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Housing Finance Across Countries

New Data and Analysis

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Abstract

This paper presents new data on the depth and penetration of mortgage markets across countries. There is a large variation across both dimensions of mortgage market development, across countries, but also—in terms of depth—within countries. Mortgage markets seem to develop only at relatively high levels of gross domestic product per capita. Policies associated with financial system development are also associated with mortgage market development, including price stability and the efficiency of contractual and information frameworks. The development of the insurance sector and the stock market, sources of long-term funding, is strongly associated with mortgage market development, while government subsidies and support are not. A benchmarking exercise compares the actual values of mortgage market development to values predicted by structural country factors and shows a large variation across countries and over time in the gap between predicted and actual values, related to specific policies but also mortgage boom and bust cycles.

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Housing Finance Across Countries: New Data and Analysis

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1. Introduction

While in high-income economies mortgages are widely available and routinely used for consumer financing of housing, many low and lower-middle-income countries only register a few thousand loans or a few hundred in some cases. As an example, total mortgage debt outstanding in the Netherlands is equivalent to 83% of GDP, whereas it amounts to less than 1 percent of GDP across many low- and lower-middle-income countries in Asia and Africa. What explains these differences? Are underdeveloped housing finance systems just a symptom of the general shallowness of financial systems across developing countries? Or are there country factors and policies that specifically explain underdeveloped mortgage markets? This paper uses new data to document cross-country variation in mortgage depth and penetration and explores country factors that can explain this variation and answer these questions.

Exploring mortgage finance and its determinants is important for both academics and policy makers. The maturity transformation of short-term liabilities into long-term assets, critical for long-term housing finance contracts, is also at the center of financial intermediation theory, with many agency conflicts and market frictions even more obvious in mortgage finance than in other segments of the financial sector. A mortgage loan is often the major liability of households in developed countries, with the house being the corresponding asset on the household balance sheet, and thus a critical part of household welfare. The importance and structure of mortgage finance is also critical for transmission channels of monetary policy. Housing finance, however, has also been at the center of multiple banking crises, most recently in the U.S., Ireland, and Spain, and recent research has shown that banking crises linked to housing boom and bust cycles are typically deeper than other crises (Claessens et al., 2011). Mortgage finance is also a critical segment of the policy agenda to "lengthen financial contracts" in many developing countries whose financial systems are dominated by short-term financial contracts and is at the center of attempts to build up non-bank segments of the financial system (Beck et al., 2011). Finally, the issue of housing finance can be seen in the context of a broader socio-economic development agenda. Many developing and emerging countries are still going through an urbanization process, which will increase the need for housing. Similarly, socio-demographic transition processes ongoing in many countries will increase the number of independent households and again increase demand for housing. Additional housing, however, requires financing—as house prices are often a multiple of annual income—and mortgage finance systems in many developing countries currently do not satisfy the housing needs of these societies.

Reforming mortgage finance systems requires the ability to understand, analyze, and diagnose their performance. While there is a long and extensive literature on housing finance across several developed economies, cross-country comparisons have been impeded by a dearth of data.[1] This paper presents cross-country data on both housing finance depth and

[1] The one notable exception is IFC (2008), which presented detailed cross-sectional data on housing finance systems across 42 countries as well as Warnock and Warnock (2008) for data on 61 countries. In addition the Housing Finance Information Network (Hofinet) is currently building up a valuable data resources with a

penetration for up to 148 countries. Specifically, we focus on an indicator for the total outstanding amount of mortgage loans relative to GDP together with an indicator showing the share of adult population with a housing loan. While the first indicator is an aggregate gauge of the importance of the mortgage finance market relative to total economic activity and thus comparable to the standard indicator of financial depth—Private Credit to GDP—the second indicator captures the access dimension, i.e. how widely used housing finance services are. While the two indicators are strongly correlated, they are not perfectly so, as we discuss below. The paper provides comparisons across country groups and correlations with other financial sector and socio-economic indicators. We use cross-sectional and panel regression analyses to document country-level covariates of mortgage depth and penetration. Finally, we present a benchmarking model that allows comparison of actual mortgage market development to a predicted level taking into account socio-economic factors and ultimately might indicate whether a mortgage finance system is below or above a sustainable equilibrium. We also relate the cross-country and within-country variation in the gap between predicted and actual levels to recent crisis episodes and policy variables.

While there is a small but growing mortgage finance literature, most of the work has been either on specific countries or country groups (e.g., Diamond and Lea, 1992; Stephens, 2003; La Cava and Simon, 2005; Wolswijk, 2006; Roy, 2008, among others; see Warnock and Warnock, 2008 for further references and an overview). While previous work has focused more on the positive sides of mortgage finance expansion and policies that can expand access to housing finance (e.g., Gerardi, Rosen and Willen, 2010; and Beck and Brown, 2010), the recent crisis in the U.S. has raised concerns about boom-and-bust cycles in housing, including the political economy behind this (see, e.g., Mian and Sufi, 2009, 2011, Mian, Sufi and Trebbi, 2010; Dell'Ariccia, Igan and Laeven, 2012).

