used when necessary. The level of household debt in 2007 is calculated as the sum of the household mortgages from 2003 to 2007. The real estate boom dummy takes a value of 1 if the respective province is among the 25 provinces with the highest increase in real estate prices prior to the crisis or takes a value of 0 otherwise. "Change in the workforce" measures the percentage increase or decrease in the size of the working-age population, i.e., the number of 15- to 64-year-olds, in a province from January 1st 2008 to January 1st 2011. The "share of construction in Q1 2008" represents the share of construction employment in total employment in the first quarter of 2008, since figures for 2007 were not available from the same database.

OLS estimation	Percentage change in unemployment from Nov. 2007 to Nov. 2010							
	Total		Tradable sector		Non-tradable sector		Construction	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Level of household debt in 2007	**0.70**	**0.60**	0.41	-0.02	**0.78**	**0.67**	**0.86**	**1.24**
(p-value)	(0.00)	(0.03)	(0.14)	(0.96)	(0.00)	(0.01)	(0.01)	(0.01)
Change in workforce		0.73		5.19		1.40		-6.46
(p-value)		(0.76)		(0.24)		(0.62)		(0.18)
Real estate boom dummy		-0.00		-0.04		-0.06		-0.09
(p-value)		(0.97)		(0.79)		(0.43)		(0.60)
Share of construction in Q1 2008		1.22		2.13		0.24		-0.20
(p-value)		(0.40)		(0.49)		(0.88)		(0.95)
Constant	**0.40**	0.30	**0.58**	0.56	**0.27**	0.33	**1.05**	**0.91**
(p-value)	(0.00)	(0.18)	(0.00)	(0.17)	(0.01)	(0.19)	(0.00)	(0.04)
N	50	50	50	50	50	50	50	50
R^2	27.2%	28.0%	4.6%	8.6%	42.1%	43.1%	15.1%	19.8%

Data source: INE, Ministerio de Empleo y Seguridad Social, Eurostat.

Model (a) uses the level of household debt as the only explanatory variable. In model (b), we amend the estimation to include a dummy variable that takes a value of 1 if the respective province is among the 50% of provinces with the highest increase in real estate prices in the years preceding the crisis or a value of zero otherwise. Including an indicator for the provinces that saw a boom in home prices reflects the idea that these households may have over-borrowed to finance a house and may be especially vulnerable to decreases in house price during a recession. These decreases might also be steeper given a stronger increase beforehand. The results are robust to different definitions of the real estate dummy, e.g., if it takes the value of 1 for the top ten provinces only. The coefficients and significant levels also change only marginally if the real

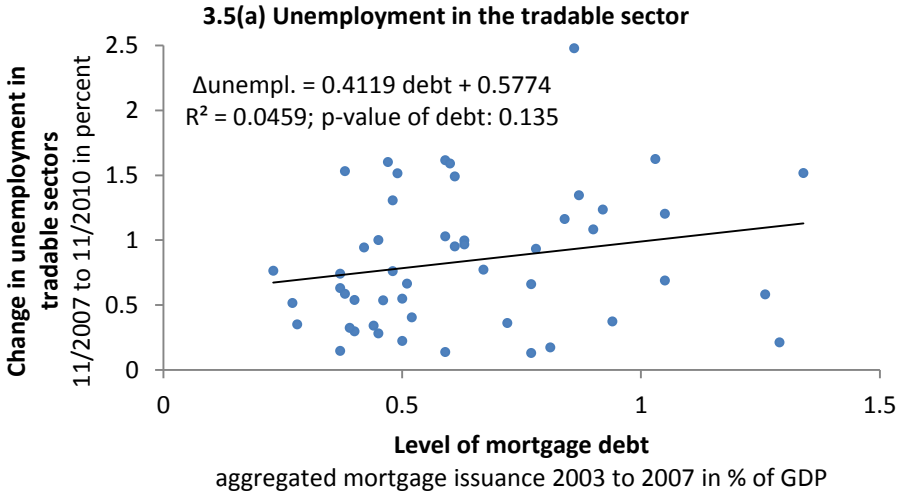
estate boom dummy is replaced for a variable that measures the percentage increase in real estate prices from 2004 to 2007. The second control variable is the change in the working-age population from 2008 to 2010. An increase in unemployment might only be linked to a stable total number of jobs and an increasing work force. However, changes in the workforce do not significantly affect unemployment in any sector. The third factor we control for is the share of construction employment in total employment. Provinces with a larger construction sector may suffer more from an increasing number of unemployed construction workers who cut back on consumption. This control variable is insignificant, too, and the inclusion of these three variables increases the R^2 by only a small amount.

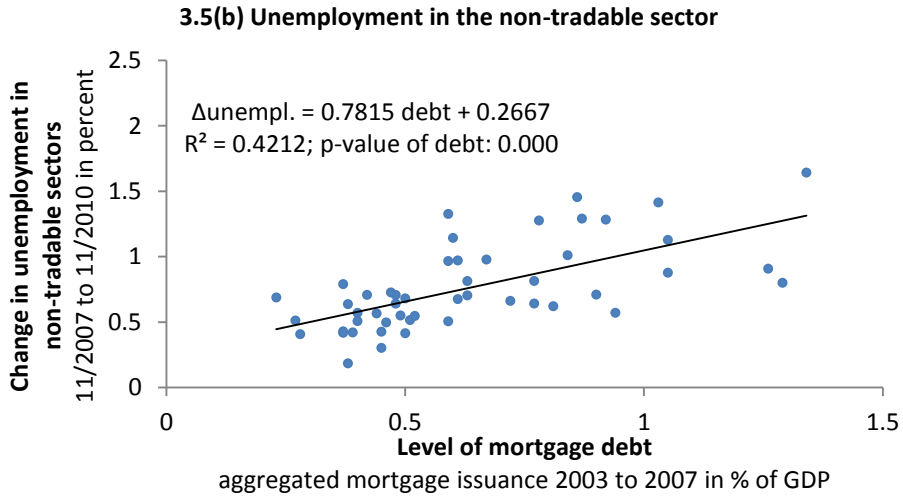
Plotting the 50 provinces in diagrams for the tradable and non-tradable sectors further illustrates these relationships with household sector debt (cf. figure 3.5).

Figure 3.5

Household sector debt and changes in tradable and non-tradable unemployment

The level of mortgage debt is calculated as the sum of all mortgages provided from 2003 to 2007 divided by the GDP in 2007. The "unemployment" figures for the tradable and non-tradable industries include unemployed persons and employed persons who are looking for jobs (e.g., part-time workers or seasonal workers). The scatter plots for the underlying economic activities are presented in figure A3.2 and A3.3 in the Appendix.





Data source: INE, Ministerio de Empleo y Seguridad Social, Eurostat.

The vertical axes of figures 3.5(a) and 3.5(b) both have the same scale. Using the same scale highlights the larger variation in the tradable sector (which does not exhibit a relationship with the provincial household balance sheet shocks) relative to the non-tradable sector, for which the observations are within a narrower band.

The reduction in consumption that generates increasing unemployment via the elasticity of employment to aggregate demand may be caused by a reduction in income (the PIH), a reduction in wealth, particularly housing wealth (part of the LCH), or an additional deleveraging effect caused by high leverage rates. Dynan (2012) disentangles these effects using micro data for the United States and finds that after income and wealth effects are controlled for, leverage is still highly significant and negative. The results presented in this study might also be attributed to a wealth effect following the burst of the real estate bubble. This pure wealth shock is difficult to separate from the shock that results from lower expected income or high leverage because all three lead to a household balance sheet adjustment via lower consumption expenditure. We try to address this issue with different robustness checks in the next section.

3.4.4 Robustness checks

The control variable for real estate price developments in table 3.2 is a first robustness check for a potential wealth effect. We use a boom variable rather than a bust variable to avoid simultaneity bias because the change in unemployment during the crisis negatively affects real estate prices. Because the real estate boom dummy is not significant, we ensure that the provinces with a real

estate boom prior to the crisis did not perform better or worse in terms of local consumption (and thus non-tradable unemployment) during the crisis. Hence, the likelihood of a pure housing wealth effect is small.

A second robustness check that can be used to explore the distinction between real estate prices and household debt involves splitting the provinces into two groups and investigating their extremes.[34] We distinguish between the provinces that show a high correlation between the changes in real estate prices and the changes in employment and those with a low correlation. A high correlation coefficient implies either that there is a direct link between real estate prices and employment or that there is at least one factor that is simultaneously determining the two variables. This group is prone to a wealth effect because decreasing house prices, i.e., decreasing wealth, may lead to decreasing consumption and reduced employment. A low correlation coefficient is a good criterion for the inclusion in a control group, as the provinces in question do not exhibit parallel movements in employment and real estate prices, nor are their employment and real estate figures subject to a common influence; thus, no wealth effect should be present in these provinces. Of the Spanish provinces, 5 provinces are assigned to the high correlation group, as these have a correlation coefficient of 70% or higher. The 5 provinces with correlation coefficients of 5% or less, including negative correlation coefficients, are assigned to the low correlation group. The coefficient itself is calculated for year-on-year changes in real estate prices and employment levels between 2005 and 2012.

Next (cf. table 3.3), we compare these two groups with regard to the change in real estate prices, employment and debt in the years prior to the crisis and during the crisis. This allows us to identify commonalities and differences between the groups and potential asymmetric effects of debt in the growth and contraction periods.

[34] This approach is similar to a case study approach. A case study is an appropriate method of investigation for this purpose because the small number of observations makes econometric tests unreliable.

Table 3.3

Development of real estate prices, employment and debt in the provinces with high and low correlations between changes in employment and real estate prices

The correlation coefficients for changes in employment and real estate prices differ across provinces. The first cluster of provinces consists of the 5 provinces (Alicante, Balears, Castellón, Madrid and Málaga) with the highest correlation coefficients (>70%) in the period from the first quarter of 2006 to the first quarter of 2012. The second cluster consists of the 5 provinces (Caceres, Lugo, Ourense, Palencia and Soria) with the lowest correlation coefficients (<5% or even negative). The correlations are calculated using year-over-year changes and quarterly data. Forming the groups using correlations between the levels of real estate prices and employment yields similar results. Developments in real estate prices and employment are measured from the start of the time series until the national peak for real estate prices and from that point in time until the latest available data. Debt is provided as described above and is comprised of the total mortgage issuance from 2003 to 2007, which (1) serves as an indicator for the increase in debt during the boom period and (2) serves as proxy for the debt level and the size of the shock at the end of 2007. All of the data are unweighted means across the groups.

		Group (a)	Group (b)
Boom-period	Time span	High (≥ 70%), 5 provinces	Low (≤ 5%), 5 provinces
Real estate prices	(Q1/2004 to Q4/2007)	+61%	+69%
Employment rate	(Q1/2005 to Q4/2007)	+5%	+5%
Non-tradable unemployment	(05/2005 to 05/2007)	-1%	-9%
Debt over GDP (1)	Accumulation of debt from 2003 to 2007	95%	34%
Crisis-period			
Real estate prices	(Q4/2007 to Q1/2012)	-24%	-8%
Employment rate	(Q4/2007 to Q1/2012)	-20%	-14%
Non-tradable unemployment	(11/2007 to 11/2010)	+102%	+48%
Debt over GDP (2)	Accumulation of debt from 2003 to 2007 - size of the shock	95%	34%

Real estate prices: On average, the provinces in both groups experienced a similar increase in real estate prices prior to the crisis. The high-correlation provinces experienced an increase of 61% from 2004 to 2007, and the value for the low-correlation provinces is slightly higher at 69%. Consequently, it appears that the boom in real estate prices and the resulting wealth effect are not good individual indicators of the subsequent changes in employment. Nor can we say that some provinces experienced a real estate price bubble and others did not simply by examining the isolated increase in real estate prices. Nevertheless, we cannot rule out the possibility that an increase of 60% in one province is speculative but that the same increase in another province is

based on fundamentals. During the crisis, the provinces with a high correlation coefficient suffered from decreases in real estate prices that were three times higher than the decreases in the provinces with a low correlation coefficient. The declines in the price levels from the fourth quarter of 2007 to the first quarter of 2012 for the high- and low-correlation provinces were 24% and 8%, respectively. Consequently, these two groups were similar prior to the crisis but differed during the crisis.

Employment: Both groups of provinces experienced the same increase in employment during the boom. The low- and high-correlation provinces both experienced an increase of 5%. The declines in employment rates during the crisis differed, but the difference is not as large as the gap between the declines in real estate prices in the two groups. The low-correlation provinces experienced a decline of 14% in employment, and the high correlation provinces suffered a decline of 20%. The differences between the two groups are larger when we consider non-tradable unemployment. The first group had a decrease of -1% during the boom, whereas the second group faced a decrease of -9%. During the crisis, the divergence became even more apparent: the first group had an increase of 102%, whereas the second group experienced an increase of 48%. As with real estate prices, there were similarities during the boom and divergences during the crisis.

Household debt: According to our hypothesis, the explanation for the difference between the high- and low-correlation provinces should be the debt level. Although the two groups had a similar increase in real estate prices and employment, the group with higher employment losses should have been exposed to a higher debt level that created a greater need for household balance sheet adjustments. In both groups, a decline in real estate wealth puts pressure on consumption via the mechanism described by the life cycle hypothesis. However, the group that is exposed to higher debt should suffer more because of the additional deleveraging effect. Indeed, the provinces with a high correlation coefficient had a higher debt level at the beginning of the crisis and also accumulated more debt prior to the crisis. The debt levels are almost three times higher; they are 95% and 34% for the high- and low-correlation provinces, respectively.

There might be other factors that distinguish the two groups from one another and that act as the underlying drivers of development. Income levels or industry structures could be affected by idiosyncratic shocks independent of the debt level. The provinces with the high debt levels are,

for example, much larger in terms of population and GDP, and their GDP per capita exceeds that of the low-correlation provinces by 22%, primarily because of Spain's capital, Madrid. The employment structure, which is an indicator of the industry structure, also differs across the two groups. The low-correlation provinces depend more on agriculture (11% vs. 2%) and industrial employment (17% vs. 13%) but less on service sector employment (60% vs. 71%). However, the shock that affects the provincial service sector more strongly than it affects the provincial agricultural or industrial sector is a reduction in demand. When we consider these regional discrepancies, household over-indebtedness again emerges as a reasonable explanation for the shock affecting those provinces.

Thus, we conclude that high household debt levels force households to cut back on consumption expenditure, which then triggers a decline in employment. The wealth effect is still apparent, and real estate prices and employment during the crisis are intertwined, but an analysis of these two groups of provinces makes it clear that household debt has a strong and negative effect on aggregate demand in times of crisis. Another interesting result of this robustness check is the asymmetric effect of household debt. Although neither employment nor real estate prices react to differences in debt accumulation prior to the crisis, there is a large difference in their reactions once the debt growth stops and debt is reduced.

3.4.5 The aggregate effect of household debt on unemployment

The change in household expenditure patterns does not exclusively affect local non-tradable employment through the consumption channel. Households also cut back on spending on durable goods and housing. If there were a proportional reduction in consumption and investment spending and if net exports did not matter, then employment in manufacturing and other tradable industries would be reduced on the same scale as in the non-tradable industries. Using this corollary, we follow Mian and Sufi (2012) and their theoretical framework, which we adapted for the case of Spain (cf. section 3.4.1). In this section we calculate the aggregate increase in unemployment in Spain that resulted from a drop in household expenditures due to deleveraging which was transmitted to the labor market via the aggregate demand channel.

