FINANCIAL DEVELOPMENT AND THE CREDIT CYCLE IN GREECE[1]

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Abstract

We review the developments in Greece's financial system since the beginning of the crisis. We also place them in a broader context by (i) evaluating the long-term performance of Greece's financial system in comparison to other countries, and (ii) reviewing the credit boom-and-bust cycle that Greece has experienced since Euro entry. Risks in the Greek economy remain overly concentrated to those originating them and are not well diversified. By raising the cost of equity capital for firms, this impedes investment. It also drives up corporate leverage, thus making the economy more vulnerable to shocks. These vulnerabilities manifested themselves even before the sovereign crisis hit. Strengthening investor protection, through improvements in the justice system and financial regulation, is an important part of the solution. In the shorter run, the debt overhang problem in the private sector should be addressed. We discuss policy options to achieve these goals.

Keywords: Financial development, investor protection, diversification, leverage, banks, credit cycle, debt overhang, bankruptcy laws, financial regulation

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1. Introduction and Summary

Much of the policy attention since the Greek crisis erupted concerned the financial system. Greek banks realized large losses on their holdings of Greek government bonds because of Greece's sovereign default. The banks also saw the fraction of their non-performing loans (NPLs) to the private sector increase dramatically because of the sharp economic contraction. Restoring the banks to solvency required a large-scale recapitalization, which took place mostly with public funds in 2013, but with increasing participation by private investors in 2014. The negotiation between the SYRIZA-ANEL government elected in January 2015 and the troika ended up with a bank run and the imposition of capital controls in the summer of 2015. A further recapitalization was made necessary by these developments.

Policy attention focused not only on recapitalizing the banks but also on improving the legal framework pertaining to bankruptcy and debt restructuring. Bankruptcy laws were revised repeatedly to facilitate the resolution of NPLs to households and firms. The dramatic increase in NPLs during the crisis reflected a drastic deterioration of households' and firms' finances brought about by the economic contraction. Households and firms were also hit through the effects that the crisis had on banks: loans became hard to obtain and deposits were no longer viewed as safe.

In this chapter we review the above developments. We also place them in a broader context by (i) evaluating the long-term performance of Greece's financial system in comparison to other countries, and (ii) reviewing the credit boom-and-bust cycle that Greece has experienced since Euro entry. This provides more perspective on the developments since the crisis, and suggests desirable policy options going forward.

In Section 2 we provide a panorama of the Greek financial system: the types of financial institutions operating in Greece and their relative size; the asset holdings of Greek households; and the capital structures of Greek firms. A consistent theme that emerges from our findings is that compared to other Eurozone (EZ) countries, the United Kingdom (UK), and the United States (US), risks in the Greek economy remain overly concentrated to those originating them and are not well diversified. In particular, financial intermediation is largely dominated by banks, with the insurance and mutual-fund sectors being much smaller than in the other countries; households hold their wealth in housing and bank deposits to a larger extent than in the other countries, with stocks, bonds, mutual funds, and voluntary pensions playing a minor role; and firms rely more on large shareholders and employ more leverage than in the other countries.

Limited diversification raises the cost of equity capital for firms, and is an impediment to long-term growth. Moreover, because it drives up corporate

leverage, it can make the economy more vulnerable to shocks. We argue that a natural explanation for limited diversification is weak investor protection and the lack of trust that it breeds. At the same time, factors such as lack of financial literacy, tax disincentives, and limited entry by foreign financial institutions which could promote competition and financial innovation, may also be playing an important role.

In Section 3 we review Greece's credit boom-and-bust cycle since Euro entry. We separate the bust into (i) the period from the beginning of the global financial crisis in August 2007 to the beginning of the sovereign debt crisis in October 2009, and (ii) the period since October 2009. This allows us to look more deeply into the bank-sovereign loop, better isolating the effects that were transmitted to banks from the sovereign and those that originated within banks. Greece's sovereign default caused all Greek banks to become insolvent because of their large positions in Greek government bonds. At the same time, the rapid growth in private-sector credit since Euro entry had left the banks exposed to a deterioration in global funding conditions, such as the one experienced in 2007-8. This risk exposure appears to have been higher for Greek banks than for the average EZ bank, and caused significant funding difficulties for Greek firms even before the sovereign crisis started.

In Sections 4 and 5 we discuss challenges facing the Greek financial system and possible policies to address them. The main challenge for the short and medium run is to recover from the credit crunch by reducing the debt burdens of households and firms, and ensuring that banks provide an adequate flow of credit to the economy. While some of the required interventions may be at the macroeconomic level and involve actions by the European Central Bank (ECB), we focus on interventions that are more microeconomic and are available to Greek policy makers.

An important set of interventions concern the judicial procedures governing bankruptcy and debt restructuring, both for firms and for households. The laws in place and their practical application generate significant inefficiencies, especially the idling of productive assets. These inefficiencies mattered less during the credit boom, but they must now be addressed. A second set of interventions concern the incentives and capacity within the banking system to resolve NPLs.

Coming to the longer run, an important challenge is to further the development of capital markets so that risks are better diversified, equity financing becomes cheaper, and the economy becomes less vulnerable to shocks. Strengthening investor protection laws and their practical application is an important part of the solution. Interventions are required both at the level of the justice system, covered extensively in Chapter XX in this volume, and at the level of financial regulators.

Stronger investor protection will help develop the capital-markets side of the financial system, but attention is also needed on the banking side. The most pressing issue is to keep clear boundaries between banks and the state. As is well known from academic research, state control of banks results in bad lending decisions, corruption, and rent seeking. Encouraging entry by new foreign financial institutions should be an important policy priority as well, given the evidence that such entry promotes competition, financial innovation, and better regulation.

2. Panorama of the Greek Financial System

In this section we present a panorama of the Greek financial system and compare with other EZ countries, the UK, and the US. Some comparisons employ only a subset of these countries because of data limitations. In Section 2.1 we describe the types of financial institutions operating in Greece, and their relative size. In Section 2.2 we describe the asset holdings of Greek households, and in Section 2.3 we describe the capital structures of Greek firms. The main takeaways from the evidence are as follows:

i. Greece's financial system is smaller (as fraction of GDP) than in all comparison countries.
ii. Greece's financial system is dominated by banks to a larger extent than in all comparison countries, with the exception of Cyprus. Other types of financial institutions, such as insurance companies and investment funds, play only a minor role in financial intermediation.
iii. The wealth of Greek households is held in real assets, such as real estate and private businesses, to a larger extent than in all comparison countries. Hence, financial assets, such as bank deposits, bonds, and stocks, account for a smaller fraction of wealth than in all comparison countries, and provide a smaller liquid buffer to smooth out drops in consumption during recessions.
iv. The financial assets of Greek households are held in bank deposits to a larger extent than in all comparison countries. This is consistent with the small size of insurance companies and investment funds.
v. Greek firms are dominated by large shareholders to a greater extent than in all comparison countries. This result holds both on average and when controlling for firm size, i.e., comparing firms of the same size.
vi. Greek firms are more levered, i.e., have a larger ratio of debt to equity, than in all comparison countries. Again, this result holds both on average and when controlling for firm size.

A consistent theme from the above findings is that risks in the Greek economy remain concentrated to those originating them and are not well diversified. This is reflected in the small size of insurance companies, which are institutions designed to

diversify risks. It is also reflected in the limited holdings of stocks and mutual funds by households, the small size of investment funds, and the dominance of large shareholders in firms: all this indicates that households hold only limited equity stakes in firms and hence firm risk is not well diversified. The larger ratio of debt to equity in firms' capital structures is an additional indication of this phenomenon.

Limited diversification is harmful because individuals remain overly exposed to risks such as those affecting their property or health status. Limited diversification at the firm level is also harmful because it implies that firms have a higher cost of raising equity capital and hence are less able to invest and create jobs. A higher cost of equity capital can also drive up corporate leverage, making the economy more vulnerable to shocks.

The extent of diversification and the size of a country's financial system are indicators of the country's level of financial development. A large body of research has shown that financial development promotes economic growth.[2] Our results suggest that financial development in Greece lags that in the comparison countries. Hence furthering financial development should be an important goal for economic policy in Greece.

Factors hindering financial development include weak investor protection and lack of financial literacy. In Sections 2.2 and 2.3 we examine how these and other factors can account for the evidence that we report. In Section 5 we discuss possible policy remedies.

2.1. Financial Institutions

Figure 1 describes the aggregate size of different types of financial institutions in Greece, and compares with other EZ countries, the UK, and the US. We consider four types of institutions: credit institutions (comprised mainly by banks), insurance companies, pension funds, and investment funds (comprised mainly by mutual funds and hedge funds). We report data on the aggregate assets held by each type of institution in each country as a percent of the country's gross domestic product (GDP). The data for credit institutions, insurance companies, and investment funds are from 2012. For pension funds we report data from 2010, which is the latest year available. Pre-crisis data from 2008, which is the earliest year for which data on insurance companies and investment funds are available, paint a similar picture.

The aggregate assets held by Greek financial institutions of all four types are 190.1% of Greek GDP. The average across the EZ is 404.8%, and the corresponding numbers

[2] See, for example, Levine (2005) for a survey. Recent evidence, e.g., Cournede and Denk (2015), qualify that view, suggesting a hump-shaped relationship between some measures of financial development and economic growth. That evidence concerns mostly the sub-sample of advanced economies.

for the UK and the US are 777.7% and 298.7%, respectively. The aggregate size of Greek financial institutions as percent of GDP is smaller than in all comparison countries. Thus, the Greek financial system is small in an aggregate sense. Next in size after Greece comes Italy (215%) and Finland (224.5%).

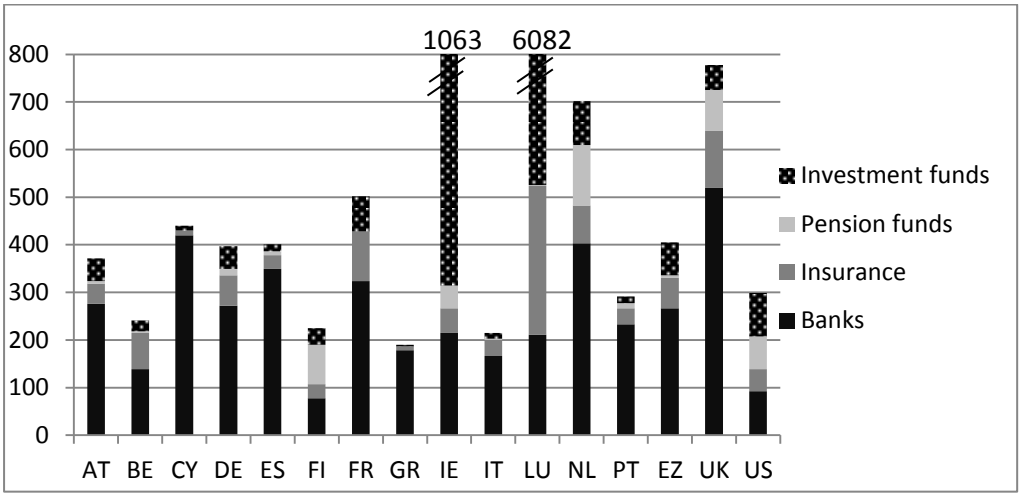

Figure 1: Assets held by financial institutions as percent of GDP. The data for credit institutions come from the ECB in the case of EZ countries, from the Bank of England in the case of the UK, and from the Federal Deposit Insurance Corporation in the case of the US. The data for insurance companies come from the ECB in the case of EZ countries, with the exception of Cyprus, Ireland, and Portugal. For these countries, as well as for the UK and the US, the data come from local industry bodies. The data for pension funds come from the World Bank's Global Financial Development Database. Pension-fund data for Cyprus are missing. The data for investment funds come from the European Fund and Asset Management Association (EFAMA). The data for credit institutions, insurance companies, and investment funds are as of 2012, and for pension funds are as of 2010. EZ averages are computed by dividing EZ assets by EZ GDP.

A more complete comparison between Greece and the other countries can be performed by breaking down assets by type of financial institution. Assets of Greek banks are 178.6% of GDP. The average across the EZ is 266.6%, and the corresponding numbers for the UK and the US are 519.2% and 92.5%, respectively. The aggregate size of Greek banks as percent of GDP is thus smaller than the EZ average, but assets of Greek banks are a larger percent of GDP than in Finland (77.2%), the US (92.5%), Belgium (138.42%), and Italy (166.1%).

The gap between Greece and the comparison countries becomes much wider when considering institutions other than banks, i.e., insurance companies, pension funds, and investment funds. The aggregate assets of these institutions as percent of GDP are 11.5% in Greece, while the average across the EZ is 138.2%, and the corresponding numbers for the UK and the US are 258.6% and 206.2%, respectively.

The previous observations suggest that the Greek financial system is dominated by banks to a larger extent than in the comparison countries. Banks indeed account for 93.9% of financial-system assets in Greece (taking the financial system to consist of the four types of institutions considered in this section), while the average across the

EZ is 70.5%, and the corresponding numbers for the UK and the US are 66.8% and 31%, respectively. The only country for which banks are more dominant than in Greece is Cyprus, where 95.4% of financial-system assets are held within banks. Next in order come Spain (87.2%), Portugal (79.9%), and Italy (77.3%). Since assets of investment funds and pension funds are mainly stocks and bonds, which are traded in capital markets, Figure 1 confirms the preponderance of banks relative to capital markets in Europe and the converse phenomenon in the US.

It is worth noting that Greece's investment-fund sector is not only the smallest than in all countries in Figure 1 (3.5% of GDP in Greece, compared to 9.8% in Cyprus, 12.6% in Italy, 14.4% in Portugal, 14.6% in Spain, and 42.6% EZ average), but is also comparable to that of European countries with lower GDP per capita, such as Romania (2.8%) and Turkey (3.9%).

Some of the services performed by insurance companies and investment funds could be performed within banks. Hence, banks could, in principle, substitute effectively for a small insurance and investment-fund sector. Figure 2 shows, however, that Greek banks focus on traditional deposit-taking and lending to a larger extent than many of their EZ counterparts. The figure plots two measures of banks' activities. First, the fraction of income earned from the interest-rate differential between loans and deposits. Second, the fraction of assets that are loans. Both fractions would be equal to one if banks engage only in deposit-taking and lending, and smaller than one if banks engage in additional activities such as insurance, asset management, etc. We report pre-crisis figures, as of 2007. More recent data paint a similar picture.

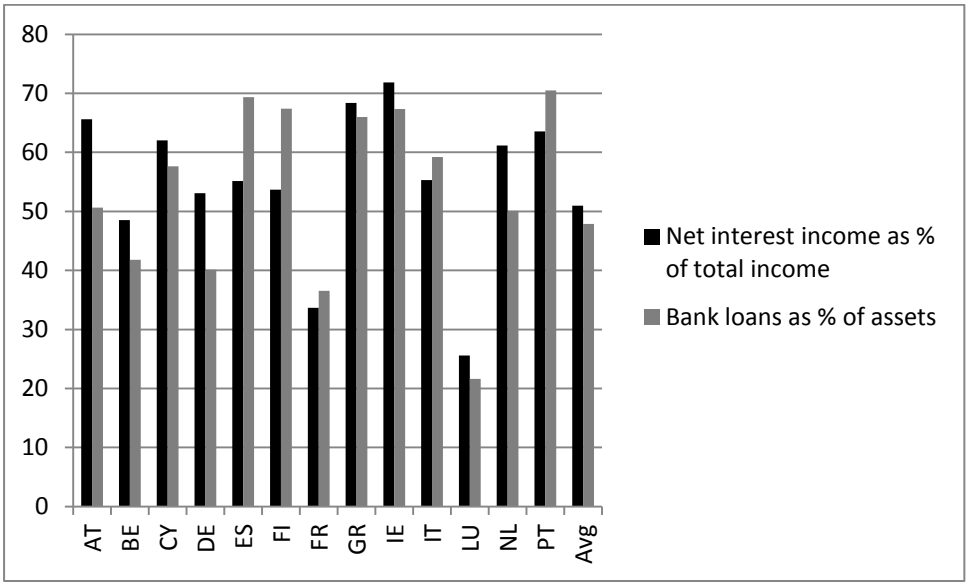

Figure 2: Bank asset and income structure. The data come from the ECB and are as of 2007. The average is computed by aggregating numerator and denominator across the countries in the figure and dividing.

Greek banks derived 68.4% of their income from traditional deposit-taking and lending in 2007. The average across all comparison countries was 51.0%, and Greece ranked second after Ireland (71.9%). The loans of Greek banks were 66% of their total assets. The average across all comparison countries was 47.9%, and Greece ranked fifth after Portugal (70.5%), Spain (69.3%), Finland (67.4%), and Ireland (67.3%).