In addition to the mortgage finance literature, this paper links to several other mostly cross-country literatures.[2] First, it links to the finance and growth literature. While theory predicts an ambiguous relationship between the efficiency of financial markets and economic growth, empirical research has established a mostly positive relationship (see Levine, 2005, for an overview). More recent studies, however, have established important non-linearities in the finance and growth relationship, with a possibly negative impact of finance on growth at very high levels (e.g., Arcand, Berkes and Panizza, 2012). While most of the empirical literature has focused on aggregate indicators of financial sector depth, more recent work has looked at the sectoral structure of credit, distinguishing between enterprise and household credit (e.g., Beck et al., 2012). This paper adds to this literature by exploring cross-country variation in mortgage finance. One important dimension of financial sector development and its impact on the real economy is maturity transformation, for which housing finance is a prime example (Caprio and Demirguc-Kunt, 1998).

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growing number of countries contributing and a long time series developing. The great value of the Hofinet data is the mix of quantitative and more descriptive elements captured in each country return.

[2] Campbell (2012) relates the discussion on mortgage markets and mortgage contract design to different strands of the economic literature.

Second, this paper links to the financial structure literature. Related to the finance and growth literature, arguments have been made in favor of either bank- or market-based financial systems.[3] Recent papers have shown systemic patterns in the rise of different segments of the financial system in the process of economic and financial development (De la Torre, Feyen and Ize, 2013). Mortgage finance systems can be financed both through bank-based channels, i.e. retail funding, and more market-based channels, e.g. wholesale funding through securitization of mortgage loans. However, the development of mortgage finance systems might also depend on the scale and income level of its host economy. We will explore the "income elasticity" of mortgage finance, the relative importance of different funding sources for the depth and penetration of mortgage finance across countries, and how the development of housing finance co-varies with the development of other segments of the financial system.

Third, the paper links to the literature on determinants of financial sector development. Theory has shown the importance of macroeconomic stability and strong contractual and informational frameworks for financial deepening as they help mitigate market frictions related to maturity transformation and information asymmetries. Cross-country comparisons have established a strong empirical relationship between low inflation, strong and effective legal systems, comprehensive accounting and auditing standards, and credit registries, on the one hand, and deep and stable financial systems, on the other hand (e.g., Levine, Loayza and Beck, 2000; Boyd, Levine, and Smith, 2001, Djankov, McLiesh and Shleifer, 2007). Theory predicts that these elements should be even more important for mortgage finance given its long-term nature. In our empirical analysis, we relate the depth and breadth of mortgage finance markets to these different country factors.

Finally, the paper links to recent work on benchmarking financial systems. On the more conceptual side, Beck and de la Torre (2007) and Barajas et al. (2013) have developed the access possibilities frontier and the financial possibilities frontier, respectively, as a conceptual framework to gauge the constrained optimal level of financial development and prioritize different policy areas. On the empirical side, Beck et al. (2008) propose a benchmarking model to derive the "natural" level of financial sector depth across different dimensions and for a broad cross-section of countries, a model that by now has been mainstreamed into World Bank operations. This benchmarking exercise has been extended as more and more financial sector data have become available, both across more segments of the financial sector as well as over more dimensions of financial sector development, most recently on financial outreach. This paper provides a benchmarking exercise for mortgage finance for both depth and penetration in the housing finance market.

To the best of our knowledge, this is the first paper to present cross-country data on the depth and breadth of mortgage finance systems for such a large number of countries. With the initial nature of the exercise, however, come several caveats. First, while we have panel data on mortgage debt to GDP for part of our cross-sectional sample, there is only one data point in time for the housing loan penetration data. Future updates of the Global Findex data will

[3] See, among others, Beck and Levine (2002).

allow the build-up of a panel version. However, the limited time-series dimension of our database prevents us from making any causal inferences. Second, while our mortgage depth data refer to the formal financial system, the housing loan penetration data refer to any provider of housing loans, including microfinance and informal providers, so that our access measure is broader than our depth measure. Third, this paper reports data on the depth and penetration of mortgage finance and thus leaves aside many other important dimensions of the mortgage market, including product quality and characteristics, including maturity structure, loan-to-value ratios and interest rate structure. Future work aims at extending this work and in the conclusions we will point to areas for further data collection and analysis.

The remainder of the paper is structured as follows. Section 2 presents our two main indicators of housing finance—mortgage debt to GDP and share of households with a mortgage—and some initial cross-country comparisons. Section 3 offers regression analysis to explore the cross-country covariates of housing finance development. Section 4 presents a benchmarking model. Section 5 concludes and looks forward to next steps.

2. Housing Finance Depth and Penetration Across Countries

This paper relies on a comprehensive data collection exercise to construct a database on housing finance markets and other country-level variables on a global scale. The data set was compiled from different economic and financial data portals such as Doing Business, Global Financial Inclusion Database (FINDEX), World Bank Group Entrepreneurship Survey, the Housing Finance Information Network (HOFINET), World Bank's Enterprise Surveys, World Bank's PovcalNet, Property Rights Alliance, Stat Compiler, Bank for International Settlements (BIS), and World Development Indicators (WDI), among others.