The estimation results presented in table 3.2 reveal that every additional percentage point of debt relative to GDP leads to an increase of 0.78 percentage points in the change in unemployment. We first calculate the number of unemployed persons in the non-tradable sector that resulted

from the high level of household debt. For this purpose, we use the linear relationship between the debt levels in 2007 and the changes in unemployment that occurred from 2007 to 2010. However, we account for the fact that households have always been indebted to some extent; in the analysis, we only incorporate the debt that exceeds the debt level of the five provinces with the least debt; i.e., we subtract 0.37 from every province's debt level to calculate the related increase in unemployment. The debt-related change in non-tradable unemployment ΔU_p^{NT} is then calculated as follows:

$$\Delta U_p^{NT} = \left(Debt_p - Debt_5\right) * \beta * U_p^{NT} = \left(Debt_p - 0.37\right) * 0.78 * U_p^{NT} \quad (3.12)$$

where $Debt_p$ is the level of debt in province p in 2007, and $Debt_5$ is the level of debt in the province at the lowest debt percentile. The effect of debt on unemployment is expressed by β and is 0.78. U_p^{NT} is the total number of unemployed in the non-tradable sector in province p in November 2007. Aggregating equation (3.12) across all provinces with $Debt_p > Debt_5$ yields the total increase in debt related non-tradable sector unemployment in Spain. Non-tradable unemployment, as classified in section 3.4.2, increased from approximately 368,000 in November 2007 to approximately 677,000 in November 2010. According to the calculation used, an increase by approximately 100,000, or 33% of this increase, is related to the indebtedness of the household sector.

The change in total unemployment is then calculated by applying the effect of debt on non-tradable unemployment to all of the other sectors. The share of non-tradable unemployment within total unemployment increased slightly from 11.9% in November 2007 to 12.1% in November 2010. Therefore, the change in non-tradable unemployment is divided by the share of non-tradable unemployment (cf. equation (3.11)). This calculation yields a total of approximately 860,000 unemployed persons, or 34.5% of the change in unemployment, as a result of the household debt or aggregate demand shock.[35]

According to the approach introduced in this study, 2/3 of the increase in Spanish unemployment is unrelated to the demand effects that stem from over-indebted households. According to our estimates, the policies directed at reducing the debt burden of households therefore address only

[35] This method is valid, when we consider a closed economy. Jobs in tradable sectors that partly depend on foreign demand are not subject to the Spanish reduction in demand.

1/3 of the unemployment issue. However, our results do not necessarily point towards structural problems of the Spanish economy and labor market because the remaining 2/3 of the increase in unemployment that is not explained may result from other demand factors, such as a reduction in government spending. Further disentangling and explaining the surge in unemployment in detail is beyond the scope of this study, but we briefly describe some other major sources for this important issue. Most construction activities stopped when the real estate bubble burst, which resulted in an increase in unemployment in this sector. The construction sector accounts for 21 % of the total increase in unemployment that occurred from November 2007 to November 2010, and the increase of 159 % that was observed in this sector is twice as high as the average increase in unemployment.[36] The household balance sheet restructuring and the end of the real estate bubble explain more than half of the increase in unemployment. Finally, the sectors that exhibit an above-average increase in unemployment include trade and repair of vehicles (86 %), the hotel sector (83 %), transportation and warehousing (84 %) and health and social work activities (91 %).[37] The increase in unemployment in the group of people classified as "without previous employment" contributes 7.4% of the total increase of unemployment. The increase in this category is 64.2% and consequently below the average national increase, but it cannot be compared to the changes in other sectors because it represents unemployed persons that have only recently entered the working population. Thus, only a few sectors exhibit an above-average increase in unemployment, which highlights the problems stemming from the construction and non-tradable sectors.

3.5 CONCLUSION

In addition to providing an empirical overview and explanation of the European debt problem, we investigated in greater detail the situation of the Spanish provinces. We found that the pre-crisis mortgage debt levels had strong positive effects on changes in the provincial unemployment rates during the crisis. This finding is consistent with the results of Mian and Sufi (2012) and highlights the relevance of household indebtedness to unemployment. Furthermore, the

[36] Unemployment in the construction sector was approximately 331,000 in November 2007 and 858,000 in November 2010. However, this increase of 527,000 is not completely related to the construction sector due to the reclassification of the employment groups in 2009 (cf. table A3.2).

[37] We cannot provide the amount of increase for all sectors due to the reclassification of the economic activities.

explanatory power of the estimation presented in this study is more than five times higher compared to the estimation presented by Mian and Sufi (2012), which has an R^2 of 8%. Our results indicate that approximately 1/3 of the aggregate increase in unemployment in Spain can be traced back to high household debt levels. This increase in Spain correlates to approximately half of the effect for the United States that Mian and Sufi (2012) found. There are many reasons why the household debt levels might be somewhat less important in explaining the increase in unemployment in Spain than in the United States: unsolved problems in the Spanish banking sector, ongoing problems with labor market rigidities, a different consumption share in the economy, and, perhaps most important, the fact that Spanish households have not yet reduced their debt relative to GDP on an aggregated basis on a comparable level relative to US households. A slight decrease (less than 1 percent) was observed in nominal liabilities in 2009. In 2010, this decrease was even lower (approximately 0.5%). The household sector increased its deleveraging on a nominal basis in 2011 with a decrease by 3% and 2% in the first and second quarters of 2012, respectively. If we take inflation into account, the nominal decrease of 6% from the peak is even larger in real terms. In the United States, in contrast, households have decreased their debt-to-GDP ratio by more than 13 percent since the end of 2009, which has exacerbated the decrease in consumption spending. The results of this analysis are unambiguous. The increasing unemployment in Europe is an explicit consequence of the relative lack of consumer demand. The combination of private sector balance sheet restructuring with a parallel government austerity program is currently amplifying the effects of shrinking consumption on aggregate demand and employment.

This study corroborates the findings of previous studies using aggregated data and household survey data for other European countries and the United States. These data support the hypothesis that debt levels do matter for consumption at the household and household sector levels. The transmission mechanism from debt levels via the aggregate demand channel to unemployment rests upon the assumption that the household sector suffers from a negative economic outlook, which lowers lifetime incomes and forces households to cut back on consumption to adjust their balance sheets. Furthermore, different income and wealth groups have different propensities to consume, and thus, the reduced consumption of debtors is not equally offset by the increased consumption of creditors who are paid back the money that they have loaned.

Although this paper has elucidated an important question regarding how debt and demand are interlinked, interesting and important related questions should be considered in future research. For instance, what occurs if more foreign debt is affected by deleveraging? How do simultaneous processes of private and government sector balance sheet restructuring compare to a two-step deleveraging process in which one sector initially stabilizes the other? Furthermore, a portion of the increase in unemployment is attributed to the creation of jobs during the debt-fueled period of economic growth. Comparing two groups of provinces to control for the effects of real estate price development, we partially address this issue of asymmetric developments. However, a more detailed comparison of the employment effects of debt during expansionary and contractionary periods will be necessary to provide policy makers and regulators with advice on how to combine sound finances with employment growth.

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APPENDIX

Table A3.1

Changes in household sector debt and contribution of consumption expenditure to GDP growth

The correlation coefficients and R^2 values are based on quarterly data that indicate the contribution of household consumption expenditures to GDP growth and the growth of household sector debt. The moving average data are calculated as four-quarter moving averages. Two results are shown for the countries with data prior to 2000 (results for the starting year through 2011 and results for 2000 through 2011).

		Moving Average			Quarterly Data		
Country	**Period**	**Correlation coefficient**	**Trend - R^2**	**Trend - coefficient for change in debt**	**Correlation coefficient**	**Trend - R^2**	**Trend - coefficient for change in debt**
Austria	2003-2011	64.4	41.4	9.4	33.3	11.1	4.9
Belgium	1996-2011	0.6	0	0.08	8.7	0.8	1
France	1996-2011	16.6	2.8	4.6	23.3	5.4	8.6
France	2000-2011	31.6	10	8.3	25.5	6.5	9.1
Germany	1993-2011	48.9	23.9	8.5	20.1	4	9.6
Germany	2000-2011	48.5	23.5	18.7	16.5	2.7	14.1
Ireland	2002-2011	80.7	65.1	16.1	61	37.2	15.2
Italy	1997-2011	35.7	12.8	8.7	25.4	6.3	6.1
Italy	2000-2011	65.6	43	12.9	42.9	18.4	10.1
Netherlands	2000-2011	42	17.7	5.7	24.8	6.2	5.6
Portugal	1998-2011	79.1	62.6	18.6	53.8	28.9	18
Spain	2000-2011	81.4	66.2	18.2	64.6	41.7	16

Data source: Eurostat, European Central Bank.

Table A3.2

Economic activities with old and new classifications

Economic activities are matched based on their old and new descriptions. The percentage of subcodes indicates how many of the previous subcodes could be matched one to one.

Category	Economic activity (CNAE 1993)	Economic activity (CNAE 2009)	Percentage of subcodes that are matched	Share in total unemployment Nov. 2007/ Nov. 2010
Tradable	A - Agriculture, livestock farming, hunting and forestry	A - Agriculture, livestock farming, forestry and fishing	90%	21.3% / 18.7%
	B - Fishing			
Tradable	C - Extracting industries	B - Extracting industries	87%	
Tradable	D - Manufacturing industries	C - Manufacturing industries	94%	
Non-Tradable	G - Trade, repair of motor vehicles, motorcycles, household goods and personal items	G - Wholesale and retail trade, repair of motor vehicles, motorcycles	93%	11.9% / 12.1%
Non-Tradable	P - Private households with employed persons	P - Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	100%	
Construction	F - Construction	F - Construction	98% of the old "F" category can be matched to entries in the new "F" category, but these entries cover only 81% of the new "F" category	10.7% / 15.4%

Figure A3.1

Changes in household sector debt and contribution of consumption expenditure to GDP growth

Figure A3.1(a) differentiates between different year groups. The data points for the period until the end of 2007 are plotted using round blue marks. The data points for the period beginning in 2008 are plotted using square red marks. Figure A3.1(b) differentiates between the countries that have been severely hit by the crisis, i.e., Ireland, Italy, Spain, and Portugal, which are represented using square red marks, and the countries that have been less affected by the crisis, i.e., Austria, Belgium, Germany, France, and the Netherlands, which are represented using round blue marks.

Figure A3.1(a) observations by year group

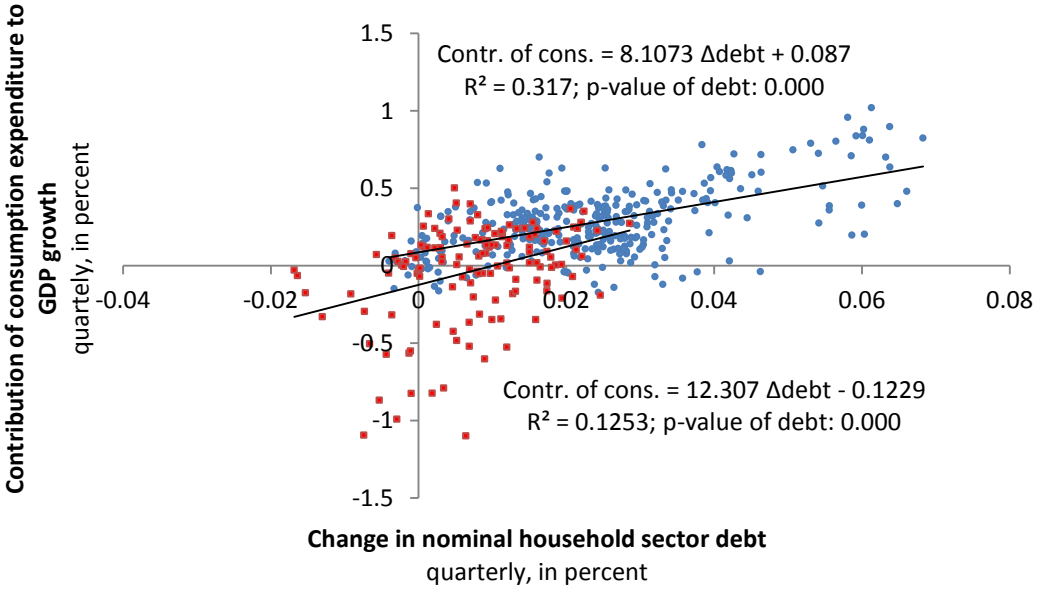
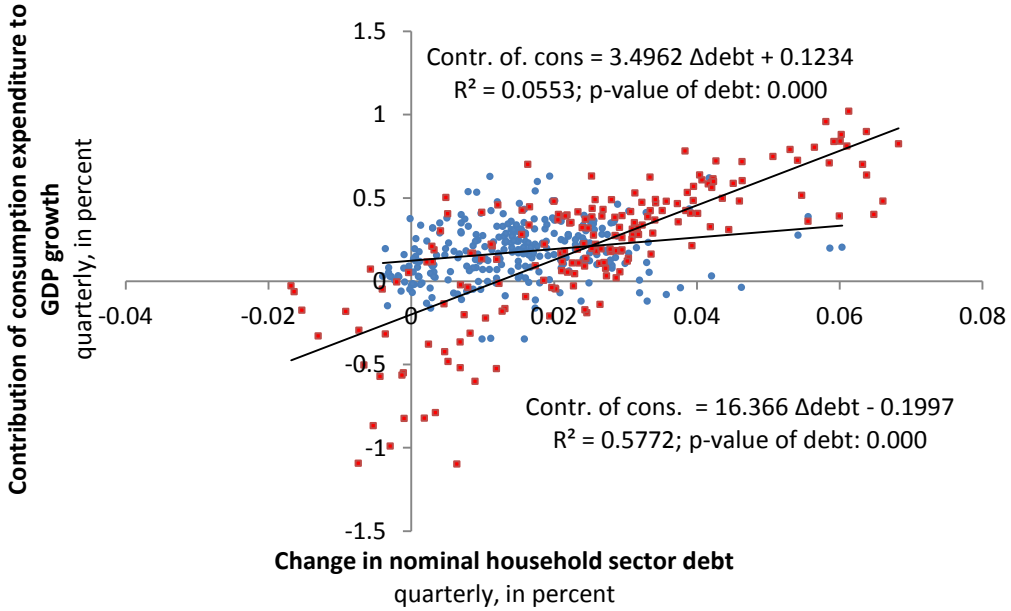


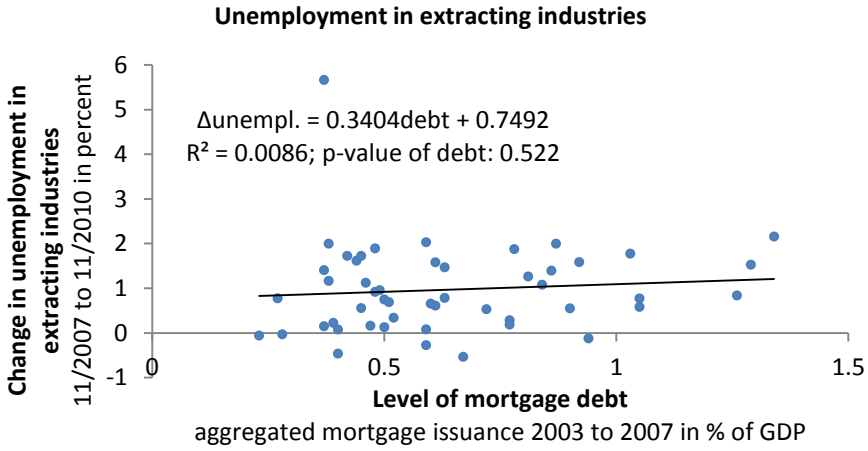
Figure A3.1(b) observations by country group