2.2. Households

We next report evidence on the asset holdings of Greek households, and compare with other EZ countries. This evidence comes from the Household Finances and Consumption Survey (HFCS), undertaken under the auspices of the ECB during 2009-2011. (The data for Greece were collected during 2009, in the months right before the start of the EZ sovereign crisis.) Figure 3 plots the breakdown of households' financial assets across various categories. These categories do not include direct holdings of cash, which the HFCS does not record.

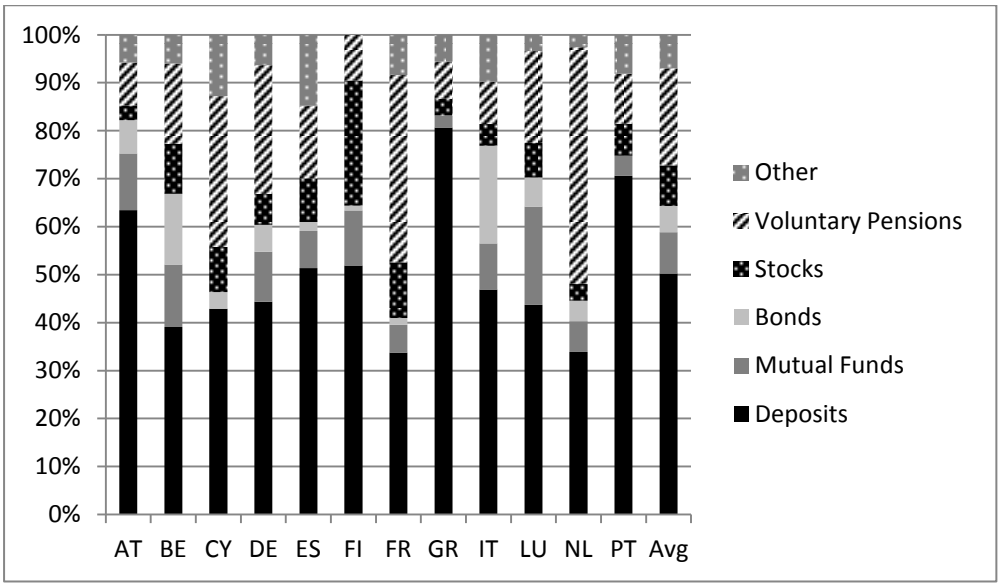

Figure 3: Breakdown of households' financial assets. The data come from the HFCS, undertaken under the auspices of the ECB during 2009-2011. The average is a simple average across the countries in the figure.

Greek households hold a larger fraction of their financial wealth in bank deposits than in all comparison countries. The fraction is 80.7% for Greece, while the average across all comparison countries is 50.2%, and the second highest fraction is 70.6% for Portugal. Holdings of mutual funds are very low (2.5%), consistent with the small size of the investment-fund sector (Figure 1), and so are direct holdings in bonds and stocks. Investment in voluntary pensions is also very low (7.7%), consistent with small size of the insurance sector (Figure 1), which offers such products.

Figure 4 plots households' financial assets as a fraction of their total assets. Wealth not invested in financial assets is held in real assets. Real assets consist predominantly of real estate. They also include private businesses, whose contribution to household wealth is on average larger for the wealthiest households.

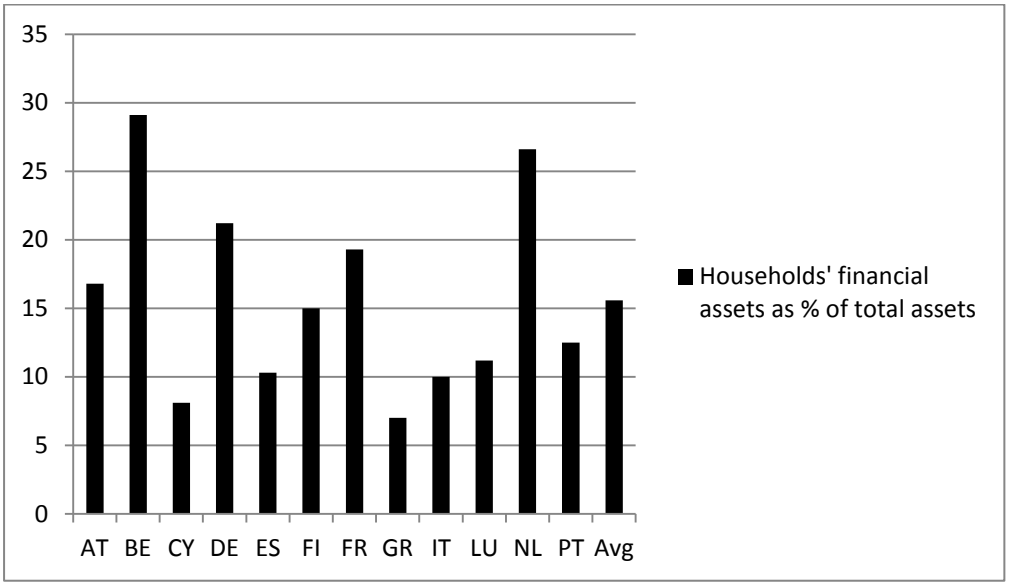

Figure 4: Households' financial assets as % of total assets. The data come from the HFCS, undertaken under the auspices of the ECB during 2009-2011. The average is a simple average across the countries in the figure.

Greek households invest a smaller fraction of their wealth in financial assets than in all comparison countries. The fraction is 7% for Greece, while the average across all comparison countries is 15.6%. Cyprus is the second lowest (8.1%), followed by Italy (10%) and Spain (10.3%). Greek households hold the vast majority of their wealth in real assets.

Investment in real assets is illiquid, especially at times of crisis, and highly undiversified. Hence, Figure 4 suggests that Greek households suffer the most from under-diversification among their EZ counterparts.[3]

We next explore possible explanations for why Greek households hold few financial assets and why these assets are held mainly in bank deposits and not in mutual funds, stocks, bonds, and retirement-related products offered by insurance companies. Such explanations could also help account for the relative under-development of the Greek insurance and investment-fund sectors.

One possible explanation is weak investor protection and the lack of trust that it breeds. Greek households avoid stocks, mutual funds, and insurance products because they are concerned about being exposed to fraud. Lack of trust is

[3] We should note, however, that households can also be prone to under-diversification in their holdings of financial assets, e.g., invest predominantly in their own country (home bias).

emphasized in the literature on financial development as a key factor limiting households' participation in the stock market (e.g., Guiso, Sapienza, and Zingales 2008), and could be a consequence of weak investor protection (e.g., La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1998, 2000). Measures of investor protection are indeed lower for Greece than for most of the comparison countries. For example, the World Bank Doing Business Report computes indices measuring the legal rights of shareholders ("protection of minority investors"), the legal rights of creditors (sub-index of "getting credit"), and the efficiency of courts ("enforcing contracts"). According to the 2015 report, Greece ranked 62nd out of 189 countries, and below all comparison countries in Figure 1 except Finland, Netherlands, and Luxembourg, for shareholder rights. It ranked 124th, and below all comparison countries except Luxembourg, Netherlands, Italy, and Portugal, for creditor rights. More troublingly, it ranked 155th, and below all comparison countries, for the efficiency of courts. Hence, while investor protection laws are not the weakest among the comparison countries, the difficulty of enforcing these laws compounds the problem significantly. These issues are analysed in greater detail in Chapter XX on the justice system in this volume.

The scores in the World Bank Doing Business report are a useful indicator of weak investor protection. An additional indicator is the many incidences of alleged or confirmed financial wrongdoing. For example, the Greek stock market experienced a severe boom and crash episode during 1997-2002, which was accompanied by many alleged incidences of financial fraud and market manipulation. Some of these cases have been taken to the courts, and the majority of those are still pending. It is natural to suppose that such allegations and the lack of trust they have created have contributed to the pronounced reluctance of Greek households to participate in the stock market, as illustrated by their low stock holdings compared to other EZ countries.[4]

Financial wrongdoing has also occurred in the insurance and asset-management sectors. For example, on 9/2009, the insurance regulator shut down the second largest insurance group in Greece (Aspis) because of insufficient capital and mismanagement. And a well-publicized scandal broke out in 2007 about state pension funds buying complicated structured bond products from brokerage firms at prices significantly above market values.

More recently, there have been cases of financial wrongdoing in the banking sector. For example, in October 2011, the central bank (Bank of Greece; BoG) shut down Proton Bank. Its main shareholder has been jailed since then because of alleged

[4] The stock-market crash might have dissuaded Greek households from investing again in stocks, even in the absence of trust-related issues. Indeed, severe stock-market downturns have been shown to discourage future participation in the stock market even in countries with stronger investor protection than Greece, e.g., the US (Malmendier and Nagel, 2011; Ampudia and Ehrmann, 2014).

loans of 700 million Euros to companies that he controlled. In January 2013 charges were brought against the management of state-controlled Postal Bank because of improper loans exceeding 400 million Euros to connected entrepreneurs.

A possibly complementary explanation for the asset holding patterns of Greek households is lack of financial literacy. Greek households might, in large part, lack familiarity with stocks and mutual funds, and might feel more secure holding their wealth in bank deposits and in the house they live in. According to a measure of financial literacy reported in the IMD World Competitiveness Yearbook, Greece lies below the EZ average, but above France, Spain, Italy, and Portugal (Jappelli 2010).

Factors other than weak investor protection and lack of financial literacy might also be at play. For example, the structure of Greece's pay-as-you-go pensions system (analyzed in depth in Chapter XX on pensions in this volume) may have been an important driver of households' limited investment in voluntary pensions. Greece's pensions system provides no incentives for households to save in private pensions, and in fact until 2014 there were tax disincentives: voluntary pension contributions could only be made from after-tax income and taxes were also collected when the pension was paid. By contrast, in several other countries, including the US, contributions are made from pre-tax income and taxes are collected only when the pension is paid: hence taxes are deferred rather than being levied twice as in Greece. As another example, the preference of Greek households for real estate might be the result of them having lived through decades of high and variable inflation prior to Euro entry: real estate protects again unexpected inflation, unlike bank deposits and nominal bonds.

The factors considered so far are all demand-side: they influence households' demand for financial products. Supply-side factors, affecting the supply of financial products might also have been important. One such factor is the limited entry by foreign financial institutions. The literature on financial development has shown that entry by foreign banks tends to increase the efficiency of the domestic banking sector (e.g., Clarke et al. 2002, Levine 2002), and this can promote financial innovation and better financial products.[5] Because of its weak institutional environment, Greece suffers from low foreign direct investment, and the financial sector is no exception. As Honohan (1999) points out, the liberalization of the Greek banking sector which started in the late 1980s spurred entry by new players, but these were mainly domestic private banks, with foreign presence remaining small.

[5] The greater development of the investment-fund sector in Turkey relative to Greece despite its lower level of GDP (Section 2.1), might be due precisely to the larger presence of foreign financial institutions, either directly or through alliances.

Presence by foreign banks increased somewhat post Euro entry, although the share of banking-system assets owned by foreign banks is well below the EU average.[6]

2.3. Firms

We next report evidence on the capital structures of Greek firms, and compare with France, Germany, Italy, Spain, and the UK. This evidence is consistent with the household evidence presented in Section 2.2. We elaborate on their relationship and the broader economic implications at the end of this section.

Our data on firms come from the Amadeus database. Amadeus reports data on individual firms, which we aggregate at the country level. We consider only five comparison countries to keep the data exercise manageable. We also consider only publicly-listed firms because data on these firms are more complete, and exclude financial firms and utilities because their capital structures differ systematically from those of other firms. As of 2012, the sample of all firms in Amadeus that meet our criteria includes 317 firms from France, 306 from Germany, 146 from Greece, 148 from Italy, 87 from Spain, and 781 from the UK.

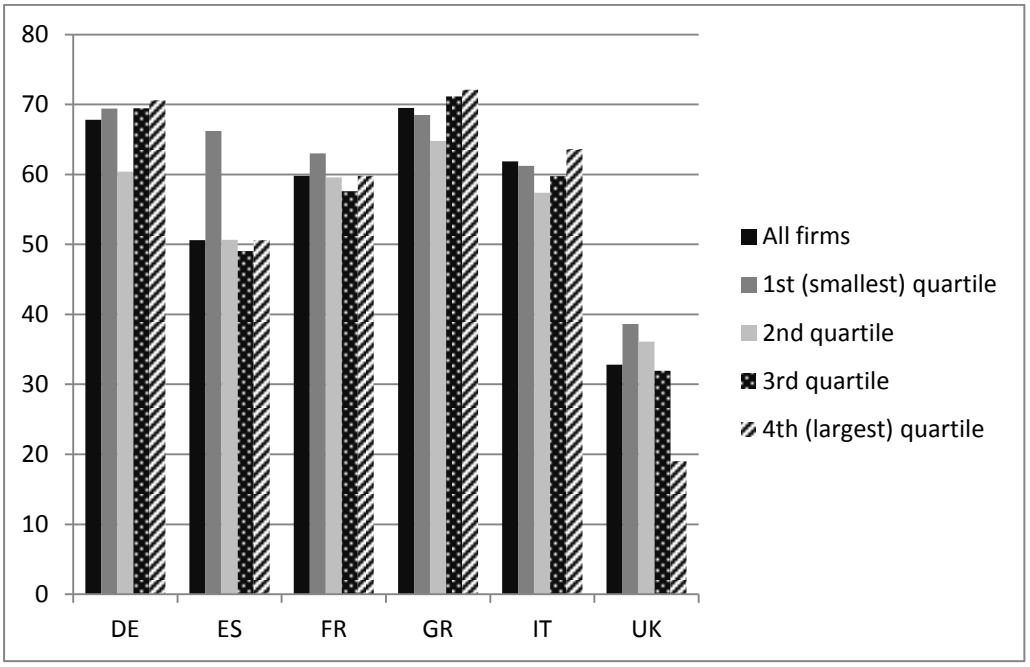

Figure 5: Percent of firms' equity held by the three largest shareholders. The data come from the Amadeus database and are as of 2012. The sample includes the publicly listed firms in each country and excludes financials and utilities. The values reported are medians.

Figure 5 plots the percent of firms' equity held by the three largest shareholders as of 2012. When this measure is high, most of the equity is held by a few entities (individuals or other firms), and small shareholders are less important.

[6] According to the ECB, the share of banking-system assets held by foreign banks in 2007 was 21.8% in Greece and the EU average was 46.2%. In 2013, these numbers became 1% and 41%, respectively. We return to foreign ownership and its dramatic decline during the crisis in Section 3.4.

Greek firms are dominated by large shareholders to a greater extent than in all comparison countries. The largest three shareholders hold 69.5% of the equity of the median Greek firm. Germany comes second with 67.8%, followed by Italy with 61.9%, France with 59.8%, Spain with 50.6%, and the UK with 32.8%. The difference between Greece and the other countries is not driven by the smaller average size of Greek firms. This can be seen by sorting the full universe of firms into four groups (quartiles) according to the size of their assets, identifying the subgroup of firms within each group that belong to each country, and computing values for the median firm in each subgroup. Greece comes at the top of every size quartile except for the quartile of the smallest firms. Thus, the smaller average size of Greek firms is not driving the ranking. The evidence is instead consistent with wealthy individuals holding controlling blocks of shares in large firms.

Figure 6 plots firms' leverage during the period 2004-2012. Leverage is computed in book value terms, by dividing the book value of debt by the book value of assets, and is expressed as a percent.

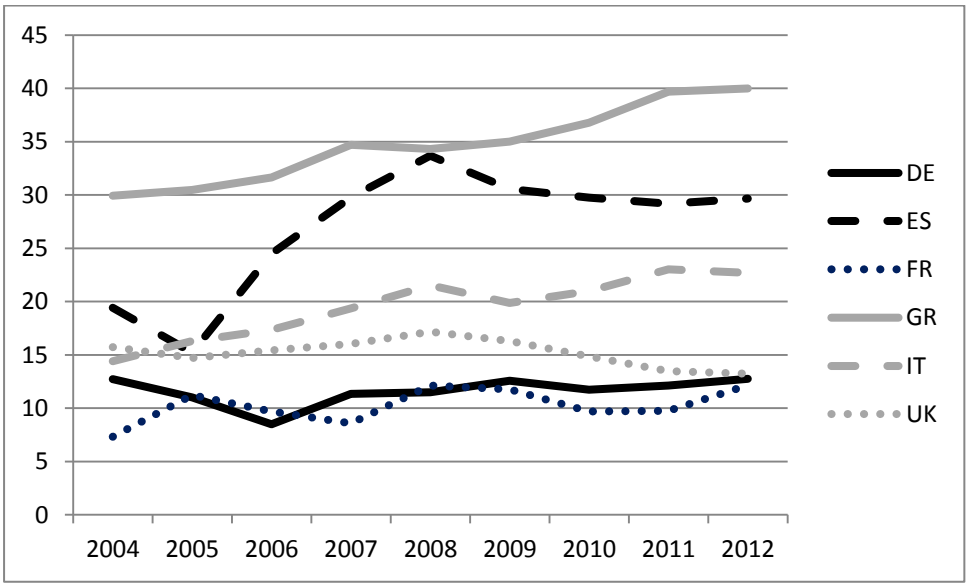

Figure 6: Firms' book leverage. The data come from the Amadeus database and cover the period 2004-2012. The sample includes the publicly listed firms in each country and it excludes financials and utilities. Leverage is computed by dividing the book value of debt by the book value of assets, and is expressed as a percent. The values reported are medians.