We use two indicators of housing finance to analyze the depth and breadth of housing finance sectors. First, **Mortgage Depth** is the outstanding mortgage debt relative to GDP and gauges the depth of mortgage markets by focusing on the total volume. The construction of the first indicator involved the collection of panel data on mortgage debt outstanding in local currency on a country by country base given the absence of a single cross-country source of data.[4] Mortgage debt data for 38 European countries and other large economies was compiled from the European Credit Research Institute (ECRI) for the period 1995–2011. For most economies, figures on mortgage debt outstanding were compiled from the countries' central banks, financial regulatory/oversight agencies, or housing finance agencies. For a number of countries, data were obtained through direct contact with housing finance officials during World Bank/IFC country missions or from field conferences or presentations. Gross Domestic Product (GDP) data used to compute the ratio were downloaded from the World Development Indicators Website. While for many countries, we have only one or two data points, we have at least 10 data points for 45 countries. In total, we have 938 observations for 118 countries. It is important to note that Mortgage Depth only captures formal mortgage loans from regulated financial institutions and excludes loans from non-regulated microfinance institutions and informal sources. Similarly, it excludes loans or grants from

[4] Appendix Table A1 lists sources for all countries.

government organizations outside the regulated financial system. Another important caveat is that the definition of housing finance will differ across countries. Some countries will only include collateralized housing finance where a mortgage lien has been established, whereas others may have a looser definition covering non-secured consumer loans used for housing purposes. Likewise there is often a fine line, especially in emerging markets, between what constitutes a secured business loan or a commercial property loan and a housing loan. For the purposes of this study, we abstract from these definitional variations across countries.

Figure 1 shows the enormous cross-country variation in mortgage depth. Here, we present average data for the period 2006 to 2010. Mortgage debt to GDP ranges from less than 1 percent in Rwanda to 109% in Denmark. Appendix Table A2 lists the average Mortgage Depth across 99 countries over the period 2006 to 2010.

The second housing finance measure—**Housing Loan Penetration**, the percentage of adult population with an outstanding loan to purchase a home—was obtained from the Global Financial Inclusion (FINDEX) Database. Unlike the Mortgage Depth indicator, the penetration indicator refers to any provider of housing loans, including regulated financial institutions, microfinance institutions, and informal sources. The FINDEX database was constructed with survey data collected from a randomly selected sample of 150,000 individuals in 148 countries. The survey, conducted by Gallup Inc. in 2011, constitutes the first comprehensive attempt to measure financial inclusion at a global scale and provides a substantial array of indicators on countries' saving, borrowing, payments, and risk management practices (See Demirguc-Kunt and Klapper, 2012 for more information). Presently, FINDEX data are only available for a cross-section of 148 countries in 2011, for which reason the data can only be used for cross-sectional analysis. This analysis can be expanded to account for over-time changes in financial inclusion measures as the data collection effort is further pursued in future years.

Figure 1: Mortgage Depth across Countries (2006-2010)