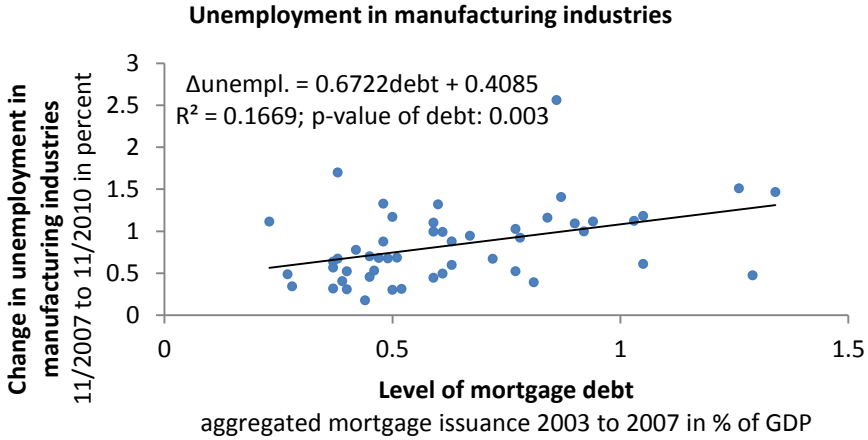


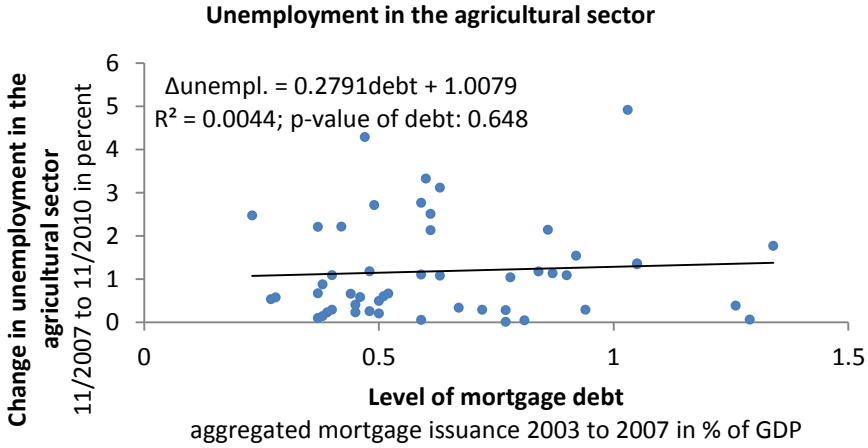
Data source: National Central Banks, European Central Bank.

Figure A3.2

Household sector debt and tradable employment sectors



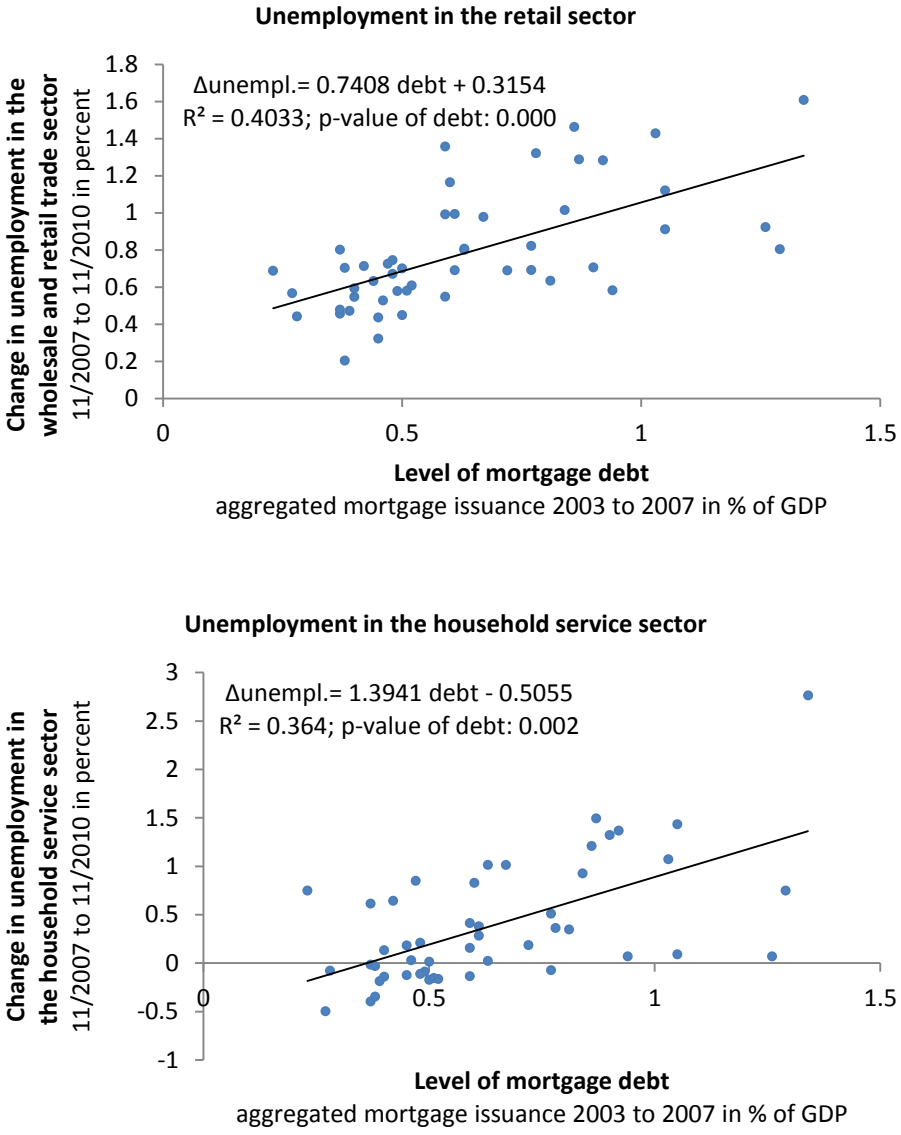




Data source: INE, Ministerio de Empleo y Seguridad Social.

Figure A3.3

Household sector debt and non-tradable employment sectors

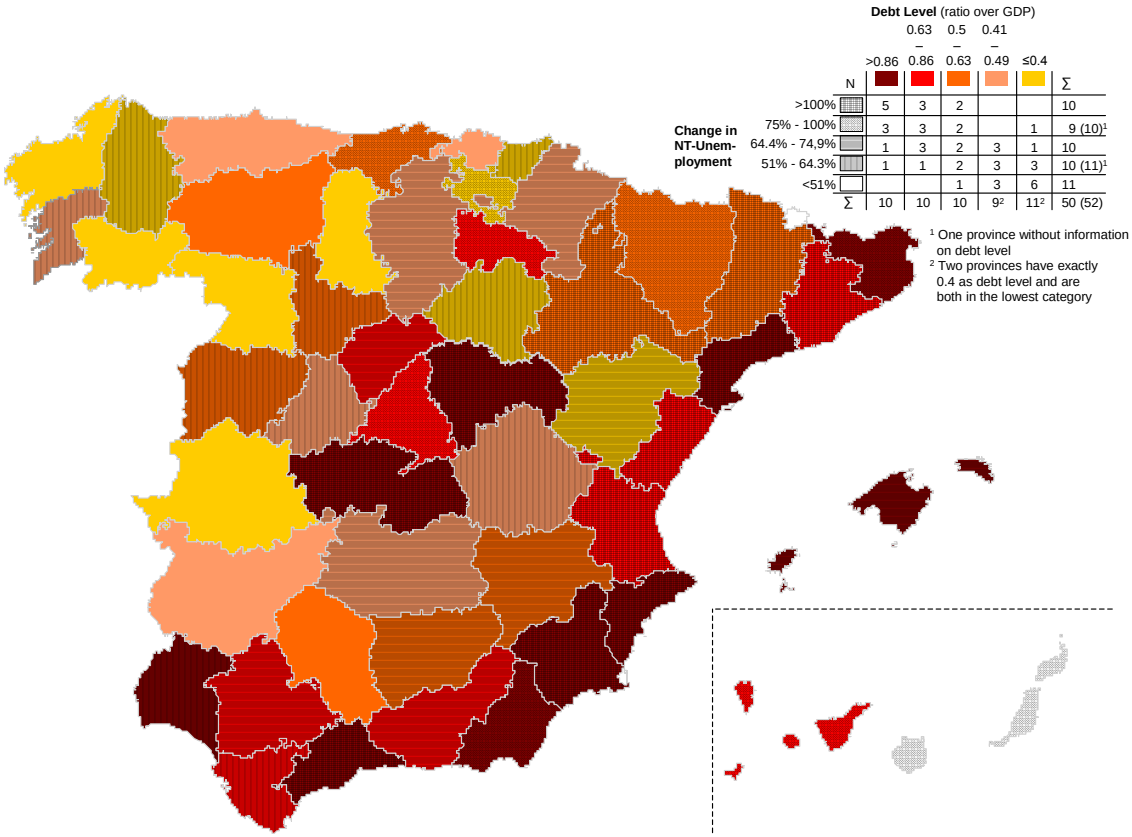


Data source: INE, Ministerio de Empleo y Seguridad Social.

Figure A3.4

Debt and unemployment in the Spanish provinces

Provinces with higher debt levels in 2007 (darker colors) experience a steeper increase in unemployment.



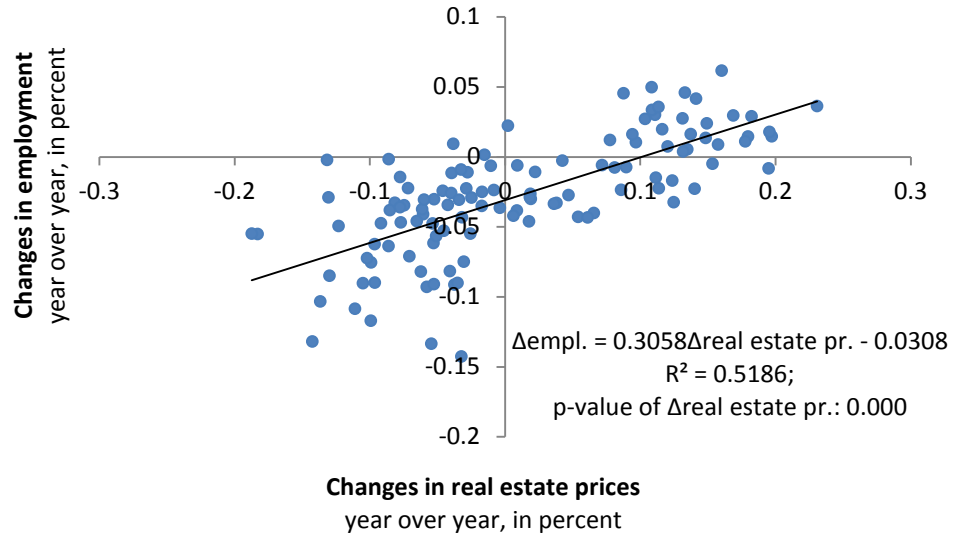
Data source: INE, Ministerio de Empleo y Seguridad Social.

Figure A3.5

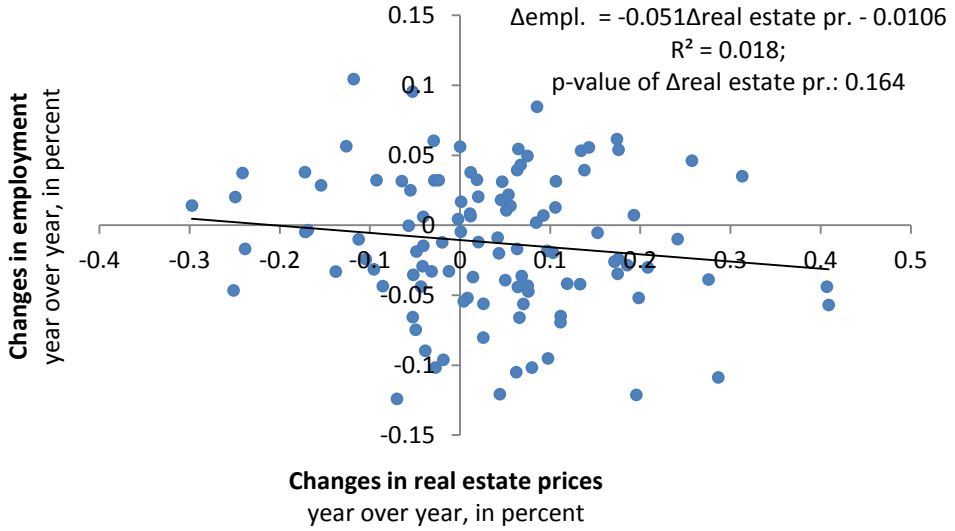
Changes in real estate prices and employment in the Spanish provinces

Table A3.2 shows the development of real estate prices, employment, and debt in two groups of Spanish provinces. The groups are clustered depending on the correlation between the changes in real estate prices and the changes in employment from the first quarter in 2006 until the first quarter in 2012. Group (a) consists of the five provinces with the highest correlation, which are shown in figure A3.5(a), and group (b) consists of the five provinces with the lowest correlation, which are shown in figure A3.5(b). The linear trend lines illustrate the high and low correlations.

A3.5(a) High correlation provinces



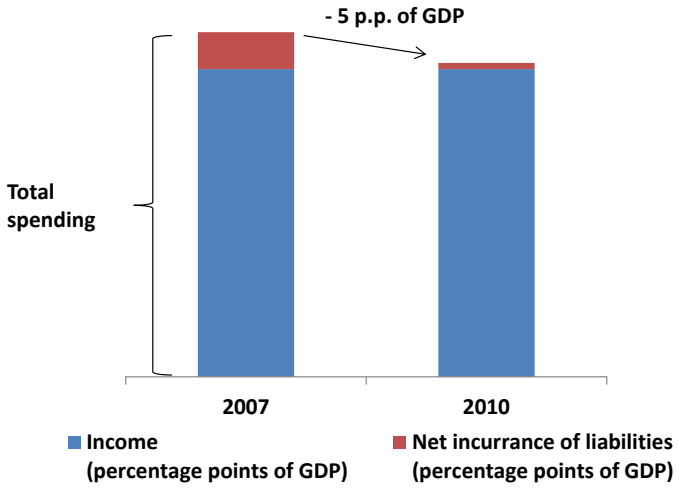
A3.5(b) Low correlation provinces



Data source: INE, Ministerio de Fomento.

Figure A3.6

How a reduction in debt growth affects spending



CHAPTER 4

Financial Development and Income Inequality – A Panel Data Approach

Abstract

We analyze the link between financial development and income inequality for a broad unbalanced dataset of up to 138 developed and developing countries over the years 1960 to 2008. Using credit-to-GDP as a measure of financial development, our results reject theoretical models predicting a negative impact of financial development on income inequality measured by the Gini coefficient. Controlling for country fixed effects and GDP per capita, we find that financial development has a positive effect on income inequality. These results are robust to different measures of financial development, econometric specifications and control variables.