Greek firms use more debt in their capital structure than in all comparison countries. For example, debt accounted for 34.3% of the assets of the median Greek firm in 2008. Spain came second with 33.7%, followed by Italy with 21.5%, the UK with 17.2%, France with 12.1%, and Germany with 11.5%. Greece comes first and with a wider margin in all other years as well, both pre-crisis and during the crisis. It also comes first when breaking the data into size quartiles, with the exception of the quartile of the smallest firms where Spain comes first in some years.

The evidence on the capital structures of Greek firms is consistent with the household evidence presented in Section 2.2. To elaborate on their relationship and the broader economic implications, we return to two key explanations for the household evidence: weak investor protection and lack of financial literacy. For concreteness, we revisit both explanations in the context of a stylized example of a firm that wants to raise funds for an investment project that costs 1.2m and will return a cashflow of 1m or 2m with equal probabilities. To keep things simple, we assume that investors are risk-neutral. Therefore, if the firm could credibly promise to investors the entire cashflow from the project, it could raise 50%*1m+50%*2m=1.5m, and would have enough funds to undertake the project.

Suppose next that because of weak investor protection, the firm's managers can divert all the cashflow above 1m (i.e., 1m if the cashflow is 2m, and zero otherwise). Then, only 1m can be promised to investors. Hence, the firm can only raise 1m from them, and cannot undertake the project.

One way for the firm to raise enough funds and undertake the project is to find one or more large shareholders, who could monitor the firm's managers and reduce the cashflow that they can divert. Large shareholders could have better incentives to monitor than small shareholders because of their larger stake in the firm. Suppose, for example, that in the presence of large shareholders managers are able to divert only 0.5m instead of 1m. Then, the firm could raise 50%*1m+50%*1.5m=1.25m, and would have enough funds to undertake the project. Alternatively, the firm could go to a bank, which could also exercise monitoring, and issue debt with face value 1.5m.

Our stylized example illustrates the consequences of weak investor protection: reduced participation by small shareholders, increased participation by large shareholders, and higher leverage. These fit exactly the evidence that we report for Greece.[7] Note that weak investor protection also results in a higher cost of equity capital, and possibly lower investment.

The consequences of lack of financial literacy are broadly similar to those of weak investor protection. Suppose, in the context of our stylized example, that investors are uncertain about the return of securities issued by the firm and assume the worst-case scenario, i.e., 1m cashflow. Thus, in the presence of such investors, the firm could only raise 1m and could not undertake the project. The firm might seek instead financing from more sophisticated investors or from banks. If sophisticated investors

[7] La Porta, Lopez de Silanes, Shleifer, and Vishny (2000) find a link between weak investor protection and the prevalence of large shareholders in a large cross-section of countries. The implications from our simple example and the evidence that we report in Figure 5 are consistent with their results.

are also large, then lack of financial literacy (in the form assumed in this example) would generate the type of evidence that we report for Greece.[8]

Weak investor protection and lack of financial literacy imply not only a higher cost of equity capital, but also financial fragility. This is because of the higher leverage. Figure 6 shows that Greek firms entered the crisis with more debt than their counterparts in the comparison countries, and hence were less able to withstand declines in their earnings and asset values. Moreover, leverage during the crisis increased for Greek firms, to 40% in 2012, while it remained roughly constant for the firms in the other countries. Hence, the crisis generated more indebtedness and possible financial distress. Figure 16 in Section 4 further illustrates this point by showing that the interest coverage ratio, defined as the ratio of earnings to interest payments on debt, decreased dramatically during the crisis for Greek firms, to levels much smaller than in the comparison countries. The higher leverage of Greek firms was of course not the only factor contributing to financial distress during the crisis. Yet, a lower cost of equity capital and higher use of equity financing could have softened the effects of the crisis on Greek firms.

3. The Credit Boom and Crunch

Greece experienced a large credit boom, which started shortly before Euro entry and after a period of financial liberalization, and which ended in 2008. The boom was followed by a severe credit crunch. In this section we present evidence on this credit cycle, and compare with other EZ countries. We focus mainly on the banking system but consider also the corporate sector. Some of the characteristics of the credit cycle are linked to the long-run features of the Greek financial system described in Section 2. Our discussion of leverage at the end of that section suggests such a link.

3.1 Financial Liberalization and the Credit Boom

Greece embarked in a significant program of financial liberalization starting in the late 1980s. Until that time, the state and the central bank (BoG) had significant influence over the setting of interest rates and the allocation of credit in the economy. Moreover, state-controlled banks accounted for the vast majority of loans and deposits. State control of the banking system resulted in a significant misallocation of credit. This misallocation was evidenced by the large fraction of

[8] Weak investor protection and lack of financial literacy yield different predictions concerning the expected return of investing in the firm's stock. Lack of financial literacy (in the form assumed in our example) implies that the expected return is "abnormally" high because investors price the firm's shares assuming the worst-case scenario: investors are willing to pay 1m for a project from which they will earn expected cashflow 1.5m. Weak investor protection implies instead that the expected return is fair because investors rationally expect the firms' managers to divert the cashflow: investors are willing to pay 1m for a project from which they will earn expected cashflow 1m.

non-performing loans held by the state-controlled banks: many of these loans had been effectively directed by the government towards state-controlled or other politically connected firms. The costs of state control of the banking system have been documented by a sizeable academic literature.[9] Honohan (1999) provides an account more specific to Greece, and compares its financial liberalization experience to that of Portugal.

Financial liberalization aimed at creating a more market-driven system, and followed similar steps to those undertaken earlier by other European Union (EU) countries. Restrictions on lending rates and deposit rates were removed during the period 1987-1993. Exchange controls were lifted in 1994. The independence of the BoG from the state was strengthened in 1997. Some state-controlled banks were privatized during the 1990s and the privately-controlled banking sector grew, partly because of entry by new players. State-controlled banks accounted for about 60% of deposits in 1998, down from 79% in 1993 and 88% in 1985. The new private banks were mostly Greek-owned, and foreign presence remained small. More foreign entry and reduction of state ownership occurred in the years following the adoption of the Euro and before the crisis.

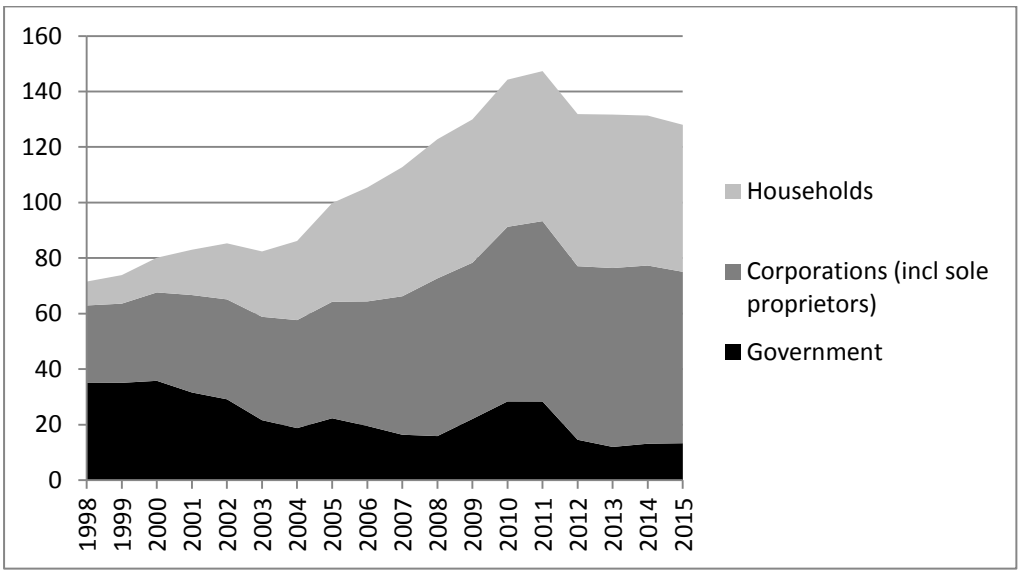

Figure 7: Bank loans as percent of GDP in Greece, by category. The data come from the Bank of Greece (BoG), are monthly and sampled in December, and cover the period 1998-2015.

[9] For example, La Porta, Lopez-de-Silanes, and Shleifer (LLS 2002) show that in countries where state ownership of banks is more extensive, lending decisions are worse, and productivity and GDP grow more slowly. Bertrand, Schoar, and Thesmar (2007) study the deregulation of the French banking system in 1980s, which eliminated state intervention in bank lending decisions. They find that deregulation raised the cost of capital for poorly performing firms, causing these firms to restructure or to exit their industries. At the same time, more capital was made available for new entrants, and this boosted entry and competition. Overall, deregulation made the allocation of capital more efficient and boosted productivity, consistent with the cross-country findings of LLS. For additional evidence on the costs of state control of banks, see Barth, Caprio and Levine (2004) and Khwaja and Mian (2005).

During the period 1998-2008, Greece experienced rapid economic growth. Its GDP grew faster than all countries in Figure 1 except from Cyprus, Ireland, Luxembourg, and Spain. The economic boom was accompanied, and to an extent caused, by a credit boom.[10] Figure 7 plots the loans of Greek banks to Greek households, corporations (excluding banks), and the government, as a fraction of GDP, from 1998 onwards.

Total credit increased from 71.6% of GDP in 1998 to 122.8% in 2008. The rate of increase was particularly rapid after 2004---total credit in that year was 86.2% of GDP.

As Figure 7 shows, the increase in total credit between 1998-2008 resulted from two opposite trends. First, loans to the government decreased, as the adoption of the Euro made it easier for the Greek government to borrow abroad. This effect, however, was more than compensated by an increase in loans to the private sector. The increase in private-sector loans was especially pronounced for loans to households, i.e., consumer loans and housing loans.

Figure 8 compares the credit boom for Greece to that in Ireland, Italy, Portugal, and Spain. We refer to these countries collectively as GIIPS.

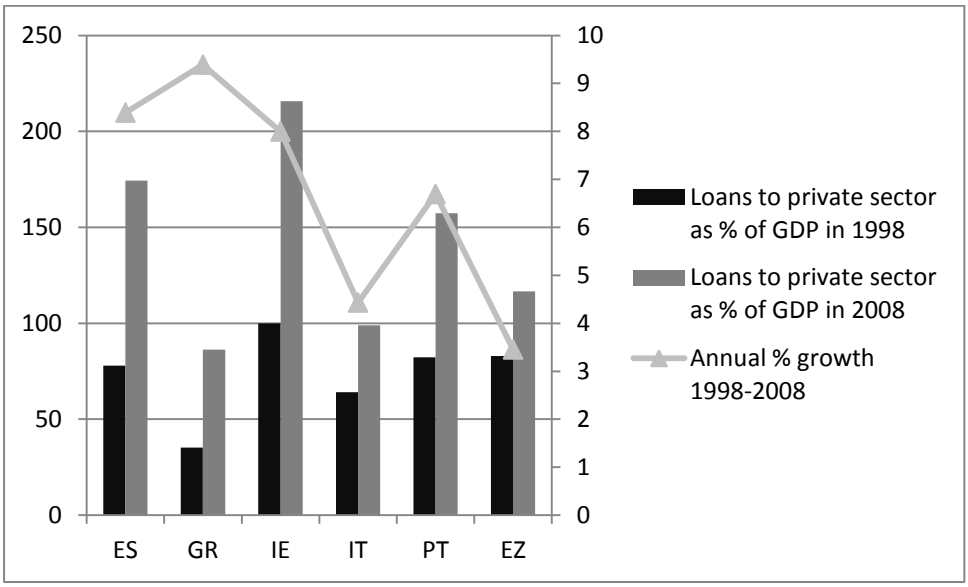

Figure 8: The credit boom in Greece, Ireland, Italy, Portugal, and Spain. The data come from the ECB, are monthly, and are sampled in December. The units for private-sector loans as percent of GDP are in the left-hand side y-axis, and the units for percentage growth are in the right-hand side y-axis. The EZ average is computed by dividing EZ loans by EZ GDP.

[10] The IMF 2007 Country Report 07/27 on Greece (page 9) quantifies the impact of three demand stimuli on Greece's economic growth between 1995-2005: private credit, government spending, and EU transfers. According to the report, private credit became the dominant stimulus from 2001 onwards.

Private-sector loans as percent of GDP were lower in Greece than in all other GIIPS countries, both in 1998 and in 2008. The gap became smaller, however, towards the end of the credit boom. In 1998, Greece stood at 43.4% of the EZ average and at 42.4% of the average among the other GIIPS countries. In 2008, the corresponding figures were 74% and 53.4%. Greece's catching up can be seen more starkly by computing the growth of private-sector credit between 1998 and 2008. Growth was higher in Greece than in all other GIIPS countries.

The growth in private credit was, to an extent, a natural consequence of the financial reforms that took place in the 1990s. For example, consumer credit was limited in the 1990s, but grew rapidly as quantity restrictions were gradually lifted. Lifting these restrictions allowed the market for household credit in Greece to develop and reach a size closer to EZ levels.

Figure 9 corroborates the convergence of household credit in Greece to EZ levels. It plots two measures of household indebtedness, reported in the Household Finances and Consumption Survey (HFCS): debt-service-to-income ratio, and loan-to-value ratio for the households' main residence. The two measures are 14.7% and 32.4%, respectively, for Greece, and their averages across all comparison countries are 15.2% and 34.7%. The indebtedness of Greek households was thus not out of line with that of their EZ counterparts.

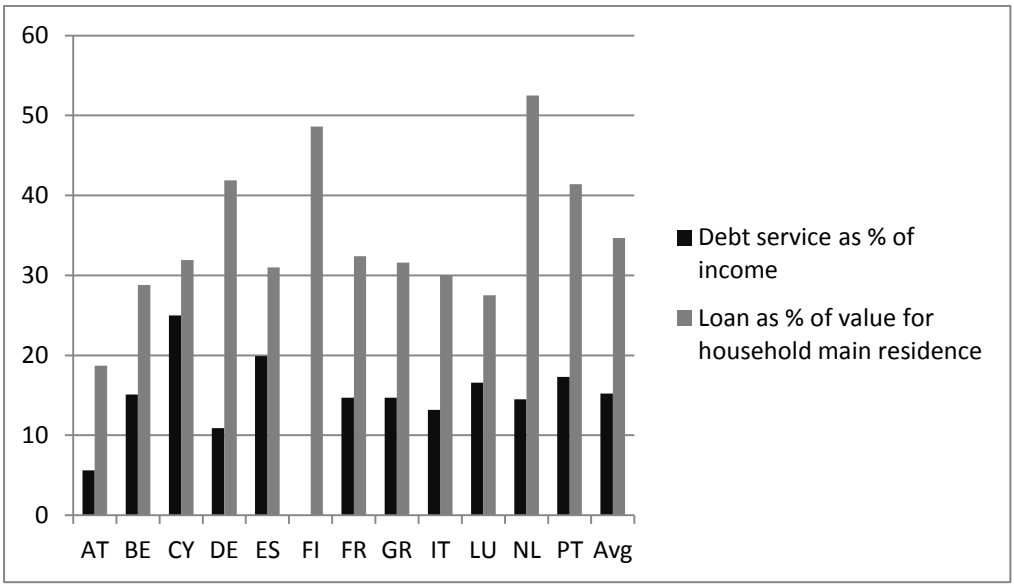

Figure 9: Household indebtedness. The data come from the HFCS, undertaken under the auspices of the ECB during 2009-2011. The debt-service-to-income ratio is missing for Finland. The average is a simple average across the countries in the figure.