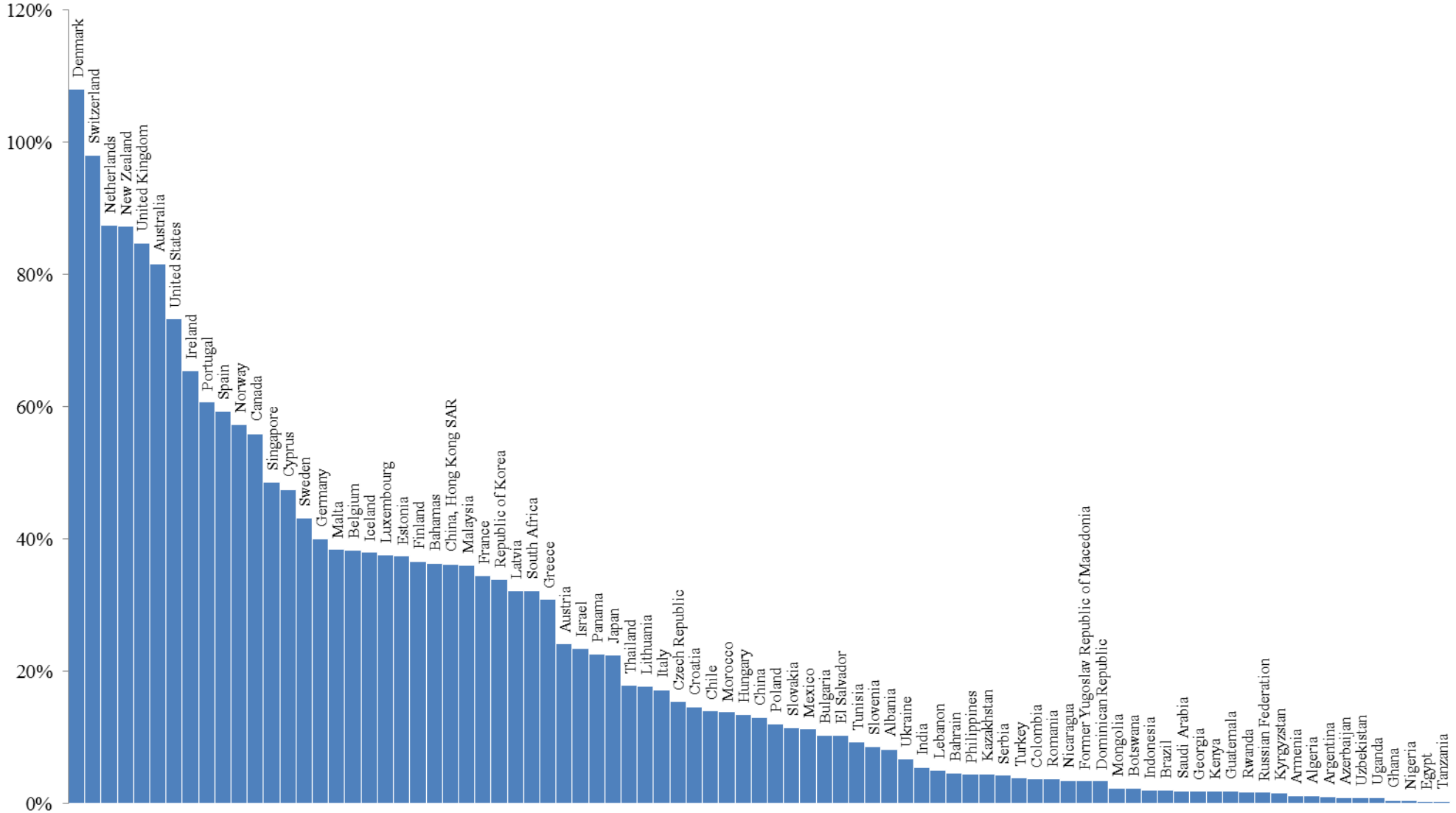


Figure 2: Housing Loan Penetration across Countries

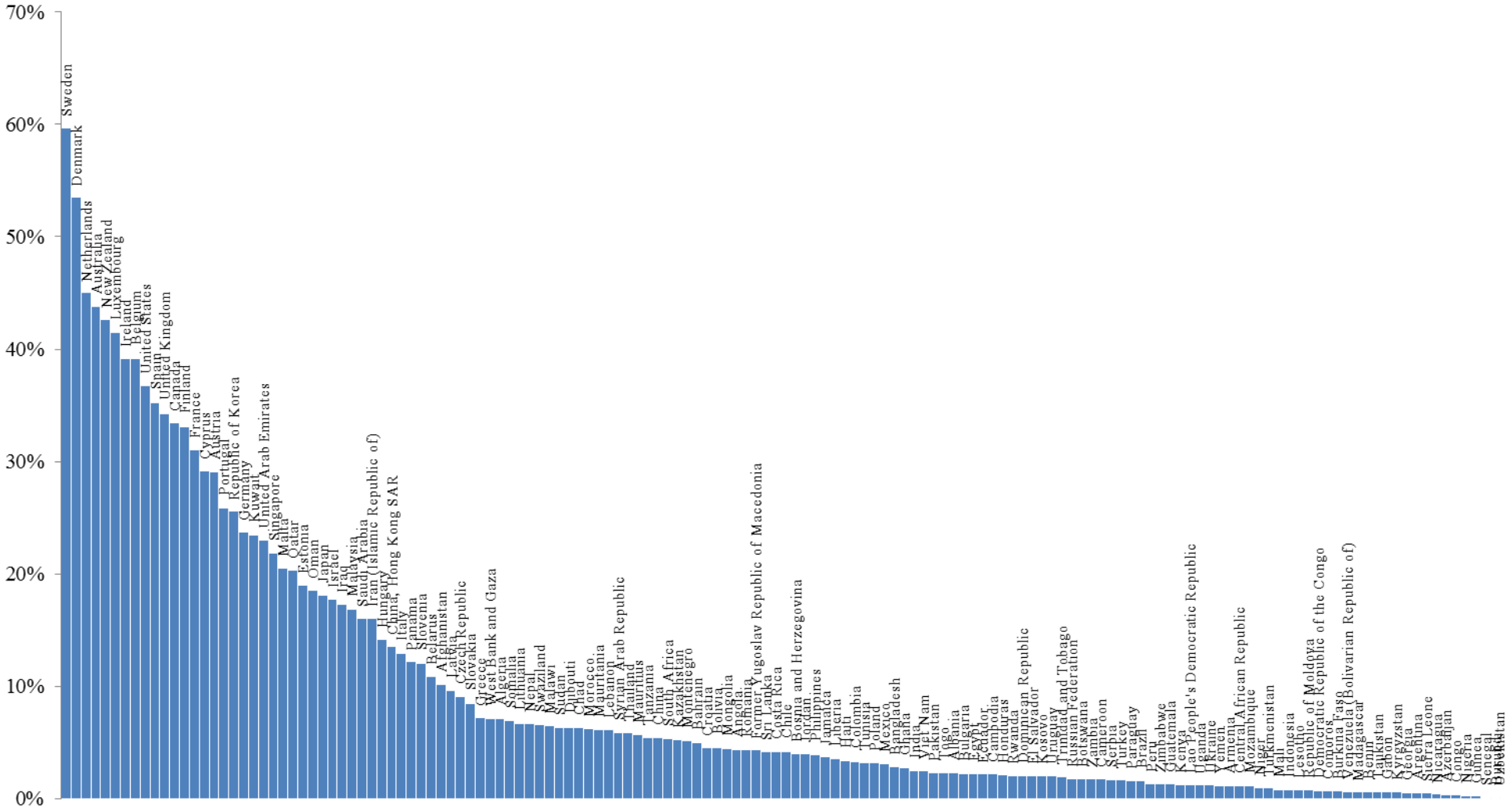
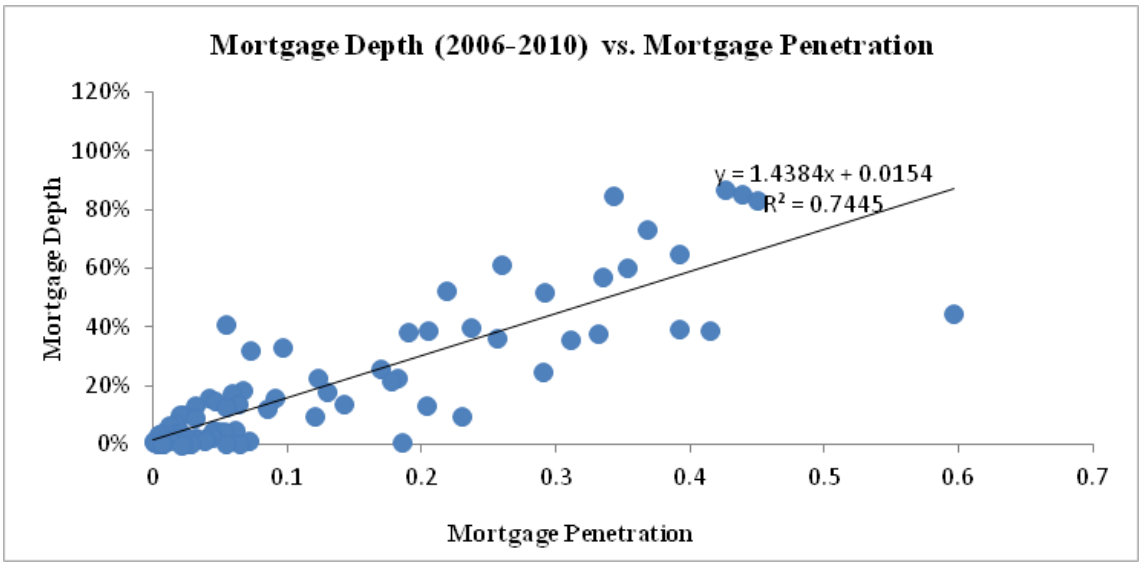