4.1 INTRODUCTION

In the aftermath of the economic crisis of 2008-09, many public commentators debated over the benefits and harms of the financial sector for the rest of society. The privatization of banks' profits and the socialization of their losses is a common bon mot in political debates in many developed countries. Together with widening income gaps and social inequality in the United States, United Kingdom, Germany and many other countries, this crisis has led the question of the contribution of the financial system to the economy and, more generally, to society, to arise. The merits of efficient financial systems fall short in being acknowledged by the public as bankers are recognized as highly paid individuals who serve only their own interest. In the view of many economists, there exists a more benign view of the financial sector: financial markets boost economic growth, enable wealthy as well as poor people to borrow and finance investments and thereby ensure that capital is distributed most efficiently – and, in particular, in a manner unrelated to inherited wealth. Generally, so the story goes, when financial markets are more efficient and well developed, a specific borrower can borrow more with a given amount of collateral. The success of microcredits for the poor in developing countries is just one example of what banks are able to do for society.[38] There are parts of society that were previously unable to borrow and now can build their own businesses, increase income and climb the social ladder. The remaining income inequality would then be optimal or justified in the sense of being independent of inherited wealth. However, there are also more critical voices that have recently been raised. In particular, banks and financial markets are highly criticized for being ruthless in developed countries where almost everybody is supposed to have access to finance and where income inequality is a phenomenon thought to be part of the past. Anecdotal evidence appears to provide arguments in favor of and against an inequality-reducing effect of financial development.

We thus aim to empirically assess the link between financial development and the distribution of income in a society. Does financial development always reduce income inequality in society? Are there important differences across and within countries based on their stage of economic development, or is the influence the same around the world, independent of country characteristics and the time we live in? We analyze the link of financial development and income

[38] Demirgüc-Kunt and Levine (2009) provide a brief overview of the relation between microfinance and income inequality and also cite studies that do not confirm that microfinance lowers inequality.

inequality using standard proxies in the financial development literature, the ratio of private credit over GDP and the Gini coefficient of income distribution within countries.

We extend the existing literature by using a larger database covering a longer time horizon and more countries with a measure for the Gini coefficient that is consistent across the dataset. We further control for year effects and time-invariant country characteristics. Finally, we conduct various robustness checks for our benchmark specification. These include a sample split of the dataset in subsamples according to income levels. In contrast to previous empirical work on this topic, we reject theories that predict an income inequality-reducing effect of financial development. This finding is robust over most specifications. Due to these more general and robust findings, we believe that our work is of importance to the literature and the profession.

While investigating the link of financial development and income inequality, we do not judge or examine whether there exists an optimal or fair level of inequality. On the one hand, higher levels of inequality may have boosting effects on an economy from an incentive point of view. If everybody was receiving the same final incomes, independent of effort, naturally nobody would have an incentive to incur extra efforts for the production of goods and services, and the economy would suffer. On the other hand, excessive inequality may lead to social unrest and political instability.

The remainder of this chapter is structured as follows: section 4.2 presents an overview of related literature and what we contribute to the literature. Section 4.3 describes the data used in our work. In section 4.4, we conduct the econometric analysis, section 4.5 presents our robustness tests and section 4.6 concludes.

4.2 OVERVIEW OF RELATED LITERATURE

Our work adds to the literature on financial development, income inequality and economic development. There is an extensive literature on the link between financial development and growth. A good overview of theoretical as well as empirical work on this issue has been provided by Levine (2005). In general, financial development is expected to enhance growth by enabling the efficient allocation of capital and reducing borrowing and financing constraints. However, this literature does not address the issue of which part of society benefits from the growth enabled

by financial development. Growth may benefit the poor by creating more employment opportunities, but it may also favor entrepreneurs and their profit margin. The relationship between the distribution of income and economic development was initially investigated by Kuznets (1955), who established the inverted U-shaped path of income inequality along economic development – the well-known Kuznets curve. Kuznets' argument was that rural areas are more equal and have a lower average income compared to urban areas in the beginning of industrialization and thus that through urbanization, a society becomes more unequal. When a new generation of former poor rural people who moved to cities is born, they are able to profit from the urban possibilities. Wages of lower-income groups rise, and overall income inequality narrows. One factor backing Kuznets' argument of urban possibilities is financial development, which enables formerly poor migrants to choose the education they desire and to build their own businesses – regardless of their inherited wealth. This is the basic reasoning why economic theories predict a negative impact of financial development on income inequality. Financial development fosters the free choice regarding education and the founding of businesses. Because both lead to growth and growth is associated with more jobs, average income will rise and inequality will fall.

The three major theoretical papers explaining the financial development and income inequality nexus are by Banerjee and Newman (1993), Galor and Zeira (1993) and Greenwood and Jovanovic (1990). Whereas the first two predict that better developed financial markets lead to a reduction in income inequality, the latter predicts an inverted U-shaped relationship between financial development and income inequality. In other words, in the early stages of financial development – during which only a small part of society benefits from this development – income inequality increases. However, after a certain stage of financial and economic development is reached, more financial development begins to reduce income inequality.

Whereas the specific economic mechanisms behind these predictions differ, the key reason why better developed financial markets – at least after some stage – reduce income inequality is always that better credit availability allows household choices and decisions to be made based more on economic optimality and less on inherited wealth. The relevant choices differ according to each study, but they all concern the individual's future income possibilities and whether these are optimal for the individual. To that end, Banerjee and Newman (1993) model households' occupational choice, which depends on credit availability. Alternatively, Galor and Zeira (1993)

model human capital investment, which again depends on credit. Finally, Greenwood and Jovanovic (1990) model household portfolio selection where the use of financial intermediaries generally improves household capital incomes but comes at a small fixed cost. Initially, poor households cannot afford using banks for their savings, leading inequality to increase with financial development, as only wealthy-born households are able to use bank finance. However, as the economy develops and grows over time, poorer households become richer and can also begin using bank finance. Therefore, inequality after some point decreases with financial and economic development.

These models theoretically motivate the use of the ratio of private credit over GDP as a proxy for financial development. On the one hand, better-developed financial markets lead to either more investment in occupational choice or human capital, which requires financing by credit. Consequently, financial development and private credit growth should go hand in hand. On the other hand, better-developed financial markets allow more households in a society to benefit from improved use of investment possibilities through the financial sector. This should thus increase bank deposits and overall savings in the economy, which are then funneled into more credit in the economy.

These theories are subjected to empirical research that uses cross-country datasets on income inequality to test for the negative and inverted U-shaped relationships of financial development and income distribution. Clarke, Xu and Zou (2003, 2006) test these different theories. Using datasets of 91 and 83 countries over the period from 1960 to 1995 and averaging the data over five-year periods, they confirm the theories of Kuznets (1955), Banerjee and Newman (1993) and Galor and Zeira (1993) and reject Greenwood and Jovanovic's (1990) model. To construct a measure of financial development, they use both private credit over GDP and bank deposits over GDP. The control variables are GDP per capita and its squared term to follow the Kuznets curve. Further control variables include the risk of expropriation, ethno-linguistic fractionalization, government consumption, inflation and the share of the modern sector. In addition to the linear negative impact of financial development on income inequality, the maximum of the Kuznets curve is calculated – depending on the econometric specification – as approximately 1,400 USD and 2,350 USD.

Beck, Demirgüc-Kunt and Levine (2004) also test the three theories about the impact of financial development. They use private credit over GDP as a proxy for financial development and, in contrast to Clarke et al. (2003, 2006), use not 5-year averages but the average over the entire time horizon covered per country with a between estimator. Their 52-country sample from 1960 to 1999 also confirms the linear negative influence of financial development on income inequality. Li, Squire and Zou (1998) explain variations in income inequality across countries and time. They approximate financial development as M2 over GDP, which has a significantly negative effect on inequality in their sample of 49 countries. They also distinguish between the effect of financial development on the poor and rich and find that it helps both groups. Further research backing Galor and Zeira (1993) and Banerjee and Newman (1993) is, for example, Kappel (2010), who uses a sample of 59 countries for a cross-country analysis and 78 countries for a panel analysis over the period 1960 to 2006. Kappel also distinguishes between high- and low-income countries. Whereas credit over GDP remains significant and negative for high-income countries, it does not show any influence for low-income countries. Jaumotte, Lall and Papageorgiou (2008) investigate income inequality with a focus on trade and financial globalization. In their sample of 51 countries from 1981 to 2003, they have the measure of private credit over GDP only as a control variable. In contrast to Beck et al. (2004) and Clarke et al. (2003, 2006), they obtain a positive and significant coefficient for financial development in all different econometric specifications of their estimation. Without explicitly stating it, they thus reject the theories explained above and contradict work that simply focuses on the link between financial development and inequality. All of the described studies have in common that they examine a broad set of countries, development over time and the theories we describe in detail. Furthermore, they begin with simple OLS estimations and pursue two-stage least squares estimation to tackle eventual omitted variable biases. Both random effects and between effects models are used, but no study compares fixed effects estimations that control for time invariant country characteristics with their results. Further empirical research (natural experiments, household studies, firm- and industry-level analyses and case studies) on the link between financial development and income inequality is summarized in Demirgüc-Kunt and Levine (2009).

Finally, there is a new and growing strand of literature emphasizing the political dimension in the inequality and finance nexus. Rajan (2010), a leading proponent of this view, argues that the

increased credit given to American households was a direct consequence of the rising inequality trend over the last two decades. Together with the political inability to use traditional forms of redistributive taxation, it seemed better and by far easier for politicians to improve access to credit for poorer American households. In this way, credit to GDP, or the literature's traditional measure of financial development, is influenced largely by politics and depends on increased inequality. Kumhof and Ranciere (2010) construct a theoretical model that endogenously explains how high credit growth and financial crises may result as a consequence of rising income inequality. The two argue that the periods 1920-1929 and 1983-2008 exhibited this type of pattern. However, the hypothesis that rising inequality generally leads to a credit boom is empirically rejected in a recent study by Bordo and Meissner (2012), who use a much larger dataset than Kumhof and Ranciere (2010) and conclude that there is no evidence that rising inequality leads to credit booms. This finding is naturally very important for our study because we ideally wish to treat financial development as a variable that is reasonably independent from income inequality. However, to be very sure, we add relevant robustness tests that also specifically allow for the endogeneity of financial development.

Our research adds value to the aforementioned literature, especially in the scope of analysis. The basic sample consists of 138 countries with observations covering the years 1960 to 2008. In total, we use 3228 country-year observations and 802 observations for the estimation with five-year averages. The large sample also allows us to distinguish between the effect of financial development in different country groups regarding income and region. This is to the best of our knowledge the largest dataset for an analysis of financial development and income inequality in terms of years as well as countries. This paper further controls for year effects with year dummies and country characteristics to isolate the effect of financial development and to reduce omitted variable bias. Finally, we conduct various robustness checks that support our key result that the data generally rejects the theoretical models.

4.3 DATA

4.3.1 Description of dataset

We combine different datasets to derive what is to the best of our knowledge the largest dataset concerning financial development and income inequality. Income inequality is measured both as

gross income before redistribution and net income after redistribution using the Gini coefficient. Redistributive policies may blur the theoretical relationship between financial development and income inequality, which is modeled without an explicit role for redistribution. Therefore, we use both gross and net Gini coefficients in our empirical analysis. The underlying source is Solt's Standardized World Income Inequality Database (SWIID) (2009), which "is the most comprehensive attempt at developing a cross-nationally comparable database of Gini indices across time" [Ortiz and Cummins (2011), p. 17].[39] The SWIID uses the World Income Inequality Database by the United Nations University, which is the successor of Deininger and Squire's (1996) database, data from the Luxembourg Income Studies (LIS), Branko Milanovic's World Income Distribution data, the Socio-Economic Database for Latin America and the ILO's Household Income and Expenditure Statistics. The total coverage is at 171 countries with 4,285 country-year observations for the gross Gini and 4,340 country-year observations for the net Gini.

The other important source for our research is the updated 2010 version of the Financial Structure Database by Beck, Demirgüc-Kunt and Levine (2010), who collected data on both of our measures for financial development – private credit divided by GDP and bank deposits divided by GDP. Private credit is calculated based on the IMF's International Financial Statistics and consists of credit provided by deposit money banks and other financial institutions to the private sector. It does not include credit provided to the state or by central banks. Bank deposits are also based on the IMF's International Financial Statistics and consist of demand, time and savings deposits in deposit money banks. Both variables are standard measures of financial development and are used in the empirical literature described above.

Finally, we control for a host of other variables that have traditionally been used to explain inequality. GDP per capita is used in constant USD and taken from the World Development Indicators of the World Bank. Table 4.1 provides an overview of the definitions and sources of all variables used in this paper.[40]

[39] Other datasets that claim to have a broad coverage and that are widely used in cross country studies include different measures of the Gini, e.g., household consumption or income, household or per person levels and gross or net income.

[40] Table A4.5 in the Appendix provides an overview of our measures for financial development and income inequality for all countries in our sample. Figure A4.4 in the Appendix provides a 3-D chart of income inequality against GDP p.c. and financial development.

Table 4.1
Overview of variables and sources

Variable	*Definition*	*Source*
Gini (gross) and Gini (net)	Gini coefficient of gross and net income	Solt (2009)
Financial development (1) – Private credit/GDP	Private credit divided by GDP; claims on the private sector by deposit money banks and other financial institutions	Beck, Demirgüc-Kunt and Levine (2010)
Financial development (2) – Bank deposits/GDP	Bank deposits divided by GDP; demand, time and savings deposits in deposit money banks	Beck, Demirgüc-Kunt and Levine (2010)
GDP per capita	Constant 2000 USD; country groups based on four income categories (high, upper middle, lower middle and low income)	World Development Indicators, World Bank (2011)
Legal origin	Dummy variable regarding the origin of the legal system (British, French, German, Scandinavian, Socialist)	La Porta, Lopez-de-Silanes, Vishny (2008)
Inflation	Consumer price index; change on previous year	World Development Indicators, World Bank (2011)
Agricultural sector	Value added by the agricultural sector as a share of GDP	World Development Indicators, World Bank (2011)
Government consumption	Government share of total expenditure	World Development Indicators, World Bank (2011)
Access to finance	Different measures for the access to finance, e.g., number of ATMs per 100,000 inhabitants, minimum amount required to borrow as ratio over GDP p.c.	Financial Access Survey, International Monetary Fund (2011)
Ethnolingusitic fractionalization (ELF)	Degree of the fractionalization of the population in 1985 with lower values indicating lower fractionalization	Roeder (2001)

Private credit over GDP can be used as a proxy for financial development, as it reflects the ease with which households and corporations may obtain credit. When more credit is provided to the private sector, private institutions find it easier to signal their creditworthiness at the respective lending rate and private individuals find credit markets to be more accessible. This argumentation does not always hold, as can be observed with real estate credit and the subprime crisis in the United States in 2007-08, but it is fairly robust over our entire sample. Furthermore, we do not have micro-level data regarding the distribution of credit in the population and among businesses and thus cannot asses how different groups in the population benefit from increasing credit provision and how this credit is used. Nonetheless, we do believe that it is a good proxy for

financial development, as there is a high correlation between private credit over GDP and access to finance, measured by other measures such as the number of ATMs or number of bank branches per population or per square mile.[41] The alternative measure we use, bank deposits over GDP, serves as a proxy, as it again describes access to finance. With less or no financial development, fewer people have access to bank accounts. Lower values of bank deposits over GDP also reflect the lack of trust of creditors in their financial system and their banks. There are again some caveats, as we do not know the distribution of bank deposits among the population and businesses, and we have no data on the turnover rate of the deposits. Overall, and most importantly, both measures explain how effective the financial system performs its inherent task – channeling funds and intermediating between creditors and debtors.