The credit boom turned into a crunch starting in late 2008. As in other EZ countries, the crunch involved a bank-sovereign loop. Solvency problems of the Greek state spilled over to Greek banks by reducing the value of (i) the banks' portfolio of Greek government bonds and (ii) the guarantees that the state had provided for bank loans

and deposits. Conversely, solvency problems of Greek banks spilled over to the Greek state because (i) the state had to recapitalize the banks and provide them with guarantees, and (ii) a drop in bank lending caused a slowdown in the economy and hence a decline in the state's tax revenues.

An analysis of the credit crunch should examine how the bank-sovereign loop manifested itself in Greece. Was the loop mainly a spill over from the state to the banks, i.e., did the problems that Greek banks encountered originate solely from the state? Or did some of the problems originate from within the banks and spill over to the state?

Complete answers to the above questions require data and analysis that are beyond the scope of this chapter. Yet, we provide some suggestive pieces of evidence. We organize our analysis by dividing the crisis period into two phases: the global financial crisis (August 2007 to September 2009) and the EZ sovereign crisis (October 2009 onwards). We identify the beginning of the EZ sovereign crisis with October 2009 because of the Greek elections and the subsequent announcement by the new government that the deficit was much larger than the previous estimate.[11] Dividing the crisis into the two phases allows us to separate the spill-over effects of the bank-sovereign loop, since spill-overs from the state to the banks mainly occurred during the second phase.

3.2. First Phase of the Credit Crunch: From Lehman to the Sovereign Crisis

The global financial crisis started in August 2007, when BNP Paribas suspended withdrawals from three of its hedge funds exposed to US subprime loans. The crisis reached its peak in October 2008, with the bankruptcy of Lehman Brothers. In Figure 10 we compare how the crisis affected Greek banks and their counterparts in other countries. We plot the value of a stock-market index composed from banks around the world and an index composed by Greek banks. We normalize both indices to 100 in January 2004, and plot their values during the subsequent period.

Between the beginning of August 2007 and the end of September 2009, the Greek index dropped by 46.9%, while the global index dropped by 45.8%. Therefore, the global financial crisis had almost the same impact on Greek banks as on the average bank around the world. At the same time, Greek banks were more sensitive than the average bank to intermediate ups and downs during the crisis: they experienced a larger drop from August 2007 until the Lehman bankruptcy, and a larger rise from that event until September 2009. As we show later in this section, this excess

[11] The Greek elections took place on October 4th. On October 19th, the Greek Finance Minister announced at the Eurogroup that the deficit was expected to be 12.5%, up from the original estimate of 6%.

sensitivity was reflected in the behaviour of deposit rates and lending in the real economy.[12]

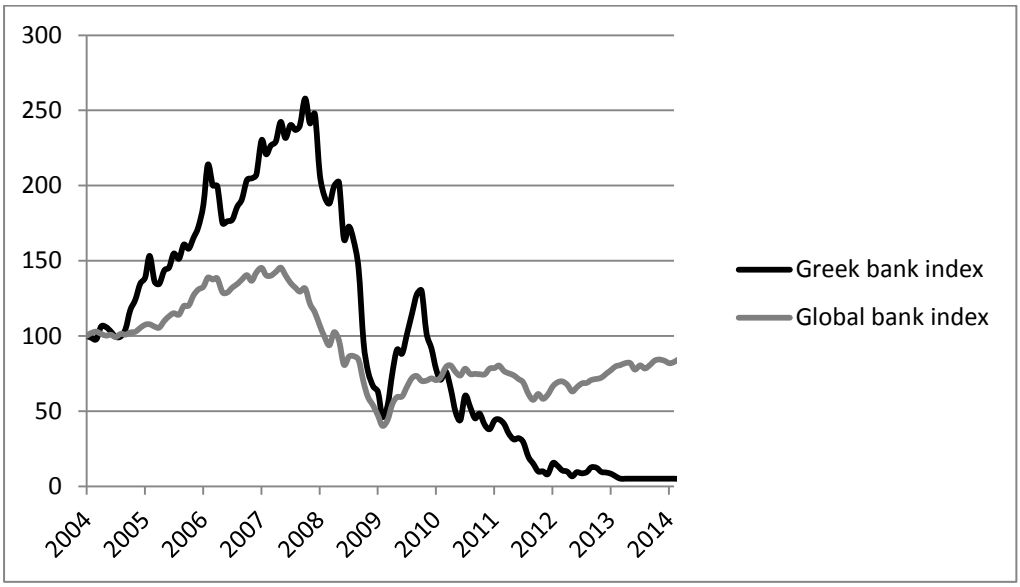

Figure 10: Performance of Greek bank index and a global bank index. The global bank index is FTSE All-World Banks F3AWB3E, and the Greek bank index is FTSE Greece Banks F3GRB3L(PI). The data come from Datastream.

The excess sensitivity of Greek banks to movements in the global bank index suggests that they were exposed to more risks and hence were more vulnerable to a global economic slowdown than the average bank. Moreover, this effect is shown on data before the sovereign crisis started, and hence it does not represent a spill-over from the state to the banks. Greek banks could have reduced their risks by employing less leverage, and in that sense their leverage may have been too high

[12] Note that the excess sensitivity of Greek banks appears even prior to the crisis: Greek banks experienced a larger rise than the average bank from January 2004 until August 2007. To compare the sensitivity of Greek banks to that of banks in other countries, we use "beta", which is a standard measure of sensitivity employed in Finance research. The beta of an asset Y on an asset X is the coefficient of a linear regression of the returns on Y on the returns on X. The beta of the Greek bank index on the global bank index during the period 01/2004-09/2009 and using monthly returns is 1.44. This means that a 1% movement in the global index was accompanied on average by a 1.44% movement in the Greek index. Among the eleven countries in Figure 1 for which we have been able to find FTSE bank indices (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Portugal, Spain, UK, US), Greece has the fourth highest beta, after Ireland (2.59), Belgium (1.64), and Austria (1.62), and is followed by Germany (1.34), France (1.21), the UK (1.19), the US (1.16), Italy (1.08), Spain (1.02), and Portugal (0.83). When computing return volatility during the period 01/2004-09/2009 and using monthly returns, Greece ranks fifth with a monthly volatility of 37%, after Ireland (78%), Austria (46%), Belgium (46%), and Germany (39%), and is followed by the US (31%), France (30%), Portugal (29%), the UK (29%), Italy (28%), and Spain (27%). The EZ bank index has beta 1.18 and volatility 23%. The figures for Spain are likely to underestimate riskiness because the cajas were not listed in the stock market and hence were not included in the Spanish bank index.

relative to their risks. This is consistent with the high leverage of Greek firms (computed by excluding financial firms), shown in Figure 5.[13]

We next examine the channels through which the global financial crisis may have affected Greek banks. The crisis could have had an effect through a solvency channel or a liquidity channel. The solvency channel is that banks incurred losses on assets whose value was reduced during the crisis, such as US subprime bonds. The liquidity channel is that even banks that did not incur losses had difficulty financing themselves in the interbank market, which was impaired by the crisis. The two channels are related: liquidity problems can turn into solvency problems, as lack of financing can reduce asset values.

Distinguishing between the two channels is difficult without detailed data on the banks' asset holdings. Yet, a suggestive piece of evidence is that from August 2007 to December 2007, the Greek bank index rose (by 3%), while most other national indices dropped. (The global bank index dropped by 14.6%.) During that stage of the crisis, the concern was primarily about US subprime exposure. Hence, the rise of the Greek index suggests that Greek banks were not holding US subprime products, consistent with anecdotal evidence. The global financial crisis may have affected Greek banks primarily through the liquidity channel, i.e., a difficulty in rolling over interbank loans. Figure 11 plots the liability structure of the aggregate of Greek banks during 2000-2015.

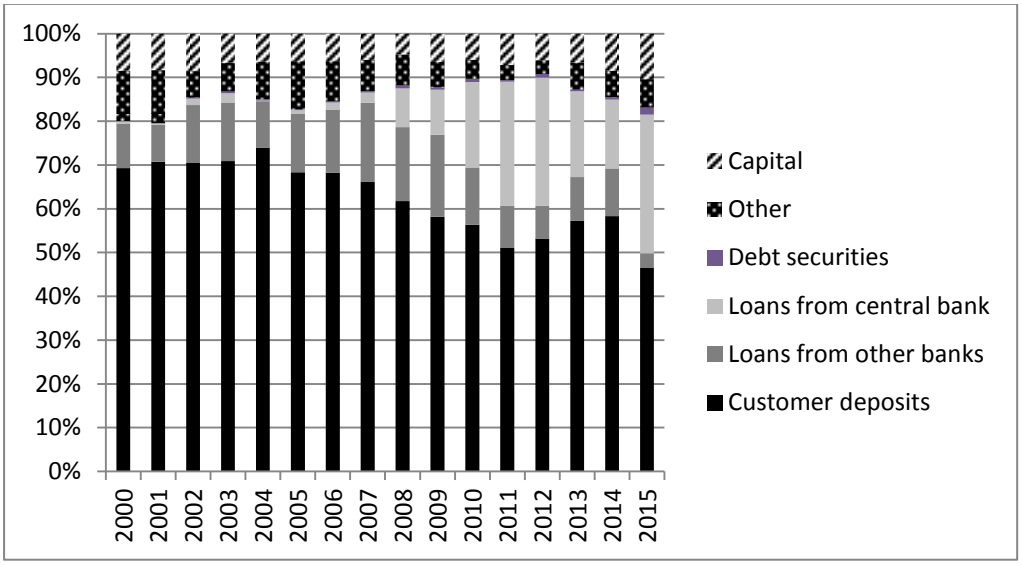

Figure 11: Liability structure of Greek financial institutions. The data come from the BoG, are monthly and sampled in December, and cover the period 1998-2015.

[13] Bank leverage is typically measured and regulated based on accounting information. We basing our analysis instead on stock market returns. Haldane (2011) argues in favour of the latter approach.

Greek banks had become increasingly dependent on interbank loans in the later stage of the credit boom: interbank loans were 11.9% of total liabilities on average during 2000-2006, and 17.5% during 2007-2008.

That Greek banks might have experienced significant funding difficulties in the interbank market is consistent with the behaviour of the rates that they were offering to attract customer deposits. With funding in the interbank market becoming scarcer, one would expect that banks would compete more aggressively for customer deposits---and this is exactly what happened. Figure 12 plots the deposit rate in the GIIPS countries and Cyprus from January 2007 onwards. We express these rates net of the average deposit rate across the EZ.

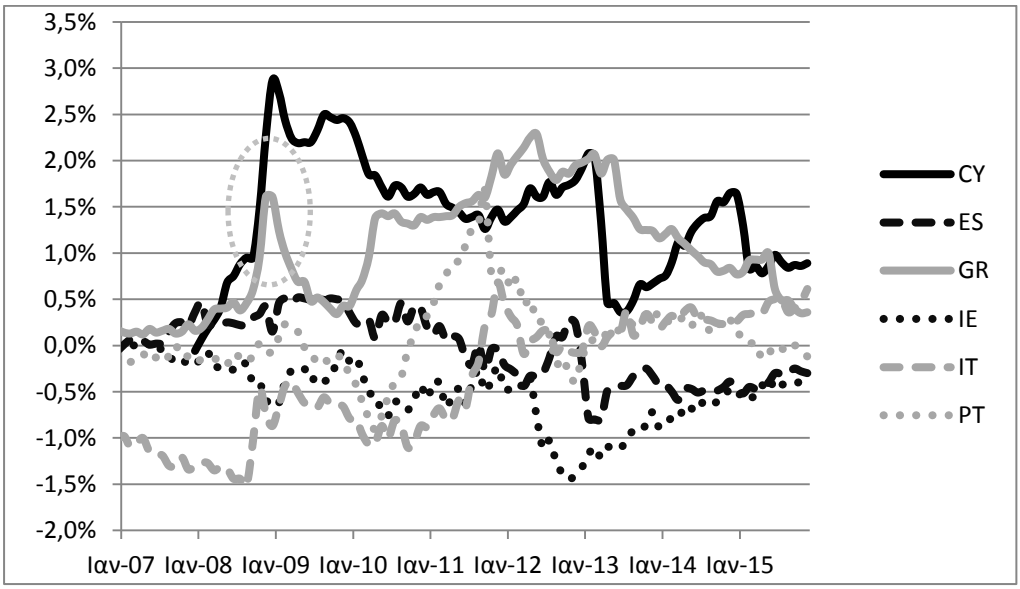

Figure 12: Deposit rates in the GIIPS countries and Cyprus relative to the EZ average. The data come from the ECB. We use the series "deposits up to one year new business", except for Ireland where that series is not available and we use instead "deposits of all maturities". The EZ average is the ECB-reported series.

In the period around the Lehman bankruptcy, the deposit rate in Greece increased sharply relative to the EZ average. The peak is the circled area in Figure 12. This sharp movement suggests that Greek banks experienced funding difficulties as the global financial crisis deepened, and more so than banks in other EZ countries. The only other countries that experienced a sharp increase in the deposit rate were Cyprus and Italy.

The funding difficulties of Greek banks appear to have spilled over to the real economy as early as the first half of 2009. This can be seen in the "Access to Finance" Flash Eurobarometer survey, conducted by the European Commission and the ECB. This survey concerns small and medium firms. In the 2009 edition of the survey, which was carried out in June-July 2009, 39% of Greek firms replied that their most pressing problem was access to finance (page 28). This was by far the highest

percentage in the EU; the second highest was 23% for Spain. By contrast, in the earlier edition of the survey, which was published in 2005, the percentage of Greek firms reporting that access to loans was easy or very easy was the fourth highest in the EZ (page 37). Thus, the credit cycle in Greece appears to have started going in reverse in early- to mid-2009, before the sovereign crisis started.

An economic slowdown caused by a drop in bank lending is one of the bank-to-state spill-over channels of the bank-sovereign loop. A second such channel is that the state incurs a cost to recapitalize banks and provide them with guarantees. That channel was also at play in Greece, but to a lesser extent than in many other countries. The Greek government passed a law in December 2008 that provided three types of support to the banks: (i) banks were offered the right to sell preferred shares to the state in exchange for acquiring government bonds, (ii) banks were offered state guarantees on their interbank loans, and (iii) banks were offered government bonds that they could use as collateral for interbank loans. These measures amounted for 5 billion (bn) Euros, 15bn Euros, and 8bn Euros, respectively, and hence for a total of 28bn Euros. Figure 13 plots state support to the banking sector as % of GDP for Greece as well as other EZ countries and the UK. Approved state support to Greek banks in 2008 was 12% of GDP. This ratio is relatively low when compared to an average of 36.1% across all comparison countries. (The latter average drops to 21.2% when Ireland is excluded as an outlier).

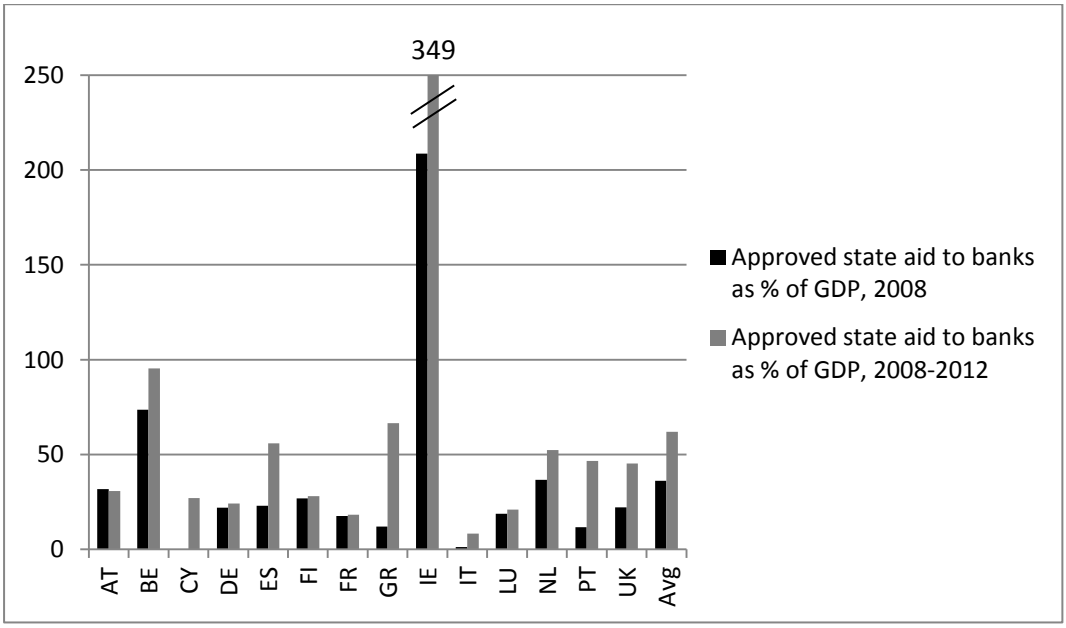

Figure 13: State aid to banks as percent of GDP. The data come from the European Commission. The average is a simple average across the countries in the figure.