Figure 2 shows a large cross-country variation in Housing Loan Penetration across countries, ranging from close to zero in many African countries to almost 60% in Sweden. Appendix Table A2 lists Housing Loan Penetration for all countries in our sample.

Mortgage depth and housing loan penetration are highly correlated, though not perfectly (Figure 3). Both Great Britain and Australia had Mortgage Debt of 85% of GDP, averaged over 2006 to 2010, but in Australia 44% of the adult population had a mortgage loan in 2011, while in Great Britain only 33%. Housing Loan Penetration stood at 29% in 2011 in both Austria and Cyprus, but Mortgage Depth was 25% in Austria over the period 2006 to 2010, while it was 52% in Cyprus over the same period. Such differences could reflect relative price differences and non-synchronized housing price cycles across countries or differences in mortgage finance systems, such as different loan-to-value averages or different institutional structures, where some housing loan providers are captured under Mortgage Depth in one but not the other country.

Figure 3: Mortgage Depth vs. Housing Loan Penetration



Mortgage depth is closely correlated with a standard measure of financial intermediation, Private Credit to GDP (Figure 4), which is not surprising given that mortgage debt constitutes part of overall lending to the private sector in the economy. However, we also note that mortgage lending as a share of overall lending increases with higher levels of Private Credit to GDP, consistent with the finding by Beck et al. (2012) that household credit increases as share of overall credit with the level of Private Credit to GDP. Similarly, Housing Loan Penetration is correlated with other outreach indicators, including the share of population with a bank account (Figure 5). This correlation, however, is significantly less strong than the correlation on the depth side, suggesting that high use of basic savings and payment accounts does not necessarily imply access to mortgage finance.