4.3.2 Income inequality over time and around the world

Income inequality may be measured on a gross and on a net basis. Gross income excludes all income from non-private sources; i.e., it excludes pensions provided by the state to pensioners, all types of social transfers to economically poor people and abstains from subtracting taxes as well as social contributions. Net income, in contrast, includes all types of public transfers and deductions. Net income measures the amount an individual possesses and may use for consumption and saving. Neither gross nor net income is the ideal instrument to measure the market outcome when individuals determine whether to follow a career opportunity, as gross income does not reflect what amount an individual can spend and save today, and net income does not consider individuals' earning entitlements on pensions and other social benefits. This paper consequently uses both measures of income inequality and investigates how gross and net income inequalities are affected by financial development and other explanatory factors.

Income inequality (gross and net) is measured with Gini coefficients. The Gini for gross (net) income inequality is normally distributed for the entire pooled sample with a mean of 44.3 (38.4), standard deviation of 9.6 (10.1), skewness of .36 (.41) and kurtosis of 3.0 (2.5).[42] Income inequality generally changes only slowly over time. Splitting the sample in observations by year, the Gini coefficient becomes more normally distributed over time with lower standard deviations. This process is accompanied by higher means. Figures A4.1 and A4.2 in the Appendix show the

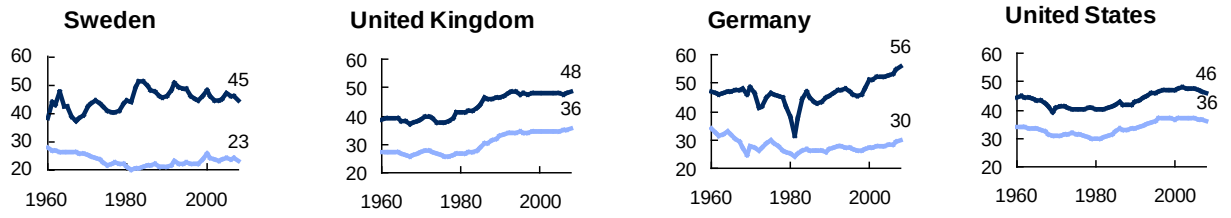
[41] Cf. table 4.7 for correlations between different measures of financial development.
[42] A normal distribution has a skewness of 0 and a kurtosis of 3.

distribution of gross and net inequality around the world, measured as the average over the years 2000 to 2004. Inequality is highest in Latin America and Sub-Saharan Africa. Very high and increasing levels of gross income inequality can also be observed in developed countries, such as Germany, the United Kingdom and the United States. However, the level of net income inequality, i.e., after redistribution, is much lower than gross income inequality in developed countries, as shown in figure 4.1. Even countries that are considered as being very equal, such as Sweden, have a high level of gross income inequality. These examples show that in discussing equality aspects, one must be explicit whether equality before or after redistribution is considered. In Germany and Sweden, net inequality is relatively constant compared to gross inequality, unlike the United Kingdom and the United States, where net and gross inequality move in parallel. Redistribution in these countries does not change when gross inequality increases or decreases. This is a very interesting result on its own, as it demonstrates how different societies address the issue of unequal income distribution.

A correlation analysis of gross and net Ginis with the other explanatory variables used shows that net income inequality has higher correlations with most variables compared to gross income inequality. From a theoretical point of view and with respect to the economic theories we outlined above, we must note that the theoretical case for financial development decreasing gross inequality may in fact be weaker than the case for financial development decreasing net inequality. Financial development may encourage risk taking, which may increase the gross Gini; meanwhile, financial development may allow households and countries to share their risks, thus reducing net Ginis. For all these reasons, we will focus on describing and interpreting the results of the estimations with net income inequality, but we will nevertheless report all results for gross income inequality throughout this paper.

Figure 4.1
Inequality over time

The dark blue (light blue) line shows the Gini for gross income inequality (net income inequality).

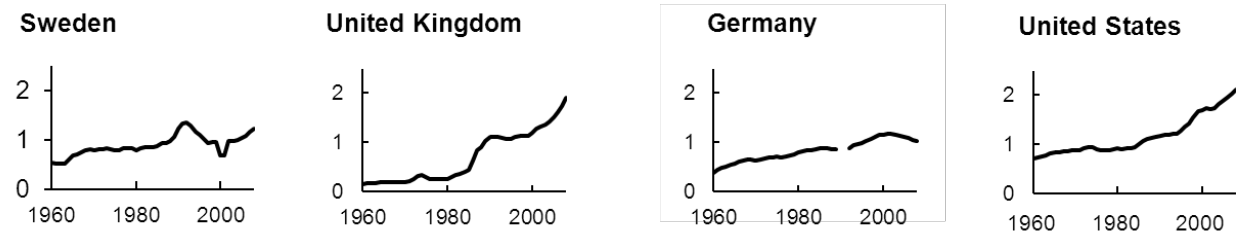


4.3.3 Financial development over time and around the world

Financial development, defined by private credit over GDP, is increasing over time. Figure 4.2 shows our measure of financial development for a selection of developed countries. The process of financial development is generally more monotonic than the development of gross inequality. The mean for the entire sample is .45 with a standard deviation of .39. Figure A4.3 in the Appendix shows the stage of financial development for the countries in our sample for the years 2000 to 2004. As expected, financial development is especially high in OECD countries, with the highest levels found in countries of Anglo-Saxon origin. The countries with the highest values are Iceland, Luxembourg and the United States. The distribution of financial development across countries and time is not as normal as it is for inequality, and thus, we transform the variable with logs for all estimations. This transformation changes the skewness from 1.5 to -.3 and the kurtosis from 5.0 to 2.8. In contrast to inequality, credit over GDP becomes more uniformly distributed across countries over time when examining different income country groups. Therefore, we do not observe a convergence to one level but rather that some countries remain at lower levels while other countries increase their credit provision more quickly. The second measure for financial development is bank deposits over GDP, which is used as a robustness check for credit over GDP. The development of bank deposits is similar to that of private credit (the mean is .42 and the standard deviation is .38). However, we point out that these measures do not determine each other equally. Whereas bank deposits are a prerequisite for the provision of credit and may be viewed as a main determinant of credit, this relation does not hold in the other direction. Financial intermediaries pool deposits and provide credit. Debtors use this credit to invest or consume but do not put this money in their bank account. Reverse causality can thus be excluded. This characteristic is important when we address potential endogeneity issues in the empirical part of this paper.

Figure 4.2

Financial development over time



4.4 ECONOMETRIC ESTIMATION

4.4.1 Basic estimation – comparison with previous research

We test the hypotheses of Galor and Zeira (1993) and Banerjee and Newman (1993), namely that financial development has a negative impact on income inequality, and the hypothesis of Greenwood and Jovanovic (1990) that this influence follows an inverted U-shape. In the following, we label these hypotheses as GZ, BN and GJ. Our basic estimation thus allows for nonlinearities due to the Kuznets curve as well as the first increasing and then decreasing influence of financial development. Equation (4.1) enables a comparison of our dataset with Gini coefficients that are suited for cross-country research with the results from other research.

$$(4.1)\quad Gini_{i,t} = \alpha + \beta_1 FD_{i,t} + \beta_2 FD_{i,t}^2 + \beta_3 GDP\ p.c._{i,t} + \beta_4 GDP\ p.c._{i,t}^2 + \beta_j X_{i,t} + \varepsilon_{i,t}$$

Following the hypothesis of a linear negative influence, β_1 should be negative and significant and β_2 should be insignificant. According to the inverted U-shape hypothesis, β_1 should be significant and positive and $\beta_2$should be significant and negative. We add *GDP per capita* and its squared term to control for the Kuznets curve. Therefore, β_3 should be positive and significant and β_4 should be negative and significant. *Gini* is normally distributed and rather stable and consequently is not transformed into logs. Both *FD* (financial development) and *GDP p.c.* are transformed into logs, as both variables have a skewed distribution. The square of the variables is taken from the log. $X_{i,t}$ represents the control variables used. Following Clarke et al. (2003, 2006), we include ethnolinguistic fractionalization (*ELF*), inflation, the share of government expenditure in GDP and the share of the agricultural sector in total value added.[43] All measures but *ELF* are transformed in logs. Our second proxy for *FD* is *bank deposits*, which is also log-linearized and treated similarly to *credit*. We estimate the model with ordinary least squares (OLS). One impediment to our estimation is heteroskedasticity, which we address by using heteroskedasticity-robust standard errors. Furthermore, there are different approaches on how to proceed with yearly data.[44] Yearly data may represent cyclical movements, whereas using a five-year average yields a more balanced panel but at the same time means a loss in the number of

[43] Clarke et al. (2003, 2006) use the share of the modern sector (industry and services), which is equivalent to one minus the agricultural share.

[44] Romer and Romer (1999) and Papageorgiou et al. (2008) use yearly data. Five-year averages are used by Clarke et al. (2003, 2006), Li et al. (1998) and Kappel (2010). Beck et al. (2004) and Kappel (2010) do not use information provided by yearly data or averages over several years and estimate the effect of financial development on income inequality with country means.

observations. To compare the results of this larger and more suitable dataset with previous work, we focus on five-year averages. Most variables change slightly between years, which also leads to greater variation with five-year averages.

Table 4.2

Basic estimation

Income inequality, measured as the Gini coefficient, is the dependent variable for all models. Model 1 uses the Gini coefficient of gross income and model 2 uses the Gini coefficient of net income. All data are five-year averages and the models are estimated with default heteroskedasticity-robust standard errors. Model *a* is estimated without control variables and model b includes control variables. Model 2b' includes all control variables except inflation, as omitting inflation increases the adjusted R^2. The Max/Min of FD (financial development) and GDP indicate the level at which the sign of the explanatory variable changes. Neither country fixed effects nor time dummies are included to make the results comparable to previous research. We also abstain from using cluster-robust standard errors to compare these results with previous research. The estimation results with bank deposits as a proxy for financial development are found in table A4.4 in the Appendix.

	Model				
	Gini (gross)		Gini (net)		
	(1a)	(1b)	(2a)	(2b')	(2b)
FD	-3.17	-0.83	-6.83***	-4.17**	-2.33
FD^2	0.58*	0.25	1.17***	0.72**	0.44
GDP p.c.	13.39***	13.11***	22.42***	21.83***	21.85***
GDP p.c.^{2}	-0.93***	-0.87***	-1.68***	-1.62***	-1.63***
ELF		6.57***		9.25***	9.08***
Inflation		-0.46			-0.20
Gov. expendit.		1.66*		-1.26	-0.96
Agriculture		0.33		-1.57***	-1.56***
Constant	3.90	-9.79	-20.82***	-20.99**	-24.27***
N	802	637	802	666	637
R^2	0.07	0.10	0.38	0.45	0.44
Max/Min of:					
FD (priv. credit)	strictl. positive	not significant	18.48%	18.11%	not significant
GDP (in USD)	1,376	1,933	784	832	828

***, **, * denote statistical significance levels at 1%, 5% and 10%.

Using the approach of previous research, not correcting for clusters in the sample and not including a time trend or time dummies, this dataset confirms some of the earlier results. Pooling all observations while disregarding time-invariant country characteristics shows that *GDP per capita* is positive and significant in its linear form and negative and significant in its quadratic from. Therefore, the influence of *GDP per capita* mirrors an inverted U-shape – a Kuznets curve. Kuznets' hypothesis on the development of income inequality during the process of economic development appears to be true, and the values for gross income inequality are in line with Clarke et al. (2003), who estimated the maximum of the Kuznets curve between 1,250 and 2,350 USD.

The maximum net income inequality is reached earlier at approximately 800 USD. This finding indicates that societies begin to redistribute income before the peak in gross income inequality is reached.

The effect of financial development on income inequality is not so clear. Controlling for other factors, there is no significant effect of financial development on gross income inequality, which does not support the above theories. Estimating the effect on net income inequality, financial development appears to generate a U-shaped response in inequality, which is contradictory to the theories. BN and GZ are backed only up to a certain degree of development, whereas GJ can reasonably be rejected. Up to the provision of private credit over GDP of approximately 18%, financial development lowers net income inequality but increases inequality afterwards. A robustness check with the second proxy for financial development indicates that financial development does not have a significant effect on net income inequality and has only a small negative effect on gross income inequality (cf. table A4.4 in the Appendix). The results on the effect of financial development are consequently inconclusive, but we cannot fully confirm any of the theoretical models described above. In a second step, we correct the default standard errors in the pooled OLS estimation for clustered data.[45] The Kuznets curve remains apparent, but the link of financial development and income inequality disappears.

To summarize, using the approach of former papers with an advanced dataset confirms the results for the effect of GDP but backs the theoretical and known empirical effects of financial development only to a certain degree.

4.4.2 Econometric hurdles

Former research considered endogeneity and used an instrumental variable approach to estimate the impact of financial development, allowing for the possibility that inequality influences financial development or for an omitted variable bias. The results did not differ much from the OLS approach. Instruments for financial development were in line with the literature on financial development the origin of a country's legal system. Following the same approach and using *legal origin* dummies as exogenous instruments leads to an R^2 of 57% in the first-stage regression in our sample when we include *GDP p.c.*, the other exogenous explanatory variables of the second

[45] Clarke et al. (2003) and Kappel (2010) do not report what type of standard errors they use. Therefore, we compare heteroskedasticity robust as well as cluster robust estimations with their results.

stage regression and the time dummies. The fitted values for *FD* have a correlation of 76% with the original values and thus may be viewed as having a good fit.

However, legal origin may not be a good instrument for financial development when investigating the inequality nexus. This is best shown by the French motto "liberté, egalité, fraternité", which of course includes equality. This characteristic shows that the origin of the legal system is not independent of inequality and is consequently not suitable as an instrument. To ensure that reverse causality is still not a problem, we conduct estimations with lagged explanatory variables, two-stage least square estimations and GMM estimation in our robustness section (cf. section 4.5 below).

However, an endogeneity problem may also occur due to omitted variables. We address this issue by using a fixed effects regression including time dummies, which is also the main difference separating our econometric approach from previous research. Country dummies are included to control for country-specific characteristics that do not change over time but are potentially influential with regard to income inequality. These can be cultural factors, religion, colonial background and others. Time dummies are included to control for common shocks for all countries such as major international political events or large business cycle fluctuations. Finally, we allow for a linear time trend, as we expect *credit* and *GDP p.c.* to grow over time as countries become better developed and richer.

Another problem often occurring in estimations is multicollinearity. Multicollinearity reduces the power of the OLS estimator, but the estimator remains unbiased and efficient. The Variance Inflation Factor (VIF) shows a high degree of multicollinearity, which is due to the structure of our base estimation with linear and squared terms of financial and economic development. Estimating the influence of financial and economic development on income inequality with either linear or squared terms only reveals a low result for the VIF and confirms that multicollinearity is not an issue in estimation.