The main conclusions from our analysis of the first phase of the credit crunch are (i) the global financial crisis had a significant impact on Greek banks, mainly through an

impaired access to funding, and (ii) the funding problems of Greek banks spilled over into the real economy and helped set the credit cycle into reverse.

3.3. Second Phase of the Credit Crunch: The Sovereign Crisis

The sovereign crisis hit Greek banks harder than their counterparts in most other EZ countries. This section focuses on the period that led to the first---and largest---recapitalization of Greek banks. That recapitalization was completed in June 2013. Section 3.4 describes and evaluates the first recapitalization as well as a second recapitalization that took place in April and May 2014. Section 3.5 focuses on the period following the SYRIZA-ANEL election in January 2015. During that period, a bank run took place, followed by the imposition of capital controls and a third recapitalization.

Between the beginning of October 2009 and the end of February 2013, the Greek bank index lost 94.9% of its value, while the EZ index lost 44.4%. The largest drops occurred for Cyprus (95%), Greece, and Ireland (94.2%), followed by Portugal (77.7%) and Italy (62%).[14]

The sovereign crisis affected Greek banks mainly through the solvency channel: the default (PSI) by the Greek state reduced dramatically the value of Greek government bonds held by the banks. Solvency problems generated liquidity problems: banks faced difficulties financing themselves in the market for retail deposits, as the guarantee by the government lost its value, and in the interbank market. These solvency and liquidity problems reflect state-to-bank spill-over channels of the bank-sovereign loop.

Figure 11 illustrates the liquidity problems of Greek banks. Interbank loans dropped from 18.7% of total liabilities in 2010 to 7.5% in 2012, and customer deposits dropped from 58.1% to 53.2%. The resulting funding needs were covered by loans from the ECB. These loans were administered either directly from the ECB, with a low interest rate and stringent collateral requirements, or indirectly via the BoG as emergency liquidity assistance (ELA), with a significantly higher interest rate and less stringent collateral requirements that included state guarantees. Central-bank loans increased from 10.3% of total liabilities in 2007 to 29.3% in 2012. These trends reversed somewhat in 2013 and 2014, but became even more pronounced in 2015.

The liquidity problems of Greek banks were reflected in the rates that the banks have been offering to attract customer deposits. As Figure 12 shows, deposit rates in Greece increased significantly since early 2010, and were 150-200 basis points (i.e., 1.5-2%) higher than the EZ average during 2011-2012.

[14] The Cyprus index (CYPBANK(PI)) is a non-FTSE index. All other indices are FTSE.

The solvency problems that Greek banks experienced during the sovereign crisis can be summarized in the following table, which was used by the BoG to determine the banks' capital needs. For now we focus on the aggregate numbers, which are in the last row, and turn to the numbers for individual banks later in this section.

The aggregate core tier 1 (CT1) capital in the Greek banking sector was 22.1bn Euros as of December 2011. Greek banks experienced total losses of 37.7bn in their holdings of Greek government bonds and other loans to the Greek state. To meet these losses, they had set aside provisions of 5.8bn. Thus, the banks' net-of-provision losses from Greece's sovereign default were 31.9bn. These losses wiped out completely the capital of the banks, and made it negative. In addition, there were projected losses on private-sector loans, due to the recession in Greece. These losses were 22.1bn, net of provisions (losses were 46.8bn and provisions were 24.7bn).

	CT1 capital, 12/2011	PSI loss	Provisions for PSI, 06/2011	Credit loss projections	Loan loss reserves, 06/2011	Capital generation	Target CT1 capital, 12/2014	Capital needs
NBG	7.29	-11.74	1.65	-8.37	5.39	4.68	8.66	9.76
Eurobank	3.52	-5.78	0.83	-8.23	3.51	2.90	2.60	5.84
Alpha	4.53	-4.79	0.67	-8.49	3.12	2.43	2.03	4.57
Piraeus	2.62	-5.91	1.01	-6.28	2.57	1.08	2.41	7.34
Emporiki	1.46	-0.59	0.07	-6.35	3.97	0.11	1.15	2.48
ATEbank	0.38	-4.33	0.84	-3.38	2.34	0.47	1.23	4.92
Postbank	0.56	-3.44	0.57	-1.48	1.28	-0.32	0.90	3.74
Millennium	0.47	-0.14	0.00	-0.64	0.21	-0.08	0.23	0.40
Geniki	0.37	-0.29	0.07	-1.55	1.31	-0.04	0.15	0.28
Attica	0.37	-0.14	0.05	-0.71	0.27	0.02	0.25	0.40
Probank	0.28	-0.30	0.06	-0.46	0.17	0.15	0.18	0.28
New Proton	0.06	-0.22	0.05	-0.48	0.37	0.03	0.12	0.31
FBB	0.15	-0.05	0.00	-0.29	0.17	-0.03	0.12	0.17
Panellinia	0.08	-0.03	0.00	-0.12	0.05	-0.03	0.04	0.08
Total	22.12	-37.73	5.86	-46.83	24.73	11.38	20.06	40.54

Table 1: Calculation of the capital needs of Greek banks. The data are from Chart I.1 from the Report on the Recapitalization and Restructuring of the Greek Banking Sector, published by the BoG in December 2012. For each row, the quantities in the first seven columns add up to the capital needs in the last column. The following quantities are reported in the first seven columns: (1) core tier 1 capital as of December 2011, (2) losses on Greek government bonds and other loans to the Greek state during the PSI, (3) provisions that banks had set aside to meet these losses, (4) projected losses in private-sector loans, (5) provisions that banks had set aside to meet these losses, (6) projected addition to capital due to earnings during the period 2012-2014, (7) target core tier one capital as of December 2014.

Table 1 makes it clear that Greece's sovereign default bankrupted its banking system. Default generated direct net-of-provision losses of 31.9bn on the banks' government-bond-and-loan portfolio, which exceeded the banks' capital of 22.1bn. It also accounted indirectly for some of the projected losses of 22.1bn on the banks' private-sector-loan portfolio because it amplified the recession in Greece.

Greek banks could, in principle, have avoided default by holding fewer Greek government bonds. Figure 14 compares the exposure of Greek banks to Greek government bonds to the exposure of banks in other Eurozone countries in their own domestic government bonds. These exposures are calculated as of December 2010, based on the stress tests that the European Banking Authority (EBA) conducted at that time and reported in July 2011.

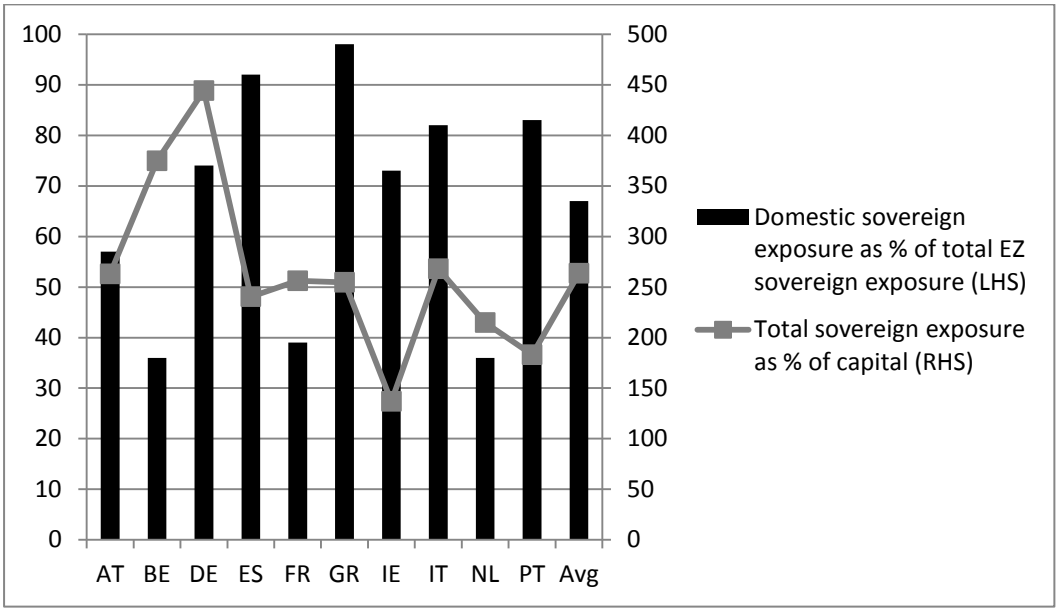

Figure 14: Holdings of government bonds by domestic banks. The data are from the 2010 EBA stress tests, as reported in Chart 5 and Table 1 in Merler and Pisani-Ferry (2012). The units for domestic sovereign exposure as percent of total EZ sovereign exposure are in the left-hand side y-axis, and the units for total sovereign exposure as percent of capital are in the right-hand side y-axis. The average is a simple average across the countries in the figure.

As of 2010, Greek banks held 98% of their EZ government-bond portfolio in Greek government bonds. This percentage was higher than in all comparison countries, and hence the government-bond portfolio of Greek banks was the most "home-biased". Whether this implies a large exposure to domestic bonds depends also on the size of the government-bond portfolio as a fraction of capital. This was 255% in Greece as of 2010, close to an average of 264% across all comparison countries. Adjusting for the size of the government-bond portfolio, the exposure of Greek banks to domestic bonds was the second-highest in the figure, after Germany, with Spain and Italy coming next.

Why did Greek banks have a large exposure to Greek government bonds, an exposure which eventually made them bankrupt? And why did this exposure increase during 2009-2010, as Figure 7 indicates?[15]

[15] Figure7 shows a steep rise in Greek banks' loans to the Greek government as percentage of GDP between 2008 and 2010. Loans to the government include Greek government bonds.

One explanation for the large domestic exposure of Greek banks is that these were pressured by the government to buy its bonds. Moreover, this pressure became stronger during the crisis, when the government had greater difficulty financing itself. According to the government-pressure explanation, domestic exposure should be larger for state-controlled banks than for privately-controlled banks, since the government has larger influence on the former. Using Table II.1 in the Recapitalization Report of the Bank of Greece, we can confirm that this is indeed the case: holdings of Greek government bonds and other loans to the Greek state were 303% of capital for the aggregate of state-controlled banks (National Bank of Greece, ATE Bank, Postbank) and 171% for the aggregate of privately-controlled banks (Eurobank, Alpha Bank, Piraeus, Emporiki, Millenium, Geniki, Attica, Probank, Proton, FBB, Panellinia). Thus, government pressure might have made the Greek banking system---which was prone to funding crises, as shown in Section 3.2---even more crisis-prone and government-dependent.[16]

The losses on Greek government bonds and the projected losses on private-sector loans rendered the Greek banking system insolvent not only on aggregate but also at the level of each individual bank. Indeed, as shown in Table 1, the losses net of provisions for each bank (sum of columns 2 to 5) exceeded the bank's capital (column 1), even taking into account projected future profitability (column 6).

The main conclusions from our analysis in this section are (i) losses on Greek government bonds and loans due to Greece's sovereign default bankrupted the Greek banking system, (ii) Greek banks suffered from the default because they had a particularly large position on Greek government bonds, which may have been the result of government pressure.

3.4. First and Second Recapitalizations

Because Greek banks became insolvent during the sovereign crisis, public intervention was needed. Public intervention towards insolvent banks generally takes one of three forms:

- Liquidation: The bank is shut down immediately and its assets are eventually sold off. The proceeds are used, possibly together with public funds, to pay depositors and other debtholders.
- Resolution: The bank is typically split into two parts, a "good bank" and a "bad bank". The good bank includes the deposits and other debt obligations,

[16] Domestic exposure increased during 2009-2010 not only for Greece, but also for Ireland, Italy, Portugal, and Spain (Table 2 in Merler and Pisani-Ferry 2012). Battistini, Pagano, and Simonelli (2014) argue that an additional explanation to government pressure is that banks were hedging the risk of Euro exit: domestic bonds would be redenominated in the new domestic currency under Euro exit, but so would bank deposits. A more precise test of the government pressure versus the hedging explanation would require data on domestic bond holdings of individual banks before the crisis.

some of the assets, and public funds. Bank depositors thus continue being served. The good bank is sold off immediately to an existing bank, or exists temporarily as a "bridge" bank before being eventually sold off. The bad bank includes the remainder of the assets, typically the low-quality ones, i.e., the bad loans. These assets are eventually sold off and the proceeds go to the taxpayer.

- Recapitalization: The bank receives an injection of funds, possibly including public funds, and continues its operations.

In principle, each of liquidation, resolution, and recapitalization can be implemented with a haircut on depositors and other debtholders. In the case of Greek banks, a haircut was viewed as destabilizing and was ruled out (although it was implemented later on for Cypriot banks). Because depositors and other debtholders did not take any losses, and because their claims were larger than bank assets (since banks were insolvent), any of the three forms of intervention would have required use of public funds. Public funds came in the form of a 50bn loan from EZ countries.

Liquidation of Greek banks was ruled out, possibly because of its disruptive effects on depositors and other banks. (Reimbursement of deposits and settlement of claims to other banks can take a significant amount of time.) The two forms of public intervention that were employed were resolution and recapitalization. Before describing their actual implementation, we analyse two policies that were not implemented. Our analysis of these policies is stylized. Yet, it helps frame the issues and serves as background for some of the material in Section 4.

The first policy is an across-the board recapitalization: all banks would be recapitalized and sold off to new private owners. An estimate of the minimum required level of public funds can be computed based on the BoG data presented in Table 1. According to the BoG, a recapitalization of the Greek banking system had to bring it to a capital level of 20.1bn, so that regulatory requirements (Basel capital ratios) could be met. Moreover, this necessitated a capital injection of 40.5bn. Assuming that the banks were 100% privately owned post-recapitalization, the maximum amount that private investors would pay is 20bn, i.e., the value of the banks' new capital. The remainder, 40.5-20=20.5bn, which was required to plug the gap between bank deposits and other debt obligations on one hand, and bank assets on the other, could only come from public funds. Note that public funds were required even though the recapitalized banks would be 100% owned by private investors. Put differently, the state had to realize a loss of 20.5bn, while private investors would break even. The only alternative to a loss by the state was to impose a haircut on depositors and other debtholders.

The 20.5bn of required public funds is only an estimated minimum level because 20bn overestimates the funds that could be raised privately. Indeed, the value of

bank assets was highly uncertain, so private investors would require a discount from the 20bn, as compensation for bearing risk. One way that the state could reduce the risk borne by private investors, and hence extract a higher price from selling the banks to them, would be to offer a guarantee. For example, it could cap aggregate losses of investors to 10bn.

The second policy is an across-the-board resolution: all banks would be resolved, their bad loans would be transferred to a bad bank, and the good banks would be sold off to new private owners. Resolution has two advantages over recapitalization. First, by taking the bad loans out of the balance sheet of the good banks, uncertainty about the good banks' assets is reduced, and so is the discount required by private investors to buy the good banks. Second, the bad bank may have better incentives to maximize the value of the bad loans, and be better equipped to do so, for reasons explained in Section 4.

A drawback of resolution relative to recapitalization is that more public funds are required. This is because funds must be found to replace the bad loans in the good banks' balance sheet. If, for example, the value of the bad loans net of losses is 40bn, then 40bn would be needed, and that would be in addition to the 20.5bn required to make the good banks solvent. The state would, of course, earn a return on its 40bn when the bad loans would be gradually sold off. Alternatively, the state could minimize its contribution to the 40bn by selling 100% of the bad bank to private investors outright (and private investors would then gradually sell off the bad loans to others). As with recapitalization, however, a discount would be required because of the uncertainty surrounding the value of the bad loans. Moreover, the discount would be larger than under recapitalization because the scope for losses is larger: the investment at stake is equal to the value of the bad loans (40bn in our example), which exceeds bank capital (20bn).

That resolution requires more public funds than recapitalization can also be understood by observing that taking the bad loans out of the good banks' balance sheet makes these banks safer for depositors. This is a transfer to depositors, which must be covered by the taxpayer.