Figure 4: Mortgage Depth vs. Private Credit to GDP

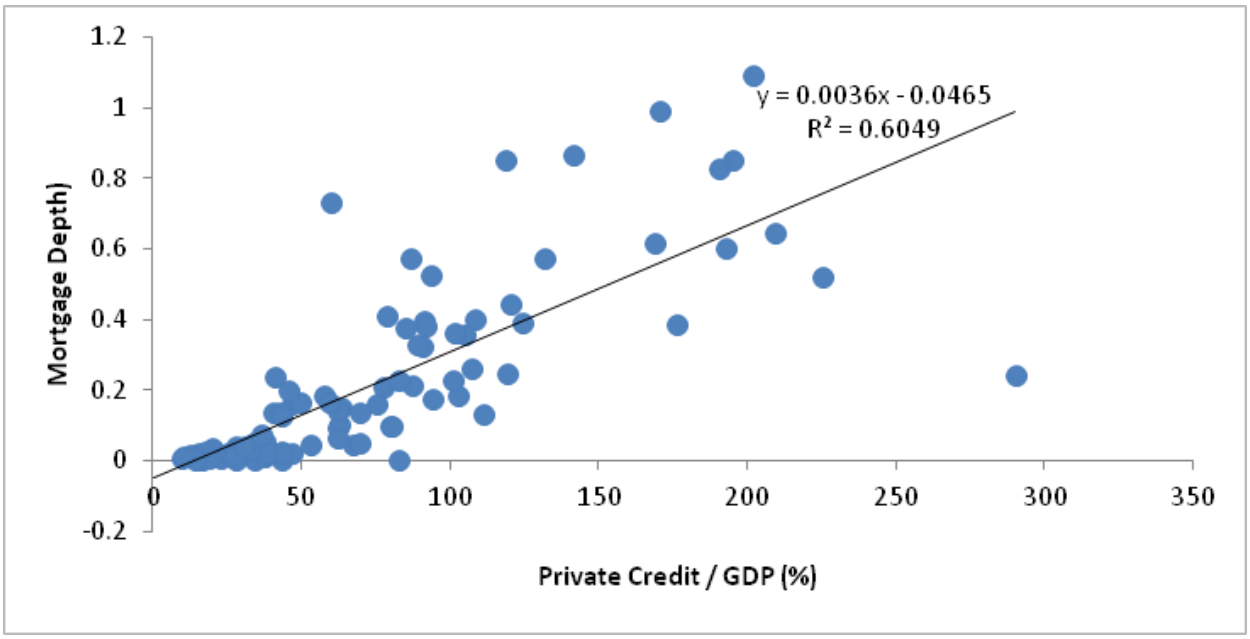
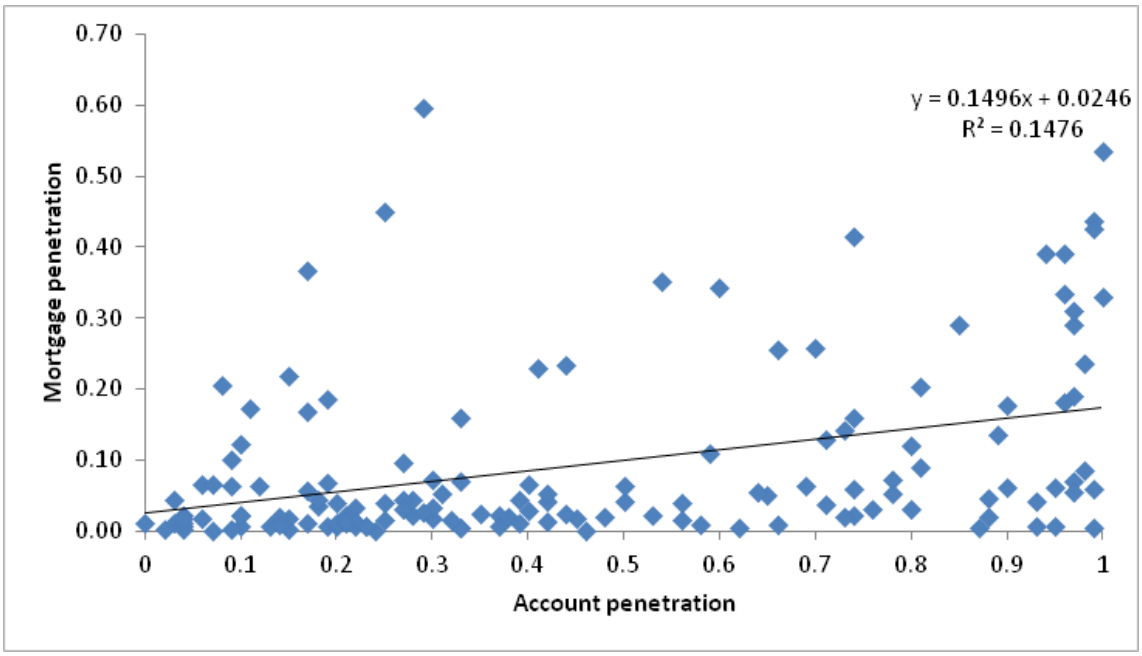


Figure 5: Housing Loan Penetration vs. Account Penetration



In the next section, we will document the relationship between different country factors and mortgage depth and penetration with regression analysis. As preliminary exploration, we offer graphic illustration of the univariate relationship between the depth and penetration of mortgage markets and different country factors. Figures 6 and 7 show that mortgage depth and housing loan penetration increase with countries' income level in a convex manner, i.e. slow increases with income across low- and middle-income countries and rapid increases with income across high-income countries, suggesting that housing finance is a "luxury"

segment of the financial sector. This observation is consistent with the "income elasticities" across different segments of the financial system as computed by Beck et al. (2008) that show that capital markets and insurance sectors—thus long-term finance segments—are more income-elastic, i.e. develop at a later stage, than the banking system.[5] We will explore the co-development of housing finance with other segments of the financial system in more detail below.

Figure 6: Mortgage Depth and Penetration across Income Groups

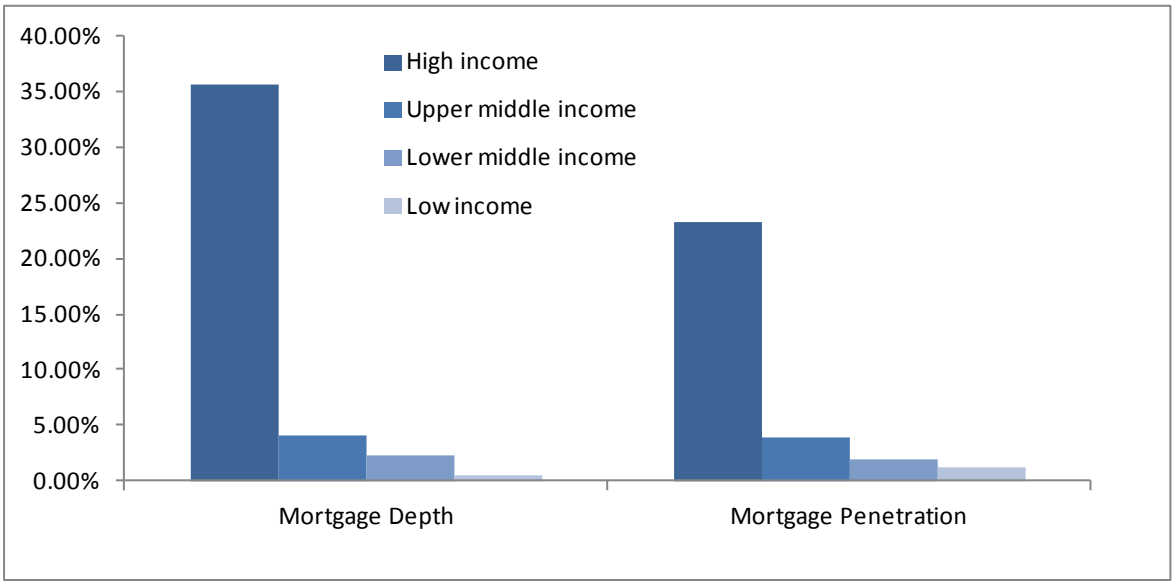


Figure 7: Mortgage Depth and Penetration vs. GDP per capita

Panel A: Mortgage Depth vs. GDP per capita **Panel B: Housing Loan Penetration vs. GDP per capita**