The estimations in table 4.2 may face an omitted variable bias because there are no country-specific effects included aside from ethnolinguistic fractionalization that explains income inequality. Therefore, as a next step, we control for country-specific effects by conducting a fixed effects estimation. Fixed effects are not a cure for all omitted variable problems as time-variant country characteristics are not included, but it is a good first approach to tackle a potential

omitted variable bias (cf. Acemoglu et al. (2008)). A further potential critique regarding the estimation process is endogeneity caused by reverse causality. An option to solve reverse causality is to use a two-stage least squares (2SLS) estimation, which is performed in the next section.

4.4.3 Fixed effects estimation

Key to this paper is the explanation of the influence of financial development on income inequality within and not between countries. Therefore, the results are not to be used to compare the levels of income inequality across countries. The estimation results answer the question how financial development in the countries included in this broad dataset influences the income distribution. To estimate this influence, we use the fixed effects estimator, also known as a within estimator. The within estimator has the advantage of controlling for country characteristics and, in contrast to the between estimator, uses all observations of the dataset and developments over time. Amending the basic estimation (4.1) by time dummies γ_t and country-specific time-invariant effects α_i leads to the new estimation equation (4.2).

$$(4.2)\ Gini_{i,t} = \alpha + \beta_1 FD_{i,t} + \beta_2 FD_{i,t}^2 + \beta_3 GDP\ p.c._{i,t} + \beta_4 GDP\ p.c._{i,t}^2 + \beta_j X_{i,t} + \gamma_t + \alpha_i + \varepsilon_{i,t}$$

The fixed effects estimator subtracts the country-specific mean from each variable so that all time-invariant factors drop out. Table 4.3 shows the results of the fixed effects estimation. To ensure that reverse causality does not disturb the estimation, the results of a 2SLS-estimation with bank deposits taken as exogenous variable are included in table 4.3. As before, yearly data and five-year averages lead to similar coefficients, and we report five-year averages.

Table 4.3

Fixed effects and 2SLS estimation

Model 3 is estimated with Gini coefficients of gross income as the dependent variable, and model 4 uses Gini coefficients of net income. Model a is a fixed effects estimation without further control variables, model b is a fixed effects estimation with control variables and model c is a 2SLS estimation, where the first-stage results are shown in table A4.3 in the Appendix. All models use data averaged over five-year periods and are estimated with heteroskedasticity-robust standard errors. Max/Min of *FD* (financial development) and *GDP p.c.* indicate the level at which the sign of the explanatory variable changes. All estimations include time dummies. The estimations with bank deposits as proxy for financial development are found in table A4.4.

	Model					
	Gini (gross)			Gini (net)		
	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)
FD	2.57***	2.75***		1.76***	1.89***	
FD - fitted			2.82***			2.13***
FD^2		not significant[1]			not significant[1]	
GDP p.c.	-24.10***	-21.90***	-21.86***	-6.88	-9.04**	-9.31**
GDP p.c.^{2}	1.56***	1.40***	1.39***	0.43	0.56*	0.57*
Inflation		-0.53*	-0.55**		-0.35*	-0.34*
Govern. exp.		1.38	1.20		0.84	0.68
Agriculture		0.13	0.07		-0.05	-.08*
Constant	133.95***	123.39***	124.10***	61.15***	64.00***	65.69***
N	802	668	669	802	668	669
R^2 (within)	0.25	0.26	0.23	0.08	0.12	0.10
Max/Min of:						
FD (priv. credit)	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.	strictl. pos.
GDP (USD)	2,240	2,547	2,659	not signif.	3,090	3,797

***, **, * denote statistical significance levels at 1%, 5% and 10%.

[1]Both terms for *FD* are insignificant in a quadratic estimation; therefore, *FD* only enters linearly in the model.

We proceed in several steps, each of which produces similar results for the influence of financial development on income inequality. Independent of the inclusion of control variables, of the investigation of gross or net income and of a fixed effects or 2SLS-fixed effects model, financial development has a significantly positive effect on income inequality. In other words, our findings somewhat surprisingly suggest that financial development increases income inequality. The distribution of gross income reacts more strongly than the distribution of net income to financial development. For the normal fixed effects models, the impact is approximately 45% larger, and for the 2SLS, the magnitude of the effect is 33% larger. The influence is statistically highly significant, but its economic consequences are of a small magnitude. An increase of financial development by ten percent increases the net Gini by approximately 0.2 points.

Equally surprising are our results for the effects of GDP per capita or economic growth on inequality. In contrast to Kuznets' inverted U-shaped hypothesis, income inequality first decreases with the process of development and increases after surpassing a threshold of roughly 2,500 USD for gross income and over 3,000 USD for net income. A possible explanation for this behavior is that Kuznets was focusing on the time of industrialization over the 19th and early 20th centuries. The time period covered in this paper begins much later. The earliest observations in our dataset are from the 1960s, enabling an initial decreasing inequality to remain in line with Kuznets. However, when a country reaches a certain development level – which was not yet reached when Kuznets wrote his work – a small fraction of the population may be better able to extract rents from using their abilities, thereby increasing inequality again. Nevertheless, this fact does not exclude the possibility that the absolute income level of the poor also increases and that the poor benefit from economic and financial development.

Inflation is the only control variable that is constantly significant. Considering inflation as an indicator of macroeconomic stability, the estimation results indicate that higher levels of uncertainty tighten the income distribution. Nonetheless, the small coefficient of inflation signals that the effect is economically minor. The explanatory power of the fixed effects estimation differs between gross and net income. The within-R^2 for gross income is over twice the size of that for net income, and thus, the estimation is more effective in explaining the development of gross income inequality over time. The main reason for the differences in explanatory power may reflect that gross income is closer related to the market outcome than net income which is also determined by redistributive policy.

To summarize, both measures of financial development, private credit over GDP and bank deposits over GDP, support the first part of GJ that the use of financial intermediation does not hamper the poor but favors rich people. This claim is supported by our empirical analysis. In contrast, the predictions of BN and GZ are rejected by the estimation results. Because our results stand in contrast to theoretical models and some earlier empirical work, the next section will provide several robustness checks.

4.5 ROBUSTNESS CHECKS

The robustness checks include estimations for subsamples of countries (cf. table 4.5), additional estimations with a lagged dependent variable and lagged explanatory variables (cf. table 4.6) and correlation analyses to further support the ratio of private credit over GDP as measure for financial development (cf. table 4.7).

First, we investigate whether the effects on income inequality hold for different country groups. This estimation requires the use of yearly data, as five-year averages would provide only a small number of observations. We split the sample into four groups according to the income categories defined by the World Bank. The high-income group consists of 1,035 country-year observations, the upper-middle-income group consists of 633, the lower-middle-income group consists of 637, and the low-income group consists of 349. All estimations are performed with fixed effects estimators and yearly data, including time dummies, to identify the influence of financial and economic development on the variation of income inequality independent of a time factor and country-specific characteristics. We include the same control variables as before. Robust standard errors are used when necessary. Splitting the sample into country groups, we expect the signs of the coefficients for economic and financial development as follows:

Table 4.4

Financial development and the Kuznets curve in different income groups

	Low inc.	Lower middle income			Upper middle income			High income			Rational/theory
GDP	positive	positive	or	positive	negative	or	positive	negative			Kuznets
GDP^2	insig.	insig.		negative	insig.		negative	insig.			
FD	positive	positive	or	positive	positive	or	positive	positive	or	negative	Greenw. &
FD^2	insig.	insig.		negative	insig.		negative	negative		insig.	Jovan.

Depending on the exact turning point in the models of Kuznets and Greenwood and Jovanovic, the squared terms of GDP per capita and financial development in the lower, upper middle and high income group may be insignificant, and we expect different signs of the linear terms for the high and low income groups. Table 4.5 shows that splitting the countries into subsamples backs the results of the previous section.

Table 4.5

Fixed effects estimation by income group

All estimations are fixed effects estimations with time dummies and robust standard errors. Max/Min of *FD* and *GDP* indicate the level at which the sign of the explanatory variable changes. All data are yearly data, as there are too few observations for this robustness check using five-year averages. The correlation coefficients for income inequality, financial development and GDP per capita by subgroup are provided in table A4.1.

	Model							
	Gini (gross)				Gini (net)			
Income level	Low	Lower middle	Upper middle	High	Low	Lower middle	Upper middle	High
FD	4.80**	2.81***	5.89*	15.87***	2.72**	2.26**	1.77***	1.75*
FD²	not significant[1]		-0.72	-1.70**	not significant[1]			
GDP p.c.	-0.18	18.39	34.41	-36.69*	-99.39*	23.38*	8.94	-16.46
GDP p.c.²	-0.16	-1.51	-2.43	1.67	9.32*	-1.90*	-0.55	0.61
Inflation	0.17	0.22	0.04	0.08	0.62*	-0.04	-0.04	-0.02
Govern. exp	-2.44	0.76	0.13	1.39	-0.56	-0.41	0.61	-0.64
Agriculture	-3.48	0.63	1.91***	-2.21*	-0.88	0.27	2.60***	-1.42
Constant	58.46	-15.69	-77.04	202.37**	302.04**	-32.74	-13.73	126.93**
N	349	633	637	1,035	349	633	637	1,035
R² (within)	0.39	0.27	0.45	0.29	0.29	0.15	0.24	0.29
Max/Min of:								
FD (credit)	strictly positive	strictly positive	strictly positive	107%	strictly positive	strictly positive	strictly positive	strictly positive
GDP (USD)	not signif.	not signif.	not signif.	strictly. neg	200	457	not signif.	not signif.

***, **, * denote statistical significance levels at 1%, 5% and 10%.

[1]Both terms for *FD* are insignificant in a quadratic estimation so that *FD* only enters linearly in the model.

The estimation by country sample reveals that financial development has a positive effect on net income inequality for all country groups, which leads to the rejection of BN and GZ and confirms the part of GJ that explains rising inequality. For gross income inequality, we do find an inverted U-shaped influence. With regard to financial development, which is reflected by a ratio of private credit to GDP of 107%, increasing financial development leads to increasing income inequality. Only after this level is surpassed is income inequality reduced.

For the influence of GDP, we only observe significant effects on gross income inequality in high-income countries, where increasing income leads to a reduction in income discrepancy. For net income, there are only significant effects in the two lower-income groups. For very low incomes, i.e. below 200 USD, inequality is decreased before it rises. In the lower-middle-income group, inequality first increases and is reduced after reaching 457 USD. This finding indicates that a Kuznets curve may be observed for the lower-middle-income countries, but the p-values are close

to 0.1. Furthermore, GDP is of no significant influence for upper-middle-income and high-income countries. As before, the control variables are mostly without a significant influence.

Second, we adjust the fixed effects estimations to consider that income inequality changes slowly over time. Therefore, we include a lagged dependent variable that represents the long-term effects on income inequality. The variable is highly significant and shows that approximately half of gross income inequality is determined by its level of the previous five-year term. The coefficient for net income inequality is smaller, at approximately one third. Net income inequality thus reacts more to short-term factors and policy action compared to gross income inequality. Governments are consequently not as active (or as possible to act) on gross income inequality than they are on redistributing income and influencing the distribution of net incomes. Regarding the influence of financial development, the results are in line with our main fixed effects estimation: more financial development is associated with a more unequal income distribution, which is more pronounced for gross than for net income. For economic development, there is again an inverted Kuznets curve. Including the lagged dependent variable substantially increases the explanatory power of the estimations; the within-R^2 for the net Gini triples.

Third, we control for potential reverse causality by taking lags of the explanatory variables. Addressing the arguments that the explanatory factors need time to influence income inequality and that there could be a simultaneity bias; this estimation measures the influence of financial and economic development on the income distribution in five years. The explanatory power on gross income inequality is reduced but remains approximately the same for net income inequality. The sign of financial development remains positive, and the coefficient increases by 107% for the gross Gini and 70% for the net Gini. The medium-term influence of financial development on income inequality is substantially more profound than the short-term influence. Furthermore, there is again the inverted Kuznets curve for gross income at the same GDP per capita level as without lagged variables. The influence of GDP per capita on net income inequality becomes negative. Higher levels of income, combined with increasing gross income inequality, therefore lead to higher redistribution and lower net income inequality. However, GDP per capita is significant at only the 10% level, with a p-value of 0.094.

As a fourth step, the first difference estimator and GMM estimators are taken as further approaches to exclude potential endogeneity problems. As discussed above in the literature

review, there is an important recent view that growing inequality – at least in the United States – was in fact the driving cause of the recent credit boom and subsequent financial crisis (cf. e.g., Rajan (2010) or Kumhof and Ranciere (2010)). Whereas the issue appears to be empirically settled by Bordo and Meissner (2012), who use a large panel dataset and find that this view is incorrect, we nevertheless wish to examine how robust our results are to treating financial development as possibly endogenous variable and using a GMM estimator. The GMM estimator used tackles potential endogeneity problems by instrumenting the questionable variable with its own lag. A test on endogeneity of the financial development and GDP per capita variables following the GMM estimation states that the variables may be treated as exogenous and confirms the validity of our main fixed effects estimation. The GMM estimation also results in an inverted Kuznets curve for gross and net income inequality; however, the levels of GDP per capita when the influence of economic development on income equality changes are substantially higher. Regarding financial development, the projection of Greenwood and Jovanovic (1990) is supported. Up to a provision of private credit to GDP of 127% for gross income and 140% of net income, more financial development leads to higher inequality. Thereafter, financial development reduces inequality. The predictable power of this result should be treated with caution, as only very few OECD countries reached this high level of credit provision in the five years averaging 2000-04 (cf. figure A4.3).

Table 4.6

First difference estimator and lagged variables

All estimations are performed for gross and net income inequality. The first model includes the lagged Gini coefficient and is estimated as a fixed effects model. The second model uses the first lag of all explanatory variables and is estimated as a fixed effects model. The third model is a first difference model and estimates the effect of changes in the explanatory variables on changes of the dependent variable. The fourth model is a 2-step GMM estimation (STATA command xtivreg2) using lagged variables of financial development and GDP per capita as instruments. All data are five-year averages, and all models except GMM, which uses a time variable, are calculated with time dummies and robust standard errors.

	Model							
	Gini (gross)				Gini (net)			
	(1) Lagged dependent	(2) Lagged explanatory	(3) First difference	(4) GMM	(1) Lagged dependent	(2) Lagged explanatory	(3) First difference	(4) GMM
Gini-lagged	0.48***				0.35***			
FD	4.35**	5.69**	1.39***	16.58***	3.61**	3.22**	1.34***	11.51***
FD^2	-0.34	-0.61	0.43	-1.71*	-0.28	-0.30	0.56	-1.17**
GDP p.c.	-15.05***	-25.40***	-0.96	-38.51***	-8.40**	-7.89*	-2.86**	-16.54**
GDP $p.c.^2$	0.85**	1.62***	4.43	2.06***	0.45*	0.48	10.33**	0.81*
Inflation	-0.12	-0.15	-0.37*	-0.23	-1.50	-0.44	-0.04	-0.25
Gov. exp	0.83	1.35	0.48	0.35	1.44	1.57	1.53	0.16
Agriculture	-0.06	-0.21	-1.18	-1.37	0.24	-0.10	-018	-0.71
Constant	76.64***	130.08***	-3.14		49.44***	60.62***	-0.64	
N	605	532	524	552	605	532	524	552
R^2 (within)	0.45	0.18			0.30	0.14		
Max/Min of:								
FD (credit)	strict. pos.	strict. pos.	strict. pos.	127%	strict. pos.	strict. pos.	strict. pos.	140%
GDP (USD)	6,836	2,530	not sig.	11,409	10,500	strict. neg.		26,372

***, **, * denote statistical significance levels at 1%, 5% and 10%.

Another possible criticism of our approach concerns our measure of financial development. Does the magnitude of credit provision truly indicate financial development? We strongly believe so. First, the amount of credit over GDP indicates the level of financial intermediation. If financial intermediaries were unable to assess credit risk, to overcome a maturity mismatch and to pool savings, they would provide less credit to households and enterprises. Second, the amount of credit may be biased towards few borrowers with high amounts outstanding and many borrowers with low amounts of credit and even more potential borrowers with no access to finance at all. We address this criticism, which essentially asks whether the amount of credit does in fact

measure access to finance by investigating the empirical link between our measures of financial development and other maybe more direct measures of access to finance. The IMF's Financial Access Survey (2011) and Demirgüc-Kunt, Beck and Honohan (2008) provide different measures for the access to financial intermediaries. Correlations of these measures with *credit* are shown in table 4.7.