The higher cost of resolution over recapitalization was an important reason why resolution was not used in a wide scale in Greece, in contrast to Ireland and Spain.[17] The chosen policy was instead to recapitalize the large four banks and resolve most of the remaining ones. The large four banks were Alpha Bank, Eurobank, National Bank of Greece (NBG), and Piraeus Bank. The agreed procedure for recapitalizing

[17] See, for example, page 51 in the IMF 2013 Country Report No. 13/155 on Greece. An additional reason mentioned by the IMF in the same report is that loans of Greek banks were less homogeneous than those of their Irish and Spanish counterparts, many of which were on real estate. Lack of homogeneity implied fewer economies of scale in forming a bad bank to sell the loans.

them was that the state and private investors would buy shares in the recapitalized entities, but private investors would receive additionally warrants for each share that they bought. Warrants are rights to buy additional shares at a pre-specified "exercise" price. These rights are valuable because of the possibility that the share price increases above the exercise price. An additional feature of the recapitalization procedure was that if private investors could buy 10% or more of the shares in a bank, then they could exert full control, except for major decisions such as capital increases and mergers. The process had to be completed by June 2013.

The introduction of warrants allowed private investors to enter the recapitalization in better terms than the state. As argued earlier, a state subsidy to private investors was necessary because the banks were insolvent. To illustrate this point with a simple example, suppose that private investors contribute 1bn worth of shares in a recapitalization of a bank and receive a subsidy worth 0.5bn by the state, e.g., through warrants. Suppose also that the state contributes 9bn. The total capital raised is 10bn and private investors own 10% of the bank. If prior to the recapitalization the bank's deposits and other debt obligations exceeded assets by X bn, then the bank would be worth 10-X bn after the recapitalization, and the total gain of private investors would be 10%*(10-X)+0.5-1, i.e., their stake in the bank, plus the subsidy, minus the amount they invested. If X=5, i.e., the bank was under water by 5bn prior to the recapitalization, then private investors just break even (despite having received a subsidy). If the bank was underwater by less than 5bn (X<5) then private investors earn a rent, and if the bank was underwater by more than 5bn (X>5) then private investors do not enter. The optimal size of the subsidy from the state's viewpoint is such that investors enter but earn zero rent.

Out of the four large banks, three raised more private capital than the required 10%: Alpha with 12%, NBG with 11.1%, and Piraeus with 19.7%. Eurobank could not raise the required 10% and became fully controlled by the state. The total amount of public funds that were used was 25.5bn: 4bn for Alpha, 5.8bn for Eurobank, 8.7bn for NBG, and 7bn for Piraeus. The total amount of private capital that was raised was 3.1bn: 0.6bn for Alpha, 1.1bn for NBG, and 1.4bn for Piraeus. The sum of public plus private capital raised for each bank is the same as the corresponding number in Table 1.[18] [19]

The remaining banks were either resolved or recapitalized, and then transferred to the large four banks---with the process being essentially completed by July 2013. The public funds used for these banks were 13.4bn. Hence, out of the 50bn of public

[18] Piraeus is an exception, as the sum exceeds the number in Table 1 by 1.1bn. Piraeus required more capital because it absorbed the Greek branches of the Cypriot banks and the good bank formed after the resolution of ATE Bank.

[19] The numbers are from the Jan-Jun 2013 report of the Hellenic Financial Stability Fund, the agency in charge of bank recapitalizations

funds that were made available, a total of 38.9bn were used for recapitalization and resolution.

The first recapitalization resulted in a drastic increase in the concentration of the Greek banking system, i.e., fewer banks. Figure 15 plots, for all EU countries, the share of banking-system assets held by the five largest banks. This is a common measure of banking-system concentration. In 2013 the five largest banks in Greece held 94% of banking-system assets, the highest share among all EU countries, and up from 67.7% in 2007. The increase in concentration between 2007 and 2013 was largest in Greece (26.3%), followed by Spain (15.2%).

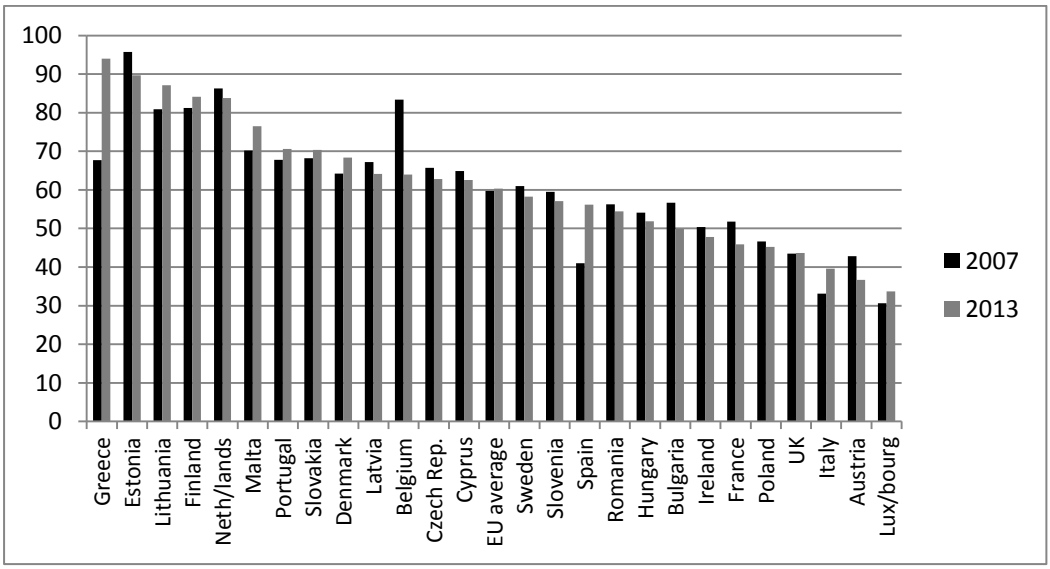

Figure 15: Share of banking-system assets held by the five largest banks. The data are from the ECB. The EU average is a simple average across the countries in the figure.

The increase in concentration can facilitate bank recapitalization because banks can have higher profit margins and hence higher earnings. Therefore, it can serve as a substitute to issuing additional equity. At the same time, a concentrated banking sector can have the usual drawbacks of an oligopoly, i.e., less competitive prices, less innovation, and political lobbying to prevent entry by outsiders. Given the important risks facing the economy and the banks (risks which became fully apparent in 2015 with the bank run, the capital controls, and the third recapitalization), a policy favouring concentration was sensible.

The consolidation of banking-system assets within the large four banks meant that presence by foreign banks was reduced essentially to zero.[20] Entry by foreign banks might have been difficult to achieve given the risks in Greece and the pressure on

[20] The share of banking-system assets held by domestic banks was 99% in Greece as of 2013, up from 78.2% in 2007. (Foreign banks Credit Agricole, Millenium, and Societe Generale exited Greece during the crisis by selling their subsidiaries.) As of 2013, Germany and Sweden had a 100% share, followed by France, Greece, and Spain with 99%, Italy with 94%, Portugal with 92%, Cyprus with 89%, and the UK with 84%. The EU average was 59%. The data are from the ECB.

Eurozone banks to de-lever. Yet, the first recapitalization might have been an opportunity to promote such entry, especially given the extensive evidence that entry by foreign banks into a crisis-hit banking system can be beneficial.[21] We should note, however, that entry by strategic long-term investors, which could have some of the same beneficial effects, did occur, especially in the case of Eurobank.

Given the lack of entry and competition, it is possible that the large banks earned rents by absorbing the remaining banks at prices below true value. Such rents would have benefited the private investors who participated in the June 2013 recapitalization. (The rents would have lowered the value of X in the example presented earlier.) At the same time, such rents could not have been too large, otherwise the banks would have been able to attract more private capital in June 2013.

In the spring of 2014, a second recapitalization was required because of increased projected losses on private-sector loans. That recapitalization was covered entirely by private funds. The total amount raised across the four large banks was 8.3bn. Eurobank raised the largest amount, 2.9bn, and returned to majority private ownership: private investors held a total stake of 64.6%, up from almost zero in June 2013. Private investors' stakes in Alpha, NBG, and Piraeus were raised to 30.1%, 42.8%, and 32.7%, respectively.

The first and second recapitalizations were successful in transforming a banking system in which all banks were insolvent into one where banks were solvent and partly owned by private investors. At the same time, banks remained fragile and highly vulnerable to a worsening in the economic situation. This can be seen by examining the composition of core equity tier 1 (CET1) capital, and its evolution after the recapitalizations.

On December 2013, the CET1 capital of the four large banks was 26.9bn. This was comfortably higher than the target in Table 1, which was 15.7bn, and indeed the Basel capital ratios of the four banks ranged from 11.2% to 15.9%, which are well beyond the minimum 4.5% required. Yet, these high numbers may provide a false sense of comfort. First, there was a significant risk that losses on private-sector loans could exceed the projected values, and hence banks would need to increase provisions by taking away from capital. Second, a significant fraction of CET1 capital was in the form of deferred tax assets (DTA), which reflect projected tax savings from losses that banks realized in the past and could carry forward to apply against

[21] Calomiris, Klingebiel, and Laeven (2012) report on such evidence from Argentina, Mexico, and other developing countries. According to these authors, entry by foreign banks not only promotes more competition but also puts more pressure on bank regulators to enforce the rules and provide a level-playing field. This leads to a virtuous cycle of more competition and better regulation.

future profits. DTA constitute an inferior form of bank capital because they involve uncertain cashflows. Indeed, the tax savings inherent in DTA accrue to banks only when they are profitable. Moreover, these savings are contingent on the state not modifying the tax code.[22]

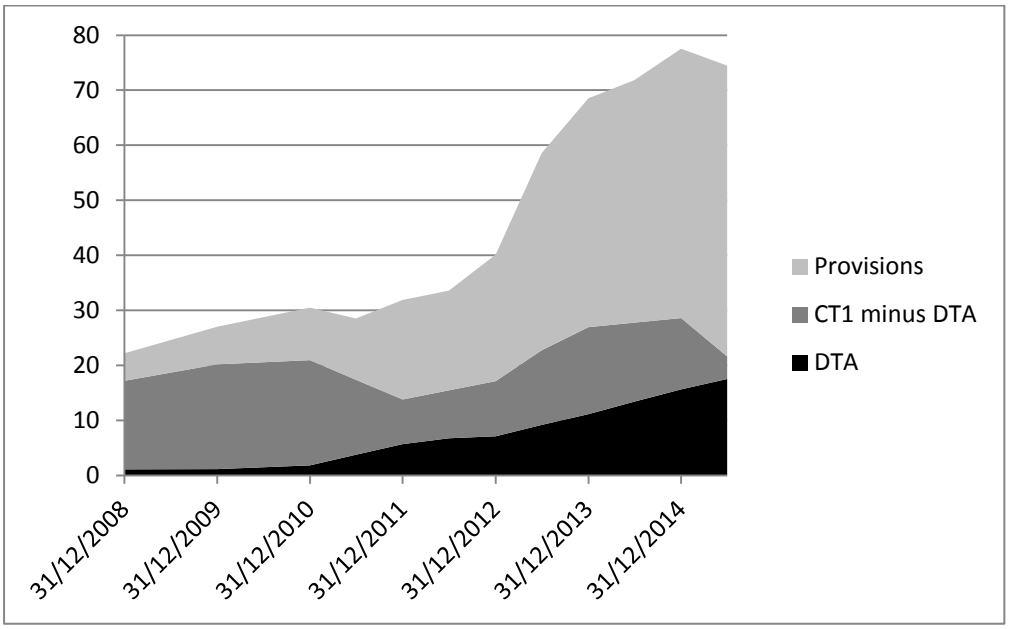

Figure 16: Deferred tax assets (DTA), core equity tier 1 (CET1) capital, and provisions aggregated across the four large banks (Alpha, Eurobank, NBG, and Piraeus). The numbers come from banks' balance sheets and are expressed in billion Euros. CET1 capital is the sum of the black and dark grey.

On December 2014 the CET1 capital of the four large banks was 28.6bn. During that year, banks had raised 8.3bn of new private capital, and increased their DTA by 4.5bn. Yet, the increase in CET1 capital relative to December 2013 was only 1.7bn (=28.6-26.9), much smaller than 12.8bn (=8.3+4.5). This was mainly because banks had to increase substantially their provisions against projected losses on private-sector loans.

[22] Revised Basel rules required banks to stop counting most DTA towards CET1 capital. Following similar initiatives in Italy, Spain, and, later, Portugal, the Greek government passed a law in the summer of 2014 allowing Greek banks to convert DTA into deferred tax credits (DTC). DTC were covered by a state guarantee that if banks realized losses in a given year and hence could not use the tax savings, the state would inject the corresponding amount of capital in the banks. Because of the state guarantee, regulators agreed to continue counting DTC-converted DTA towards CET1 capital. Out of 15.6bn DTA that the four large banks reported in December 2014, 12.8bn had been converted into DTC.
The ECB carried out an Asset Quality Review and Stress Tests on all large European banks during the third quarter of 2014. In the ECB's static exercise, which utilized the banks' balance sheets at the end of 2013, three of the four large Greek banks needed additional capital. However, in the dynamic exercise, which took into consideration the capital developments of 2014, DTC fully counted as equity capital, thus allowing all four large banks to continue operating in the fourth quarter of 2014 without having to raise additional capital. DTC continue to be a major part of banks' capital base in 2016.

Figure 16 summarizes the above developments by plotting the dynamics of CET1 capital, DTA, and provisions for the aggregate of the four large banks.

3.5. Bank Run, Capital Controls, and Third Recapitalization

The election of January 2015 brought into power a government formed by the SYRIZA and ANEL parties, both of which had opposed the provisions of the bailout plan. A lengthy negotiation with the troika during the first half of 2015 generated uncertainty about whether Greece would continue with the bailout plan or default and exit the Euro. That uncertainty drove depositors to withdraw money from banks, and aggregate deposits dropped by 48.6bn between December 2014 and June 2015. As of June 2015, deposits accounted for 46.2% of total bank liabilities, and central-bank loans (in the form of ELA or direct ECB loans) accounted for 36.7%. For comparison, at the double election of May and June 2012, when deposits had reached their previous minimum, they accounted for 50.1% of bank liabilities (a figure which rose to 58.3% in December 2014), while central-bank loans accounted for 33% (a figure which dropped to 15.7% in December 2014).

Following the announcement of a referendum to approve a new bailout agreement, on June 28, 2015, there was a renewed flight on deposits. The refusal of the ECB to increase the loan limit (which was already stretched due to the lack of collateral by Greek banks) resulted in the imposition of capital controls and a daily limit of 60 Euros for withdrawal of bank deposits.

The deposit flight in the first half of 2015, the imposition of capital controls, and the overall weakening of the economy, increased the projected losses on private-sector loans. In response to these developments, the EZ's Single Supervisory Mechanism (SSM) decided to conduct a new Asset Quality Review (AQR) and perform new Stress Tests specifically for the four large Greek banks, a year after a similar exercise had been conducted by the ECB on all large European banks, and a year before the SSM was due to conduct the second such exercise. The AQR, conducted during the third quarter of 2015, required the four large banks to acknowledge an additional combined capital loss of 9.6bn relative to the AQR of the previous year. This brought CET1 capital down to 16.2bn, most of which was in the form of DTA. Banks were required to raise 13.7bn of new capital, 3.7bn of which had to come from private investors and conversions of debt into equity, and 10bn from either private investors or public funds.

Two of the four banks raised all the required capital from private investors. The four banks combined raised 5.3bn from private investors and converted 2.7bn of bonds into stocks. Hence, approximately 8bn from the required 13.7bn were raised from private sources. Later, in early 2016, one of the banks sold its Turkish subsidiary, hence reducing further the need for state support.

In November 2015, prior to the third recapitalization, existing capital was valued at 0.7bn. This constituted a large loss for previous private investors, who had invested a total of 11.4bn in the banks in the first and second recapitalizations. It also constituted a large loss for the state, which had injected 25.5bn (although about half of that amount was a loss from the outset because it was necessary to bring the banks back to solvency).

After the third recapitalization, the state's stake in the four large banks shrank considerably. In early 2016, the State owned 11% of Alpha Bank, 2.4% of Eurobank, 40.4% of NBG, and 26.4% of Piraeus. Prior to the third recapitalization, these stakes were 66.3, 35.4, 57.2, and 66.9, respectively.