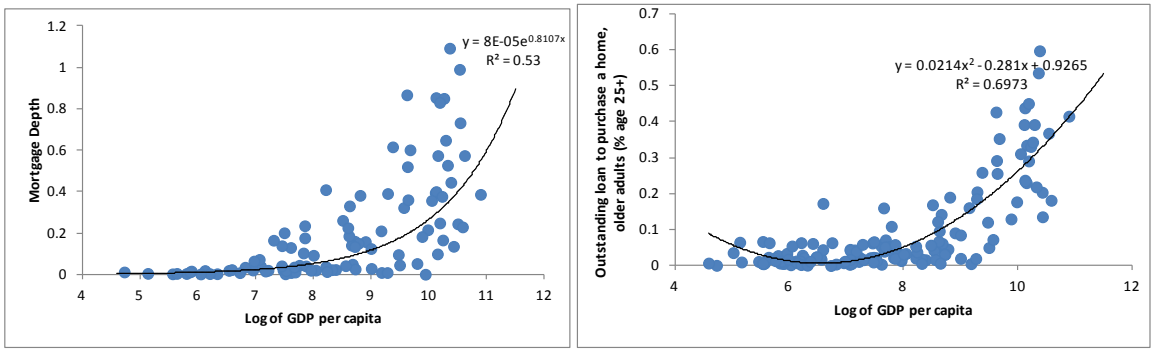


Figure 8 shows a non-linear negative relationship between monetary instability and mortgage depth and penetration. Given the long-term nature of mortgage contracts, monetary stability can be considered a key condition for building up mortgage markets. Figure 8 confirms that. While high inflation is associated with very shallow mortgage markets, there is a high variation in mortgage depth and housing loan penetration among low-inflation countries,

[5] We report median values across the four income groups to avoid the impact of outliers.

suggesting that macroeconomic stability is a necessary but not sufficient condition for deep and broad mortgage markets.

Figure 8: Mortgage Depth and Penetration vs. Inflation

Panel A: Mortgage Depth vs. inflation **Panel B: Housing Loan Penetration vs. inflation**

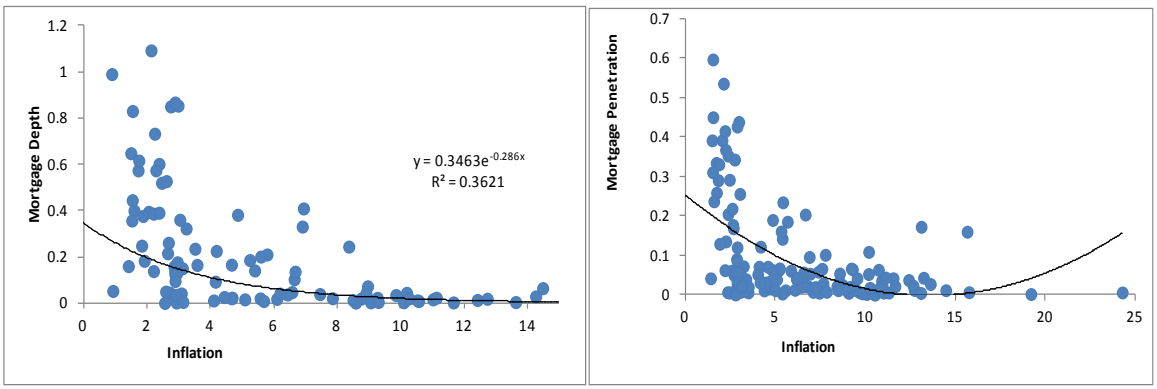
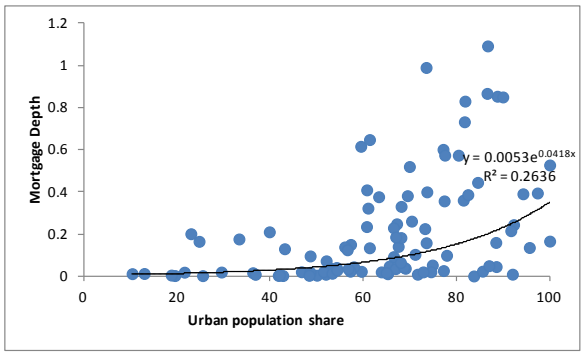


Figure 9 shows a non-linear positive relationship between urbanization and mortgage depth and penetration. A higher share of urban population is conjectured to increase both demand (due to higher mobility and smaller household size) and supply (due to lower delivery cost and more easily protectable creditor rights). On the other hand, a higher degree of urbanization might result in lower use of mortgage finance if most households decide to live in rental apartments rather than houses. Figure 9 shows a positive relationship between urbanization and mortgage finance. Many of the countries with the highest level of urbanization also have among the highest levels of mortgage depth and penetration. While countries with low levels of urbanization have low levels of mortgage depth and housing loan penetration, there is a higher variation in the depth and breadth of mortgage markets across countries with high levels of urbanization.