Table 4.7

Access to finance and the provision of credit

The number of ATMs is taken from the IMF's Financial Access Survey. The other measures are taken from the World Bank.

Correlation coefficients	Access to finance				
	ATMs per 100,000 inhabitants (2004)	Loans per 1,000 people[1]	Bank branches per 100,000 people[1]	Minimum loan volume to SMEs as % of GDP p.c.[1]	Share of adult population with access to an account with a financial intermediary[1]
Credit over GDP	0.74	0.57	0.57	-0.26	0.69
(p-value)	(0.00)	(0.00)	(0.00)	(0.05)	(0.00)
# of countries	73	39	86	54	80

[1] Year may differ by country; credit over GDP is taken as the average from 1999 to 2003

The measures for access to finance are only available as cross-section data and not as panel data and differ with regard to the number of countries covered. Therefore, a replication of the previous fixed effects panel estimations is not feasible, and a cross-country analysis remains the best option to investigate the appropriateness of the credit measure for financial development. The first out of five ratios under consideration is the number of ATMs per 100,000 inhabitants, which indicates how many people use bank accounts. If credit and bank access were only relevant for a few, there would be fewer ATMs. The correlation of 0.74 for a set of 73 countries backs our use of credit as a proxy for financial development. The number of loans and the number of bank branches point in the same direction. If only a small proportion of the population would use financial intermediaries for the provision of credit, there would be fewer banks and fewer loans. Financial development in the sense of Banerjee and Newman (1993) means that funding for small and medium enterprises becomes easier. In particular, small loans may help to start a business or grow a small business. The minimum loan volume should also be lower in better-developed financial markets, as credit evaluation and provision processes should be more efficient and worthwhile for banks, even for relatively lower amounts of credit. The negative correlation of minimum loan volume with total credits confirms this fact. Lower minimum credit volumes are

associated with a greater provision of credit. The fifth indicator we use is based on survey data and measures the overall access of the adult population to a bank account. Even developed countries in the European Union have values below 100%, as some people abstain from banking voluntarily or involuntarily due to discrimination or the fee structure. Again, more people using financial services are correlated with higher amounts of credit. All these correlations over different measures and different sets of countries are significant and legitimize in our view the use of the private credit over GDP ratio as a proxy for financial development.

4.6 CONCLUSION

Two phenomena can be observed over the last five decades around the world – increasing financial development and increasing gross income inequality in many countries, especially in the developed world. We discuss theoretical models, which explain the link between financial development and income inequality and predict that better-developed financial markets lead to decreasing levels of income inequality regarding labor and entrepreneurial income and first increasing and then decreasing levels regarding capital income. Earlier empirical research focusing on this financial development income inequality nexus broadly confirms the decreasing effect of financial development. This research either is built upon a pure cross-country perspective that cannot account for the many country-specific characteristics or uses panel data approaches but, again, neglects country-specific characteristics.

Using a broader dataset and time-invariant country specifics in our panel estimation, we reach a different conclusion in the analysis of this nexus and reject these earlier theories and previous empirical research. Integrating time-invariant country characteristics, we find a positive relationship between financial development and income inequality within countries. Further developed financial markets lead to higher gross and net income inequality. This finding holds for several robustness checks, e.g., for subsamples by different income groups, neglecting country characteristics and including further control variables, as well as bank deposits as an alternative measure for financial development. The positive relationship is highly significant but

is only of a small magnitude. An increase in the provision of credit by ten percent leads to an increase in the Gini coefficient by 0.23 for the within estimation.[46]

We do not exclude the possibility that all income groups within a country benefit from more financial development, but we do find that those who are already better off benefit more because income inequality is increasing. These results add to the existing literature on financial development and income inequality by using new estimation techniques and a dataset with more countries for a longer time horizon compared to previous research. Our results should, at the very least, allow researchers to remain somewhat skeptical when confronted with the supposedly beneficial effects of financial development. It appears instead to be very important to target financial development towards the poorest in society. Only then can we hope for inefficient and excessive inequality to reduce. Nonetheless, the relationship between finance, financial development and income inequality offers more research opportunities and merits more resources and effort.

[46] This value ranges from 0.17 to 0.26 depending on the subsample and specification.

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APPENDIX

Table A4.1

Correlation analysis 1

Correlation of Gini coefficients with financial development (credit over GDP) and GDP per capita for the full sample and for subsamples along income groups. Correlations and significance levels were calculated in Stata by *pwcorr, sig*; FD (financial development) and GDP p.c. are in logs.

	Complete Dataset (N=3228)			
	Gini (gross)	Gini (net)	FD	GDP p.c.
Gini (gross)	1.000			
Gini (net)	.7852***	1.000		
FD	-.089***	-.397***	1.000	
GDP p.c.	-.145***	-.537***	.753***	1.000

	High income (N=1285)				Upper middle income (N=739)			
	Gini(g.)	Gini (n.)	FD	GDP p.c.	Gini (g.)	Gini (n.)	FD	GDP p.c.
Gini (gr.)	1.000				1.000			
Gini (net)	.525***	1.000			.825***	1.000		
FD	.142***	.063**	1.000		.298***	.301***	1.000	
GDP p.c.	.048***	-.231***	.642***	1.000	.054	.206***	.235***	1.000
Gini (gr.)	1.000				1.000			
Gini (net)	.826***	1.000			.903***	1.000		
FD	-.083**	-.049	1.000		.048	-.001	1.000	
GDP p.c.	.242***	.350***	.511***	1.000	.256***	.254***	.259***	1.000
	Lower middle income (N=765)				Low income (N=439)			

***,**,* denote statistical significance levels of the correlation coefficient at 1%, 5% and 10%.

Table A4.2

Correlation analysis 2

Correlation of Gini coefficients, measures for financial development (both, private credit over GDP and bank deposits over GDP), GDP per capita and the control variables used in the analyses (N = 2,565).

	Gini (gross)	**Gini (net)**	FD (credit)	FD (depos.)	GDP p.c.	Infla-tion	Share of gover. expendi ture	Share of agricult. in GDP	Ethno- Ling. Fractio-nalization (ELF)	Leg. org. UK	Leg. org FR	Leg. org GE
Gini (gross)	**1.00**											
Gini (net)	**0.71**	**1.00**										
FD (credit)	**-0.04**	**-0.38**	1.00									
FD (deposits)	**-0.14**	**-0.40**	0.86	1.00								
GDP p.c.	**-0.12**	**-0.53**	0.74	0.68	1.00							
Inflation	**0.08**	**0.23**	-0.41	-0.40	-0.29	1.00						
Gov exp.	**-0.02**	**-0.31**	0.37	0.37	0.43	-0.21	1.00					
Agriculture	**0.08**	**0.42**	-0.69	-0.66	-0.87	0.35	-0.41	1.00				
ELF	**0.20**	**0.45**	-0.34	-0.35	-0.52	0.11	-0.24	0.36	1.00			
Legal org. UK	**0.13**	**0.12**	-0.02	0.04	-0.13	-0.01	0.02	0.03	0.30	1.00		
Legal org. FR	**0.04**	**0.27**	-0.19	-0.18	-0.16	0.12	-0.22	0.19	0.06	-0.69	1.00	
Legal org. GE	**-0.22**	**-0.31**	0.17	0.15	0.20	-0.09	0.09	-0.19	-0.31	-0.25	-0.37	1.00

Table A4.3

First stage regression – financial development

The first-stage regression yields the fitted values of financial development (private credit over GDP) for the second-stage regression for the Gini coefficients. The estimation is a fixed effects estimation with robust standard errors and time dummies.

Dep. var: FD (credit)	Coefficient	p-Value
Bank deposits	0.8145	0.000
GDP p.c.	0.3381	0.435
GDP p.c.^{2}	0.0057	0.845
Inflation	-0.0071	0.676
Government expenditure	0.1208	0.205
Agriculture	-0.0699	0.443
Constant	-2.3159	0.145
N	668	
R^2 - within	0.67	

Table A4.4

Robustness check with bank deposits as proxy for financial development

Bank deposits are used as a proxy for financial development. Model 1 is a pooled OLS estimation with heteroskedasticity-robust standard errors. Model 2 uses cluster-robust standard errors. Model 3 is a fixed effects model with robust standard errors. All data are five-year averages and models are estimated with time dummies.

	Model					
	Gini (gross)			Gini (net)		
	(1) Pooled OLS	(2) Pooled OLS-Cluster	(3) Fixed effects	(1) Pooled OLS	(2) Pooled OLS-Cluster	(3) Fixed effects
FD	-1.01*	-1.01	2.34***	-0.67	-0.67	1.72***
FD²	not signif.[1]	not signif.	not signif.[1]	not signif.	not signif.	not signif.[1]
GDP p.c.	12.05***	12.05***	-21.49***	20.38***	20.38***	-9.08**
GDP p.c.²	-0.81***	-0.81***	1.49***	-1.51***	-1.51***	0.67**
ELF	5.72***	5.72*	time invariant	9.23***	9.23***	time invariant
Inflation	-0.60*	-0.60	-0.52*	-0.37	-0.37	-0.31
Gov. exp	2.24**	2.24	1.78	-0.84	-0.84	1.04
Agriculture	-1.04*	-1.04	0.01	-1.81***	-1.81*	0.03
Constant	9.84	9.84	115.73***	-22.78**	-22.78	57.84***
N	638	638	638	638	638	638
R² (within)			0.25			0.12
Max/Min of:						
FD (deposits)	strict. neg.	not signif.	strict. pos.	not signif.	not signif.	strict. pos.
GDP (USD)	1,726	1,726	1,377	854	854	843

***, **, * denote statistical significance levels at 1%, 5% and 10%.

[1] Both terms of FD (bank deposits) in the quadratic form are insignificant, but FD is significant in its linear form.

Table A4.5

Income inequality and financial development by country

Only country-year observations with information on income inequality (Gini), financial development (credit) and GDP per capita are included in the table, as other information were not used for the basic estimation.

		Gini (gross)			Financial development (credit)		
Country	N	Mean	Min	Max	Mean	Min	Max
High income	**1285**	**42.84**	**25.01**	**64.37**	**74.57**	**7.04**	**269.76**
Australia	44	39.76	31.29	43.96	50.24	19.31	121.43
Austria	33	42.85	33.08	51.81	80.59	38.14	111.58
Bahamas, The	32	54.05	48.20	61.43	50.96	31.85	69.94
Barbados	28	45.56	40.46	52.16	40.93	31.01	49.94
Belgium	36	34.01	25.01	51.29	45.82	11.23	93.70
Canada	46	39.46	35.82	43.82	78.13	17.73	183.83
Croatia	14	34.87	32.40	38.21	42.67	24.98	67.32
Cyprus	19	42.59	37.00	47.44	140.18	91.21	200.80
Czech Republic	15	35.50	33.58	36.81	48.72	29.21	69.25
Denmark	47	48.70	45.43	54.55	54.76	22.02	209.82
Estonia	16	48.79	43.93	51.56	41.50	9.47	99.25
Finland	44	42.96	36.38	64.37	55.73	37.18	93.26
France	35	42.22	31.28	54.70	73.82	22.36	106.75
Germany	37	46.36	31.43	55.95	91.10	63.09	116.93
Greece	41	44.67	38.55	55.23	37.04	13.48	91.66
Hong Kong	16	54.37	47.17	59.54	146.53	124.36	176.76
Hungary	26	41.00	28.16	48.28	33.78	16.18	64.21
Iceland	4	41.65	40.31	43.01	181.12	116.44	269.76
Ireland	44	44.45	38.87	47.43	70.71	30.42	205.77
Israel	30	41.29	30.67	45.08	57.34	31.66	88.39
Italy	42	45.23	38.18	51.12	64.67	47.56	103.33
Japan	45	37.87	34.26	41.70	126.38	51.27	200.61
Korea, Rep.	38	39.69	35.16	45.97	84.09	36.41	144.59
Latvia	15	47.19	42.15	53.20	34.42	7.04	94.72
Luxembourg	31	36.39	27.55	43.96	102.30	56.07	211.42
Malta	8	45.75	43.65	48.62	106.02	101.81	112.37
Netherlands	43	41.48	37.54	53.74	101.34	41.61	192.60
New Zealand	45	40.03	33.07	47.00	60.55	23.76	140.14
Norway	42	42.32	37.74	48.13	85.28	58.16	113.89
Poland	19	41.13	34.01	47.97	23.70	14.87	40.55
Portugal	32	53.44	46.42	61.05	90.08	47.99	171.69
Singapore	44	46.98	42.30	53.13	87.45	35.03	135.74
Slovak Republic	15	33.98	29.75	36.83	40.90	29.60	52.87
Slovenia	17	33.55	29.20	35.35	38.03	19.45	80.95
Spain	35	38.81	32.93	46.65	87.25	63.67	188.49
Sweden	49	44.60	36.94	51.09	89.64	51.37	134.88
Switzerland	26	42.29	39.17	56.64	146.44	100.84	162.99
Trinidad a. Tobago	34	44.69	37.83	64.06	39.84	12.28	62.16
United Kingdom	49	43.30	37.30	48.78	70.33	16.05	189.56
United States	49	43.50	39.33	47.93	116.43	70.53	210.73