4. Policies for the Short and Medium Run: Dealing with Debt Overhang

In this section we discuss the challenges facing the Greek financial system in the short and medium run, and possible public policies to address them. The main challenge is to recover from the credit crunch; this requires dealing with the high debt levels of households and firms, and ensuring that the banking system provides an adequate flow of credit to the economy.[23]

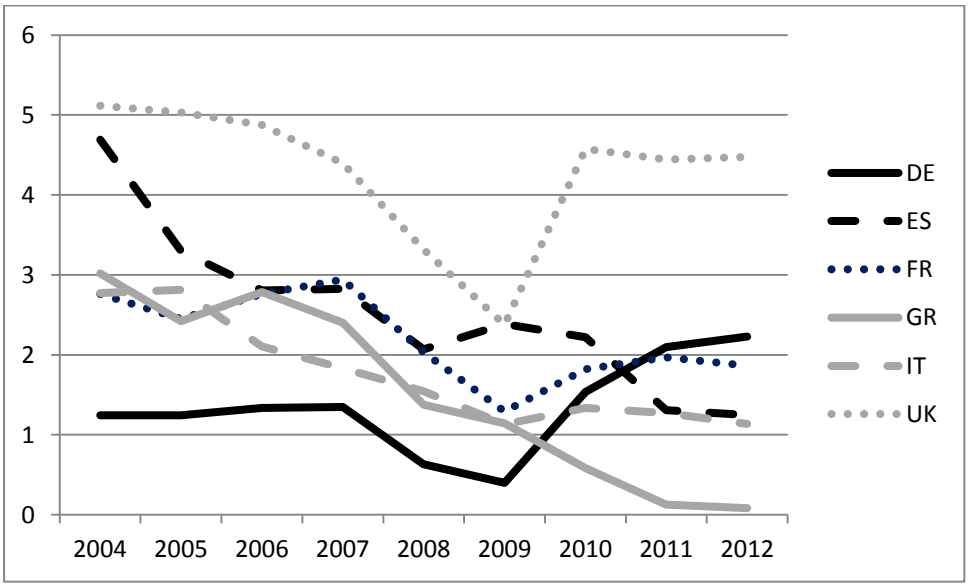

Figure 17: Firms' interest coverage ratio. The data come from the Amadeus database and cover the period 2004-2012. The sample includes the publicly listed firms in each country and it excludes financials and utilities. The interest coverage ratio is defined as the ratio of earnings to interest payments on debt. The values reported are medians.

[23] While the discussion in this section focuses on the flow of credit via the banking system, policies could also be designed to channel credit via capital markets. For example, the Athens Stock Exchange has sought to introduce new products to attract foreign investment into Greek firms and projects. Such efforts are especially important given the impaired state of the banks.

The magnitude of the credit crunch can be seen in Figures 17 and 18. Figure 17 plots the interest coverage ratio in the corporate sector. This ratio is computed by dividing corporate earnings by interest payments on debt. We report interest coverage for Greek firms, and compare with France, Germany, Italy, Spain, and the UK. The set of firms is the same as in Section 2.3.

Figure 18 plots non-performing loans (NPLs) for Greek banks, and compares with Cyprus, Ireland, Italy, Portugal, and Spain. NPLs are plotted as percent of the loan portfolio of the banks in each country, and include both corporate loans and loans to households. Loans are generally classified as non-performing when payments have not been made for at least three months.

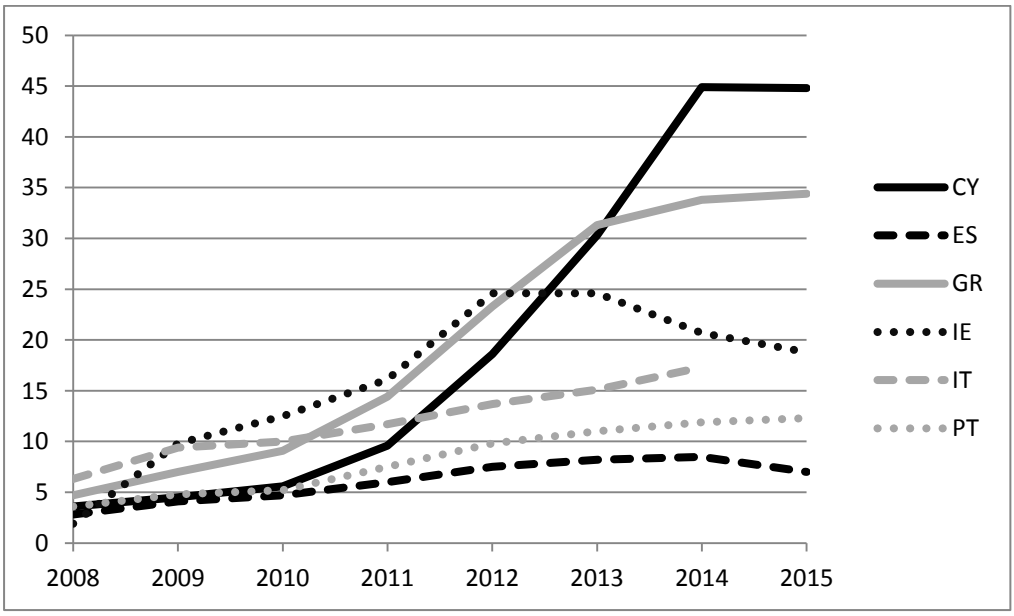

Figure 18: Non-performing loans as percent of the banks' loan portfolio. The data are from the World Bank.

NPLs in Greece were at comparable levels to the other countries in 2008, but increased sharply during the crisis, overtaking all countries except Cyprus from 2013 onwards. As of 2015, they accounted for 34.4% of all loans (Figure 18), and the percentage increases above 40% when restructured loans are included.[24]

High indebtedness threatens both the financial system and the real economy. If NPLs are not resolved appropriately, a large fraction of productive assets will not be put to their most efficient use and may remain idle. This implies that any growth will be anaemic and unemployment will remain high. Moreover, lack of appropriate resolution of the NPLs will prevent banks from lending to new and profitable

[24] The rationale of including restructured loans in the NPL calculation is that these loans have a high probability of re-becoming NPLs. In conducting the AQR and Stress Tests, the SSM examines this latter, stricter ratio, which it calls Non-Performing Exposure (NPE).

projects, further hindering growth. Lack of growth will in turn worsen the NPL problem, leading to a vicious cycle.

A solution to the NPL problem requires intervention on two fronts: the judicial procedures governing bankruptcy and debt restructuring, and the capacity and incentives within the banking system to resolve NPLs. We consider the two forms of intervention in Sections 4.1 and 4.2, respectively, where we also analyse in greater depth the economic costs imposed by NPLs.

The two forms of intervention that we consider are microeconomic in nature. The NPL problem, however, may also require intervention at the macroeconomic level. The deflation that Greece is experiencing raises the promised payments on loans in real terms, and hence makes loans harder to service. Hence, ECB policies to tackle deflation could contribute to reducing the NPL problem in Greece---as well as in other EZ countries with high NPLs. Such policies, however, are outside of the scope of this chapter, which focuses on interventions available to Greek policy makers.

4.1. Judicial procedures for bankruptcy and debt restructuring

Judicial procedures must be designed to render bankruptcy and debt restructuring as efficient as possible. We discuss existing procedures and their shortcomings, distinguishing between firms and households. We do not attempt to be comprehensive, but describe what we view as the main issues.[25]

4.1.1. Firms

When a firm is unable to repay its debts, two broad outcomes are possible:[26]

- Liquidation: The firm's assets are sold off. The proceeds are used to pay creditors, as well as any overdue wages to employees and debts to the state. (In what follows, we use the term "creditors" to also refer to employees and the state.)
- Reorganization: The firm agrees on a reorganization plan with its creditors, and continues to operate. The reorganization plan may involve debt reductions. It can be negotiated before the firm ceases payments to creditors, and can then be ratified by the court. Alternatively, it can be negotiated after cessation of payments, in which case the firm must submit a formal application to the court. During the time that the court considers the application, and until it ratifies the reorganization plan (assuming that it

[25] For a more comprehensive analysis see, for example, Potamitis and Rokas (2012), and Potamitis, Kontoulas, and Nounou (2014).
[26] We describe outcomes under Greek law, but the description applies to many other countries as well.

accepts the application) the firm's assets are protected from creditors. If the firm cannot reach an agreement with creditors, then it is liquidated.

The choice between liquidation and reorganization should depend on whether the firm's assets can be put to better use outside or inside the firm. To illustrate this point, we consider a stylized example of a firm that has total debts of 1m (one million) but can generate total income worth only 0.7m. If other firms are willing to pay 0.9m to acquire the firm's assets, then liquidation is the better option. If instead, they are willing to pay only 0.5m, then reorganization is better: creditors prefer to keep the firm in operation even though they cannot recover the full 1m of their debts because the 0.7m that they earn exceeds the 0.5m earned under liquidation.

Liquidation in Greece is highly inefficient: the proceeds from selling a firm's assets are significantly smaller than what other firms are willing to pay for the assets. A key source of inefficiency is delay. According to the judicial procedure in place, all the claims of creditors against a firm must be verified before the firm's assets can be sold. Verification can take years because creditors might raise objections against each other's claims. This delay is costly not only because of the foregone output during the verification period, but also because lack of use can cause the firm's assets to depreciate and become unsuitable for future use. (This is, for example, the case for buildings.) A second source of inefficiency is that the auction process through which the assets are sold is complicated and opaque. This discourages participation by interested buyers and can benefit well-connected insiders. A third source of inefficiency is that the bankruptcy administrators in charge of selling the assets often have limited experience. The law requires that they are selected randomly from the local bar association, and hence experience in conducting liquidations is not taken into account.

The inefficiency of the liquidation option makes reorganization more attractive for creditors. To return to the previous example, suppose that other firms are willing to pay 0.9m to acquire the assets of the bankrupt firm, but 0.35m is squandered during the liquidation process. Creditors then earn only 0.9-0.35=0.55m from liquidation, and hence prefer reorganization.

Shareholders can exploit the inefficiency of the liquidation option to extract significant concessions from creditors. In the context of the previous example, shareholders could push creditors to reduce the debt level to a minimum of 0.55m, which is the creditors' outside option under liquidation. Shareholders could thus earn a maximum rent of 0.7-0.55=0.15m from reorganization, even though their firm is bankrupt. Shareholders could also have an incentive to delay the reorganization process to extract such a rent.

An additional friction in reorganization negotiations is that employees and the state have seniority over all other creditors, i.e., their claims must be honoured in full before honouring any of the claims of the other creditors. This is a friction because in contrast to creditors such as banks, the state has little flexibility to renegotiate its claims and little expertise in designing and monitoring reorganization plans. The same is true to a lesser extent for employees. Because of these considerations, the firm might be liquidated even when reorganization is more efficient. Indeed, suppose in the context of the previous example that out of the 1m in debts, 0.75m are owed to the state and 0.25m to banks. Suppose also that liquidation yields 0.55m. If the state has no flexibility to reduce its claim down to 0.7m, to make a reorganized firm viable, then the firm will be liquidated, yielding only 0.55m to the state.

Summarizing, a fundamental problem with the judicial procedures governing bankruptcy and debt restructuring is that liquidation is highly inefficient. One consequence of the inefficiency is that shareholders can extract significant rents at the expense of creditors. The seniority of claims to the state and employees is also a problem because it is conducive to inefficient liquidation.

Inefficient liquidation aggravates the NPL problem. Indeed, efficient resolution of NPLs may require that assets are transferred to other firms, which can use them better. If transfers are highly costly, then assets are not put to their best use, causing losses in output and preventing the creation of employment opportunities.

Making NPL resolution more efficient requires a number of public policy interventions targeted to address the shortcomings identified above:

- Modify the judicial procedure to allow prompt sales of assets in a liquidation. Any conflicts between creditors can be addressed in a parallel and separate process. Procedures along these lines are followed in a number of countries, including the UK and the US.
- Make the auction process through which the assets are sold more transparent, e.g., electronic auctions. An effort to introduce electronic auctions has been undertaken for assets seized against tax-related debts. Such auctions could be used more broadly.
- Open up the job of bankruptcy administrator to qualified professionals who are not lawyers, e.g., accountants. Efforts in this direction have been undertaken already, and should be followed up on. In a number of countries, including the UK and the US, bankruptcy administrators are often large firms with extensive expertise in the area.
- Simplify judicial procedures relating to reorganization. For example, a judge currently needs to decide whether a reorganization plan proposed by a firm is viable before authorizing that it serves as a basis for negotiations between

the firm and its creditors. A hearing takes four months, and more time is required for a decision. This not only delays negotiations, but also requires the judge to make a complicated decision about the viability of a firm under a yet-to-be-implemented reorganization plan. It would be more efficient to grant automatically a short "stay" period during which a reorganization plan can be negotiated between the firm and its creditors, and is then ratified by the judge. More broadly, it would be beneficial to reduce the role of the judge in the bankruptcy process, and to facilitate instead negotiations between the firm and its creditors. While in countries such as the UK and the US, the judge is given a high degree of discretion, such discretion in the Greek context is likely to cause delays and unpredictability given the high case load of Greek courts and the limited expertise of many judges on bankruptcy matters.[27]

- The seniority of claims of the state and employees could be made more comparable to that of claims of other creditors. In particular, terms agreed with other creditors could automatically extend to the state and employees.

4.1.2. Households

When a household is unable to repay its debts, it can apply for protection under the "Law for Over-Indebted Households" (Law 3869/2010 and its subsequent modifications). The law requires that the household first seeks to negotiate debt relief with its creditors out of court. If negotiations do not yield an agreement, then a judge makes a decision. If the household's debts are unsecured, then the household's primary residence is protected (up to a given value) but all other assets can be liquidated to repay the debts. For debts that are secured against the household's primary residence, relief can be granted so that these debts represent no more than 80% of the residence value. The exact amounts are up to the judge's discretion and take into account factors such as employment or health status. Until the time that the judge makes a decision, the household's assets are protected from creditors. As of the end of 2014, there were approximately one-hundred thousand applications by over-indebted households in the court system.

The law does not constitute a fully-fledged personal bankruptcy regime because some types of debts are not covered. For example, debts to the state are excluded, and are effectively given more senior status. At the same time, the law has the attractive feature that it allows households to settle their eligible debts and restart with a clean slate. The alternative solution of requiring households to remain in debt

[27] In the longer term, more emphasis should be given to training judges on bankruptcy matters and related business disciplines such as accounting and finance. It could also be beneficial to create special courts for bankruptcy cases. For a more detailed discussion of these issues, see Chapter XX on the justice system in this volume.

until they generate enough new income to repay in full (as, e.g., in Spain) could leave them in a perpetual state of debt overhang, with low incentives to generate income.

The practical application of the law has been problematic. A key problem is court delays. Most hearings are scheduled five or more years after the household applies for protection, and some hearings have been scheduled as late as 2028 (fourteen years after application). Given that household assets are protected from creditors until the hearing, the incentives to apply for protection are strong even for households who can make the debt payments. Such households might hence choose to default strategically. Another problem is that court decisions have been highly variable even across similar cases. This has strengthened incentives to default strategically, and to file in jurisdictions where judges have the reputation of being pro-debtor. Incentives for strategic default have been further strengthened by a ban on liquidations of primary residences even in cases where such liquidations have previously been authorized by the courts.

Strategic default undermines the very existence of the credit market: banks will not lend if they are concerned that even solvent borrowers will not repay. Moreover, the losses that banks incur because of strategic default are ultimately borne by taxpayers because the state owns large stakes in the banks. In an attempt to curtail incentives for strategic default, the government has recently (2013-2014) required households to make a small monthly payment, typically around 10% of the instalment due, until the court hearing. While this measure goes in the right direction, more direct action is needed to reduce court delays and make court decisions more uniform. This is especially so given that court delays have increased dramatically since the beginning of the crisis.[28]

Reducing court delays will help deal with strategic defaulters. One would want to know also how much debt relief should be granted to those genuinely unable to pay. Court decisions on debt relief have been highly variable and the underlying principles have not been laid out clearly. To illustrate the issues, we consider a stylized example of a household that has taken a mortgage loan of 200K from a bank for its primary residence but can generate only 40K of total income to repay the loan. If the bank would earn less than 40K by selling the house, then it is in its best interest to not sell the house and reduce the loan to 40K, which the household can repay. If, however, the bank would earn more than 40K by selling the house, should the court allow the house to be sold? And if so, how can the household be protected from becoming homeless?

[28] For example, according to the World Bank Doing Business Report, the average time to resolve a simple dispute through the court system in Greece increased from 819 days in 2008 to 1580 days in 2014. For proposals to reduce court delays, see Chapter XX on the justice system in this volume.

One way to approach the above questions is to determine a minimum housing consumption to which a household should be entitled given its size and possibly other attributes. Suppose that the household in our example is entitled to 60K. Then, the bank could be allowed to sell the house, provided that it pays 20K to the household from the liquidation proceeds so that the household could combine with its 40K and access housing worth 60K.[29] The bank would then sell the house if it could get a price greater than 60K. Otherwise, it would reduce the loan to 40K and let the household remain in the house. This solution ensures a minimum housing entitlement for households while also allowing liquidation to occur if it is efficient enough. Liquidation occurs if the price exceeds the maximum of (i) the amount that the household can repay and (ii) the household's minimum housing entitlement.