		Gini (gross)			Financial development (credit)		
Country	N	Mean	Min	Max	Mean	Min	Max
Upper middle income	**739**	**49.49**	**27.52**	**77.28**	**32.31**	**2.80**	**155.25**
Albania	10	32.27	30.62	35.13	5.46	2.80	11.81
Algeria	23	37.71	35.28	40.75	26.11	4.14	68.29
Argentina	22	46.20	43.04	50.38	16.17	9.77	25.18
Botswana	24	55.86	52.60	59.64	12.68	6.54	19.65
Brazil	17	56.45	52.66	58.53	35.26	27.03	54.49
Bulgaria	17	32.62	27.52	38.39	34.22	8.94	68.19
Chile	30	52.76	50.91	54.45	52.84	11.08	74.34
Colombia	41	58.53	48.86	67.50	25.34	16.83	35.65
Costa Rica	38	48.55	43.30	60.89	22.45	10.47	51.96
Dominica	1	41.41	41.41	41.41	63.30	63.30	63.30
Dominican Republic	22	48.86	45.91	50.44	22.20	14.80	30.75
Fiji	17	52.46	50.30	54.29	26.51	18.04	38.25
Gabon	8	57.68	42.74	70.66	12.82	7.89	16.37
Grenada	1	53.19	53.19	53.19	67.08	67.08	67.08
Iran	35	47.26	42.95	53.25	28.16	18.64	43.62
Jamaica	37	59.57	47.56	77.28	22.95	13.15	30.66
Kazakhstan	13	37.11	34.01	41.94	14.72	4.97	36.83
Lithuania	15	47.83	47.07	48.71	23.30	10.22	61.23
Macedonia, FYR	14	32.88	29.72	38.94	23.66	17.38	37.01
Malaysia	38	51.85	40.32	67.17	75.53	7.10	155.25
Mauritius	31	47.98	39.73	56.62	38.34	20.63	72.35
Mexico	42	51.49	46.72	68.75	20.36	8.69	37.10
Panama	44	52.22	47.97	57.37	51.24	10.51	97.32
Peru	20	47.65	44.34	51.01	16.94	3.16	27.89
Romania	12	43.19	40.46	49.79	14.45	6.43	36.87
Russian Federation	16	47.48	43.48	51.34	18.78	6.78	48.54
Serbia	6	41.13	40.29	41.77	22.01	16.31	27.98
Seychelles	1	57.59	57.59	57.59	22.45	22.45	22.45
South Africa	38	65.45	61.70	70.24	80.68	43.44	132.56
St. Lucia	2	49.75	40.25	59.26	67.72	58.26	77.19
St. Vincent and the Gren.	1	66.41	66.41	66.41	43.94	43.94	43.94
Suriname	7	50.28	50.05	50.51	14.33	7.27	21.88
Turkey	25	45.36	41.75	50.84	14.67	10.91	18.79
Uruguay	28	41.39	40.10	43.00	33.56	19.99	67.05
Venezuela, RB	43	43.98	41.28	58.27	28.83	8.13	66.17

		Gini (gross)			Financial development (credit)		
Country	N	Mean	Min	Max	Mean	Min	Max
Lower middle income	**765**	**46.64**	**30.43**	**77.36**	**27.48**	**1.14**	**165.96**
Angola	6	60.34	60.06	60.61	3.12	1.14	4.45
Armenia	15	45.68	39.59	54.42	7.86	3.09	23.42
Belize	7	55.57	50.58	59.07	41.33	37.26	46.80
Bhutan	3	48.17	48.07	48.27	14.60	11.48	18.08
Bolivia	22	53.61	44.10	58.26	38.22	4.47	63.04
Cameroon	19	47.69	43.96	49.51	16.93	6.66	28.14
Cape Verde	17	50.06	42.35	55.89	24.15	3.02	41.13
Cote d'Ivoire	32	48.89	38.20	59.84	28.93	14.91	41.22
Ecuador	28	50.59	42.81	61.64	21.63	12.91	40.67
Egypt, Arab Rep.	41	36.32	32.71	51.35	25.89	11.43	53.38
El Salvador	42	51.16	47.46	63.71	28.01	16.82	43.53
Georgia	10	45.44	43.14	47.55	6.45	3.31	11.31
Guatemala	29	54.27	42.14	57.89	17.43	11.25	29.04
Guyana	5	44.62	43.94	45.60	41.49	23.17	54.89
Honduras	24	55.94	52.46	72.79	31.34	13.84	46.60
India	46	35.35	31.99	44.51	19.46	7.84	36.37
Indonesia	29	34.98	32.19	38.59	28.29	9.04	53.53
Jordan	30	39.88	35.08	48.67	63.62	32.15	83.50
Lesotho	18	59.67	51.95	64.54	13.78	5.60	20.05
Moldova	13	41.22	37.24	44.46	14.78	4.45	29.68
Mongolia	11	35.69	34.15	38.72	13.49	6.25	32.63
Morocco	38	47.48	37.71	69.06	31.34	11.74	60.91
Nigeria	35	50.80	43.40	65.16	11.20	3.33	18.93
Pakistan	43	39.05	30.43	44.15	21.92	12.83	27.57
Papua New Guinea	11	49.05	40.62	52.56	15.07	12.37	17.95
Paraguay	19	50.98	37.51	55.35	22.09	13.18	29.03
Philippines	45	55.42	45.83	61.30	30.64	16.94	54.06
Senegal	17	44.93	39.50	58.56	18.13	14.51	26.10
Sri Lanka	27	45.33	32.52	57.22	18.55	7.74	28.71
Swaziland	13	55.25	49.07	77.36	14.14	10.92	18.83
Thailand	36	50.18	43.98	60.27	68.38	15.07	165.96
Tunisia	18	41.01	39.03	42.02	60.64	48.67	66.60
Vietnam	11	37.60	36.34	38.64	36.33	17.23	64.37
Yemen, Rep.	5	36.51	32.24	39.03	5.64	4.67	6.47

		Gini (gross)			Financial development (credit)		
Country	N	Mean	Min	Max	Mean	Min	Max
Low income	**439**	**46.91**	**29.70**	**75.08**	**12.23**	**1.10**	**41.41**
Bangladesh	10	34.08	33.16	35.75	24.41	15.12	31.14
Benin	4	37.43	36.89	37.97	13.59	12.05	15.11
Burkina Faso	10	50.79	44.77	54.31	9.40	5.73	12.84
Burundi	15	37.40	34.17	41.02	19.81	14.25	27.95
Cambodia	10	44.64	43.77	45.73	5.52	3.14	7.64
Central African Rep.	2	61.41	60.96	61.86	5.14	4.50	5.78
Chad	4	40.85	40.75	40.92	3.35	2.77	3.96
Congo, Dem. Rep.	2	44.70	44.52	44.88	1.88	1.58	2.19
Ethiopia	25	37.64	30.39	44.22	18.45	9.90	30.20
Gambia, The	12	52.54	48.15	59.91	13.55	8.88	26.07
Ghana	25	38.69	35.59	42.79	6.98	1.40	15.52
Guinea-Bissau	15	43.72	36.30	54.61	4.08	1.49	7.62
Haiti	11	54.06	53.61	56.05	12.74	10.26	13.99
Kenya	39	61.34	49.80	75.08	25.82	12.19	34.96
Kyrgyz Republic	12	42.60	39.00	47.30	5.97	3.74	11.29
Lao PDR	11	34.88	31.10	37.16	7.14	3.63	9.19
Madagascar	30	45.24	40.00	46.88	13.86	7.88	21.24
Malawi	25	58.57	39.45	72.33	11.14	4.95	20.12
Mali	18	44.17	37.51	53.00	13.48	8.13	17.11
Mauritania	14	43.66	38.79	47.50	25.61	16.53	41.41
Mozambique	10	42.82	40.15	46.01	11.27	8.31	15.39
Nepal	29	42.59	29.70	63.98	14.55	3.72	28.31
Niger	14	45.95	40.58	50.51	6.06	3.54	11.79
Rwanda	6	46.96	45.85	48.08	10.60	10.16	11.04
Sierra Leone	32	58.14	45.31	67.51	3.98	1.89	7.78
Tanzania	12	39.55	36.06	44.50	7.97	3.08	15.09
Togo	2	35.13	35.13	35.14	16.52	16.48	16.57
Uganda	20	41.82	37.01	46.09	3.94	1.10	5.87
Zambia	20	53.90	46.48	57.71	6.35	3.69	8.69

Figure A4.1

Gross income inequality around the world

Income inequality is measured by the Gini coefficient of gross income. Data is based on averages from 2000 to 2004.

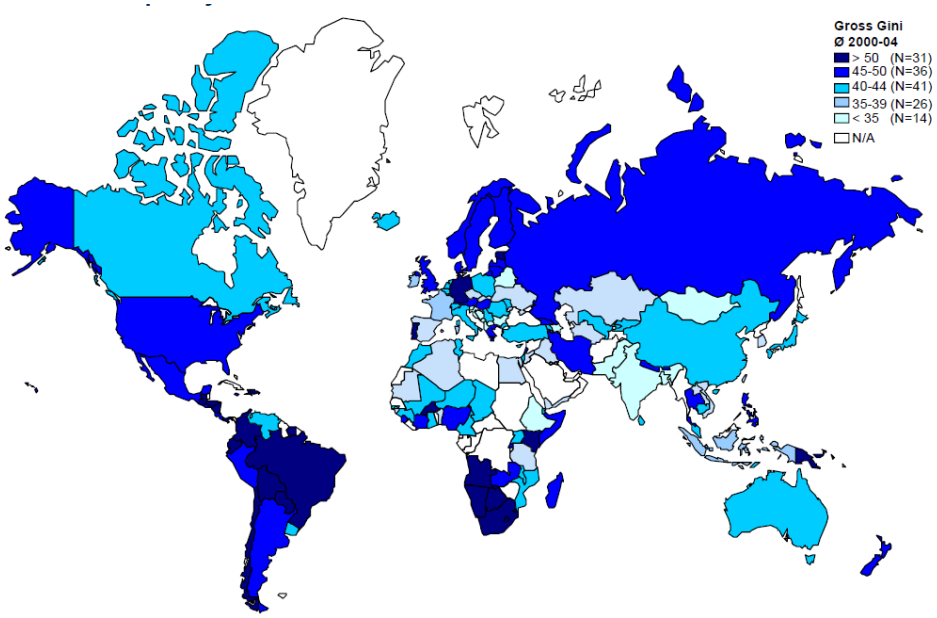


Figure A4.2

Net income inequality around the world

Income inequality is measured by the Gini coefficient of net income. Data is based on averages from 2000 to 2004.

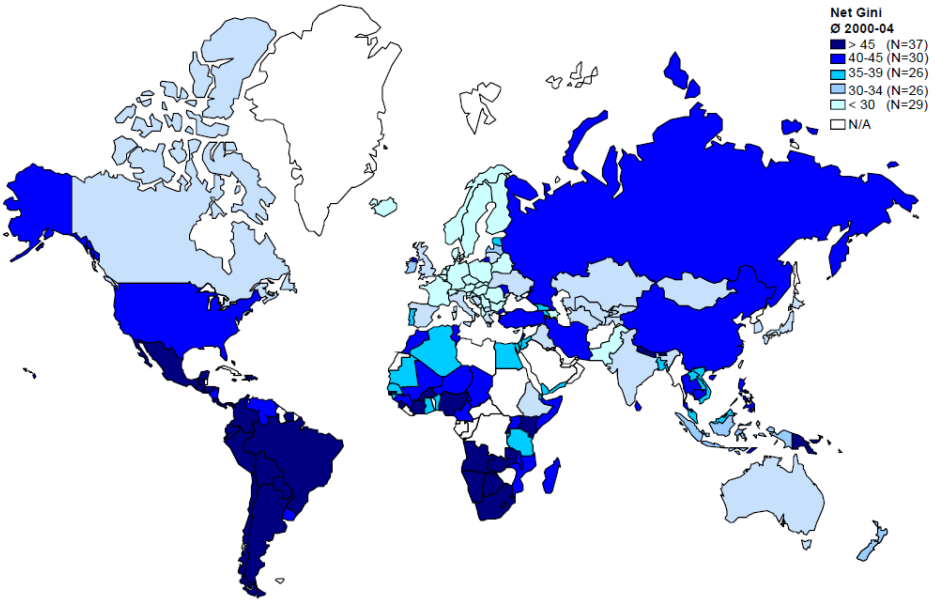


Figure A4.3

Financial development around the world

Financial development is measured by the average volume of private credit over GDP from 2000 to 2004.

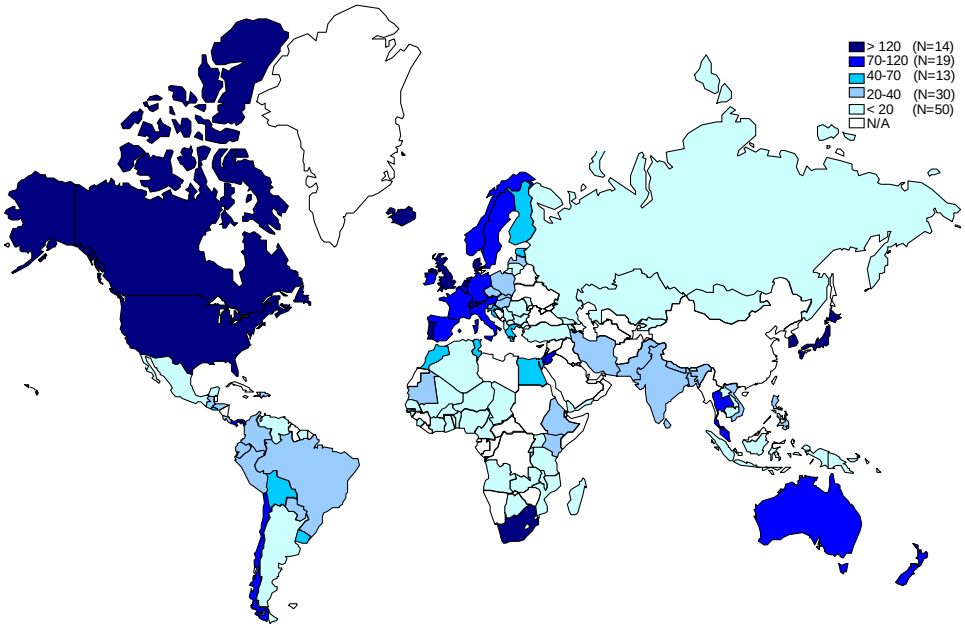
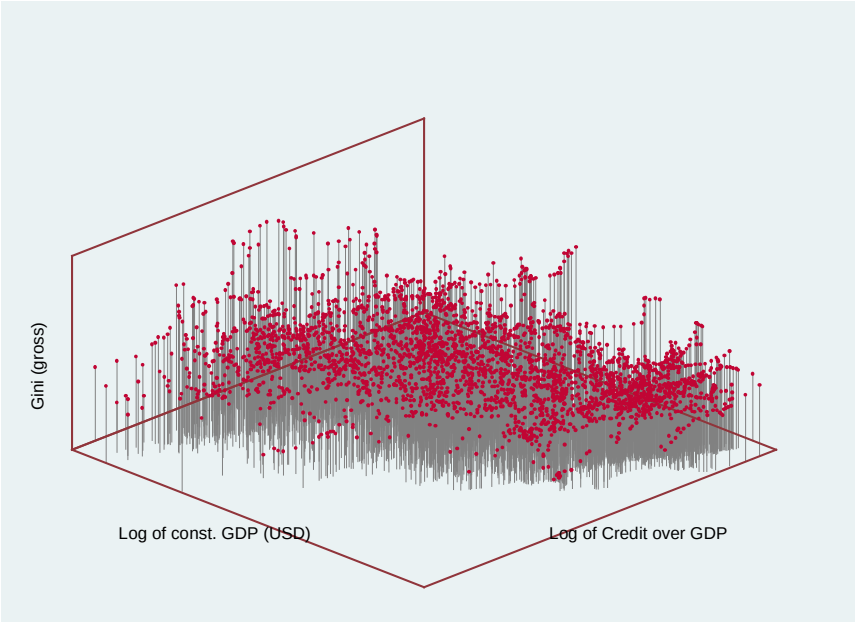


Figure A4.4

Financial development, economic development and income inequality

3D-graph for the relationship between Gini, economic and financial development with all country-year observations.



Curriculum Vitae

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2003 – 2004	Studies in Business Administration, Vordiplom Ludwig-Maximilians-Universität Munich
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