Our stylized example illustrates a principle that is broad and extends beyond housing: a minimum amount of exempt assets can be specified, so that only assets in excess of this are made available to lenders. Indeed, this is the approach taken in the US, where responsibility for determining the exempt amount lies with individual states. Using systematic measures of the exempt amount and of collateral values (e.g., house prices) in court decisions can enhance consistency and efficiency.

4.2. Banks

Improving the judicial procedures that govern bankruptcy and debt restructuring is only part of the solution to the NPL problem. Banks must also have the incentives and capacity to use these procedures efficiently. To illustrate the problems that may arise, we return to a stylized example used in Section 4.1.1, in which a firm has total debts of 1m, can generate a total income worth only 0.7m, and its assets can be liquidated for 0.5m. We also assume that all of the firm's debts are from a single bank. The best option in this example is reorganization, where the bank keeps the firm in operation and reduces its debt down to 0.7m. The bank might not have the incentives to implement this outcome for three main reasons:

- "Extend-and-pretend": The bank may be reluctant to agree to reduce the debt of a firm even if this makes economic sense because by doing so it takes a capital loss. Such a loss could force it to raise new capital (i.e., equity) to meet Basel capital ratios, and this hurts existing shareholders.[30] To avoid having to raise new capital, the bank could choose to "extend-and-pretend", rolling over a firm's debt even if the firm is unable to repay it. The extend-

[29] If the house can be sold for more than 200K, the household should receive the difference between the sale price and 200K, or 20K, whichever is larger.

[30] New capital benefits debtholders because banks are made safer. Since the return on shareholders' investment accrues partly to debtholders, and since new shareholders must break even on their investment, existing shareholders must lose. This is the classic debt-overhang problem (Myers 1977). For a recent analysis of the debt-overhang problem in the context of banks, see Admati-Hellwig (2014).

and-pretend problem is more severe for banks that have low capital ratios, because they are more likely to be required to raise new capital following losses.

- Reputational concerns: Reducing down debt can, in some cases, be an admission of a bad lending decision. Hence, bank managers may be unwilling to reduce debt, even in the absence of any concerns with capital ratios.
- State ownership: Because the state has become a large shareholder in the banks following their recapitalization, reducing down debt can expose bank managers to lawsuits for mismanaging public funds. Conviction in those lawsuits carries extremely severe penalties such as life imprisonment. Hence, managers may be unwilling to reduce debt, even in the absence of any concerns about capital ratios.

In all three cases, the bank in our example could have the incentive to keep rolling over the loan at 1m and not reduce it to 0.7m to make the firm viable. The firm would then become a "zombie": it would continue operating despite having a value smaller than its debts. Operating as a zombie is inefficient because the firm would not undertake any new investment, even to maintain its assets. Indeed, its shareholders would not invest because all the returns would go to the bank. The firm would eventually have to be liquidated, and at a value possibly much smaller than 0.5m because of the capital depreciation and the delays. An additional inefficiency caused by zombie lending is that fewer funds are available for profitable new firms. [31]

One solution to the extend-and-pretend problem is to ensure that banks hold adequate provisions against their NPLs, i.e., provisions that are based on realistic estimates of NPL losses. In the context of our example, suppose that the regulator forces the bank to take a provision of 0.3m against the loan to the firm. Taking this provision is an accounting operation that moves 0.3m from the entry of "capital" in the bank's balance sheet to that of "provisions". Following the regulator's action, the bank has no incentive to keep the loan at 1m. Indeed, by reducing the loan to 0.7m, it can recover 0.7m rather than the smaller amount that it would collect by keeping the firm as a zombie. Moreover, it can do so without suffering any reduction to its capital beyond that already imposed by the regulator.

An alternative solution to the extend-and-pretend problem is to transfer the NPLs of all the banks to a "bad bank", whose sole mandate is to resolve them. Assuming that the NPLs are transferred at a price that reflects the amount that can realistically be recovered, the extend-and-pretend problem is solved for the same reason as under

[31] This inefficiency does not arise in our example because the bank's best option is to keep the firm in operation, and this does not release funds to the bank. If, however, the bank's best option were to liquidate the firm (e.g., the firm's assets could be liquidated for 0.9m instead of 0.5m), then liquidating the firm would release funds to the bank, but these funds would not be available if the bank kept the firm as a zombie.

the first solution: banks are forced to recognize their capital losses. In the context of our example, the bank would sell the loan to the bad bank at 0.7m, and hence would be forced to reduce its capital by 0.3m. Note that either solution, i.e., increasing provisions or transferring NPLs to a bad bank, may expose capital deficiencies of the banks and require them to raise new capital. A realistic assessment of capital levels is indeed key to any solution of the extend-and-pretend problem.

An advantage of dealing with NPLs by transferring them to a bad bank is economies of scale. Economies of scale arise because resolving NPLs requires an investment in specialized expertise, which can be amortized over a larger number of loans when these are gathered into a single entity. Economies of scale also arise because many firms and households hold loans from multiple banks. Resolving these loans requires getting all the banks together to share information and agree on concessions that each will make. This process can become more feasible and efficient when the loans are owned by a single entity. Economies of scale could finally arise if the bad bank is expanded to include also debts to the state (e.g., unpaid taxes and social contributions).

An additional advantage of the bad-bank solution lies in the incentives to resolve the bad loans. The managers of the bad bank are not “tied” to the lending decisions that led to the NPLs, and reducing down debt does not reflect badly on their reputation. Therefore, they are more eager to reduce down debt if this makes economic sense, compared to the managers of the bank that made the original loan. A related point is that the managers of the bad bank are more eager to liquidate a firm than the managers of the originator bank. This is both because of the reputational concerns mentioned above and because the originator bank might value the future business that the firm and other connected firms can bring to the bank. In summary, the bad bank has a focused mandate to resolve NPLs efficiently, while for the originator bank efficiency is only one of the objectives.

In addition to the above advantages that concern incentives and efficiency at the micro-economic level, there is an advantage at the macro-economic level: the bad bank can internalize successfully an economy-wide externality. When a bank resolves its own NPLs, this increases economic activity and benefits other banks by making their NPL problem less severe. The bank in question does not internalize this benefit. A bad bank, however, does because it owns all the NPLs.

A disadvantage of the bad-bank solution is that it requires funding because the banks must be compensated for giving away their NPLs. The funds could come from the state or from the private sector. Assuming, for example, that the value of the NPLs is 40bn, then 40bn of new funds would be needed. Some of this amount could come from the banks themselves, in the form of debt: the bad bank could issue debt which could be given to the banks as part of the compensation for the NPLs that they

would be giving away. The equity of the bad bank, however, cannot come from the banks since the incentive conflicts mentioned above would reappear. The equity would have to come from the state and from new private investors.

Applying either of the above solutions in the Greek context (as of early 2016) is difficult because of the Greek banks' large amount of NPLs relative to their capital levels. While Greek banks have been increasing their provisions against losses on NPLs, and have benefitted from three recapitalizations, their non-provisioned NPLs exceed significantly their CET1 capital levels.[32] Thus, requiring banks to make more realistic provisions would necessitate a fourth recapitalization. Transferring NPLs to a bad bank would not get around this requirement. Given that funds to perform a fourth recapitalization are not likely to be forthcoming (as of early 2016), the priority should be to ensure that NPLs return to more manageable levels through the interventions on bankruptcy procedures covered in Section 3.1 and more importantly through sound economic policies to end the recession. Until this happens, the extend-and-pretend problem is likely to be important.[33]

While a bad bank gathering loans from the four large banks may not be a feasible option in the near future, a smaller bad bank can be created by gathering under the same roof the bad-bank components of all the banks that were resolved during 2012-13. Because separate liquidators were put in place for each bank, it became difficult to realize gains from coordination. In early 2016, however, steps were taken to replace the multiple liquidators by a single one. Such a liquidator could eventually also take over loans from the four large banks and possibly from the state.

The governance of a bad bank should be given careful attention. A state-controlled bad bank would be a disaster given the extent of corruption and government ineffectiveness in Greece.[34] Such an institution would be subject to extensive political interference, and hence would be managed inefficiently and benefit those

[32] According to Fitch's pro-forma conservative analysis of November 2015, the ratio of non-provisioned non-performing exposure (NPE) as of the end of September 2015 to CET1 post-October-2015-AQR and post-third-recapitalization capital was 1.83 when aggregating across the four large banks. Out of 112bn NPE, 48.8% was covered by provisions, while the remaining 51.2% was non-provisioned. Of course, the ratio of non-provisioned NPE to CET1 capital does not take into account the recovery value of the loans, which is larger than zero when supporting collateral exists.

[33] As of early 2016, fears that Greek banks may soon need an additional recapitalization were widespread and the banks' stock prices tumbled once again together with the stock prices of other European banks. Meanwhile the possibility of a future bail-in, whose framework was put in place and was operational in 2016, was still creeping in the minds of the Greek public. Opinion polls were showing that few Greeks were willing to redeposit in the Greek banking system the cash they withdrew during the crisis years.

[34] According to the World Bank's Worldwide Governance Indicators in 2013, Greece scored 26th out of the 28 EU countries on both control of corruption and government effectiveness.

with political connections. Moreover, the political factors affecting its performance would spill over to the banks if they hold securities in the bad bank. On the other hand, a bad bank in which private investors hold a controlling equity stake, with appropriate safeguards for the state, could be an attractive policy option.

5. Policies for the Longer Run: Furthering Financial Development

In this section we discuss possible policies to address longer-run challenges facing the Greek financial system, i.e., challenges that go beyond recovering from the crisis by reducing debt burdens and restoring the flow of credit. The longer-run challenges relate mainly to the findings reported in Section 2. These findings suggest that risk-sharing and diversification in Greece are more limited than in other EZ countries, the UK, and the US. Limited diversification leaves households overly exposed to risks, and raises firms' cost of equity capital. A higher cost of equity capital reduces firms' ability to invest and create jobs. It also drives up corporate leverage, making the economy more vulnerable to shocks.

Improving diversification and furthering financial development more broadly, should be an important goal for economic policy in Greece. Section 2 suggests that a key cause of the problem is weak investor protection and the lack of trust that it breeds. Investor protection laws in Greece are not the weakest among the comparison countries, although there is significant scope for improvement as Section 4.1 indicates in the case of bankruptcy laws. The problem is made significantly worse by the difficulty of enforcing the laws, especially the long court delays and the limited expertise of many judges on financial matters such as bankruptcy, market manipulation, corporate fraud, etc. These shortcomings should be addressed, and the Chapter XX on the justice system in this volume offers a number of proposals towards that goal.

Investor protection requires not only an efficient justice system but also strong financial regulators. Financial regulation in Greece is performed by two agencies: the Bank of Greece (BoG), which covers banks and insurance companies (the latter since 2010), and the Hellenic Capital Markets Commission (HCMC), which covers capital markets and mutual funds. The BoG was established in 1927 and the HCMC in 1991. Being the older organization, the BoG is more mature and well-resourced. The HCMC's procedures and resourcing are in more need of development, although significant strides have been made in a relatively short period.

A comprehensive review of both organizations was performed by the IMF in its Financial System Stability Assessment (FSSA) report in 2006. Among the recommendations in the report, was that the HCMC should be given greater

operational independence, be made more accountable, establish better controls for conflicts of interest, and help promote financial literacy.[35]

Strengthening the HCMC's independence and accountability is important, and will help promote the agency's effectiveness and prestige. Concerning operational independence, for example, the HCMC should be allowed to prioritize which cases it will investigate. Currently it is forced to prioritize requests coming from prosecutors, but these requests occasionally concern old or less important cases, and hence the HCMC may lack the resources to focus on more recent market developments. The problem is made worse by HCMC's limited budget, which renders it difficult to attract and retain specialized staff and to employ adequate IT resources. The HCMC should also be given greater authority to levy fines before it refers cases to courts.

Controlling for conflicts of interest is relevant both for the HCMC and the BoG. Regulators should not be making decisions that affect firms for which they worked in the recent past, or where they expect to work at the end of their tenure, or with which they have other links. Such instances have occurred even for past heads of both agencies, and concerns have been raised about the quality of decisions that were made. Requirements that senior staff at both agencies cannot be employed at regulated firms for "cooling off periods" of a few years after leaving the agencies; cannot have been employed at such firms for periods of similar length before joining the agencies; and cannot hold financial stakes in regulated firms should be enforced vigorously. The appointment process of senior staff at these agencies should also become more transparent and less political. (This is a broader issue that extends to other government agencies as well.) Currently, the party in power appoints its favourite candidate as agency head. A more open process in which candidates are approved following a rigorous hearing by a parliamentary committee, and are perhaps pre-selected by an independent committee of experts, could help ensure that the best qualified candidates are selected.

An important additional factor that contributes to the under-development of the insurance and investment-fund sectors is the structure of Greece's pay-as-you-go pensions system, which provides no incentives for households to save in private pensions or private life insurance. The Greek pensions system is not sustainable in its current form, as it absorbs every year about 10.5% of GDP from the state budget compared to an average of only 2.5% in the EZ. A reform has been under way since 2010 to make it sustainable. This reform ought to become ambitious and include a

[35] The bulk of the recommendations in the IMF FSSA report concerned weaknesses of the insurance regulator, which at the time was a Directorate at the Ministry of Development. These recommendations proved to be prescient in light of the insurance fraud scandal in 2009, following which insurance regulation was handed over to the BoG. The report also highlighted the risks from an absence of a regulator for pension funds. This proved to be prescient as well in light of the pension-fund scandal in 2007.

separate pillar based on non-taxable individual contributions that could be invested in mutual funds, similar to the individual retirement accounts (IRA) in the United States. (Chapter XX on pensions in this volume proposes a multi-pillar system along these lines.) Generous tax incentives for life insurance policies are another important policy that needs to be strengthened.

Concerning the banking system, a key issue for the short run is to keep clear boundaries between banks and the state. Following the recapitalizations, which necessitated public funds, the state became a large shareholder in Greek banks. This should be a transitory arrangement, however, and the state should ensure that its stake is sold back to the private sector.[36] Indeed, lending by state-controlled banks is more likely to be channelled towards those with political connections, and this fosters corruption and rent-seeking. Moreover, such inefficient lending decisions are associated with low productivity and GDP growth.

The high concentration of the Greek banking system is an additional issue that should be addressed, although this should be done when the crisis is over. As we argue in Section 2.4, the benefits of high concentration probably exceed the costs during the crisis, given the important risks facing the economy and the banks. This is likely to reverse, however, when the economy recovers, and entry by new players will become beneficial. It will be important, in particular, to encourage entry by foreign financial institutions. Such entry promotes competition, financial innovation, and better regulation. Greece has been underperforming historically in attracting foreign direct investment in the financial sector (and in other sectors as well) because of its weak institutional environment and the resistance by domestic incumbents. Such investment, however, can bring significant benefits.

Lastly, the crisis has shown both the appetite for and the lack of a safe asset in Greece. As shown in Section 2, Greek households are holding their wealth mainly in real estate and bank deposits, probably because they were viewing them as the safest assets. This perception changed dramatically during the crisis. Following an increase in the perceived riskiness of bank deposits due to the state's inability to insure them and to the risk of converting them to a devalued new currency, a significant fraction of deposits left the country, as documented in Sections 3.2 and 3.3. Real estate also ceased to be perceived as safe, as a new real estate tax was imposed and contributed to a large decline in house prices. While a loss of aggregate household wealth was unavoidable during the crisis, each individual household should be able to control its own portfolio risk exposure, trading off risk and return.

[36] A recent effort to strengthen the boundaries between banks and the state was a law passed in late 2015 establishing a cooling off period of four years before an individual who held a prominent political position in the government can subsequently become a bank executive or bank board member inside the country.

Access to a safe asset will expand the menu of portfolios available to households, and hence will ensure that risk is borne only by those who are willing to bear it (and to be rewarded for that).

Safe assets are available outside Greece, e.g., German bonds and Swiss bank accounts. These investments, however, are available only to the richest households. Moreover, the funds channeled into these investments are not used to finance firms or projects in the Greek economy. Designing safe assets that are both more widely accessible, and that yield the benefits of EZ-wide diversification while channeling some of the funds back to the domestic economy, should be an important policy goal. This might require coordinated action at the Eurozone level. The ESBies proposal of Brunnermeier et al. (2011), whereby government debt of all EZ economies is packaged in fixed GDP weights and is tranched to produce a safe asset, has this feature. Other initiatives that facilitate EZ-wide diversification could also be considered.

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