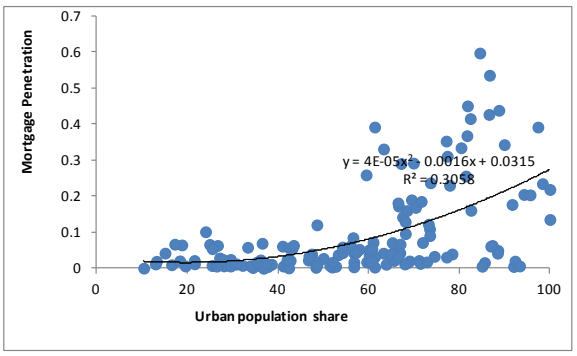
In summary, the depth and breadth of mortgage markets is correlated with several country characteristics in ways predicted by theory. In the following, we will use regression analysis to explore in more depth and more formally which country factors and policies can explain differences in the depth and breadth of mortgage markets.

Figure 9: Mortgage Depth and Penetration vs. Urbanization

Panel A: Mortgage Depth vs. Urbanization



Panel B: Housing Loan Penetration vs. Urbanization



3. What Explains Variation in Housing Finance Across Countries and Over Time?

This section discusses regression analysis of mortgage depth and housing loan penetration across countries and over time. It is important to stress, as we have already done in the Introduction, that we do not imply any causal inference from our analysis. Table 1 presents descriptive statistics for the different explanatory variables that we use, while Table 2 presents correlations of Mortgage Depth and Housing Loan Penetration with the explanatory variables. We note that many of the variables are significantly correlated with the two mortgage finance indicators. We will discuss the different variables as we present the regression results. Tables 3 to7 present cross-sectional regressions of Mortgage Depth (Panel A) and Housing Loan Penetration (Panel B) on an array of socio-economic variables, while Tables 8 to 10 present panel regressions for Mortgage Depth. All regressions were estimated with robust standard errors. In the case of the panel regressions, these standard errors are robust to heteroskedasticity and autocorrelation. For the cross-sectional regressions, we average data over 2006 to 2010, unless noted otherwise.

We first present a baseline regression where we include inflation and the log of the share of urban population.[6] In line with the graphs presented in the previous section, we expect positive (negative) associations of income and urbanization (and inflation) with Mortgage Depth and Penetration, although the three variables are also correlated with each other. Then we test for the significance of several socio-economic variables, including (i) inflation volatility, defined as the standard deviation of inflation over the period 2002 to 2007, (ii) the log of the age dependency ratio, defined as the ratio of population below 15 and above 65 to working population (between 15 and 65), (iii) population growth, and (iv) population density. We expect more volatile inflation to be negatively associated with mortgage market development, while population growth and density are conjectured to be positively associated with mortgage depth and breadth, both through higher demand for housing and more cost-

[6] We use the log of urban population share to control for non-linear relationships between these variables and mortgage depth and housing loan penetration. We include one plus log of inflation to reduce the impact of outliers.

effective financial service delivery. In the following, we also discuss robustness tests, where (i) we include the log of GDP per capita to gauge whether the impact of different country factors simply proxies for the level of economic development, (ii) we exclude high-income countries, as they have significantly more developed mortgage markets than developing countries, and (iii) we include Private Credit to GDP to see whether the empirical relationship of specific country factors with mortgage market development simply reflects the relationship with the general development of financial systems.

The baseline regression in Table 3, column 1 shows that both Mortgage Depth and Housing Loan Penetration are strongly and positively associated with the share of urban population, while inflation is negatively and significantly associated with mortgage market development. In the subsequent regressions, we add one socio-economic variable at a time. We find that the Old (Young) Age Dependency Ratio is positively (negatively) and significantly associated with both Mortgage Depth and Housing Loan Penetration. A higher share of older population thus increases the depth and penetration of housing finance, while younger societies have lower levels of housing finance markets. Inflation volatility is negatively and significantly associated with Mortgage Depth, while positively and significantly with Housing Loan Penetration, which might indicate the use of housing loans (and thus real estate more generally) as a hedge against inflation, where available. Neither population density nor growth is significantly associated with either Mortgage Depth or Housing Loan Penetration. In summary, this suggests that income, inflation, and urbanization are critical predictors of Mortgage Depth confirming the correlations presented in graphic format above. The age structure of the population has important repercussions for the development of housing finance. The R square suggests that our variables can together account for approximately a third of the cross-country variation in Mortgage Depth and Housing Loan Penetration, with a higher share of variation explained in the case of penetration. When we include GDP per capita in our regressions, the explanatory power increases, but some of the variables lose significance or change signs, such as urbanization, which is now negatively associated with Mortgage Depth. Controlling for Private Credit to GDP renders most of the other explanatory variables in the Mortgage Depth and Housing Loan Penetration regressions insignificant. Similarly, limiting our sample to high-income countries reduces the significance of many variables greatly. Across all sample cuts, however, the strong and negative association of inflation with both Mortgage Depth and Housing Loan Penetration holds.

Table 4 shows regressions of Mortgage Depth and Housing Loan Penetration on different indicators of market structure and competitiveness of the banking system as well as indicators of the regulatory frameworks banks face. Specifically, we test whether (i) regulatory restrictions on banks' activities[7], (ii) restrictions on banks' real estate activities, (iii) the share of government-owned banks, (iv) the share of foreign-owned banks, (v) the 3-bank

[7] The index ranges from one to 16 and covers four areas, securities business, real estate investments, insurance activities and ownership on non-financial enterprises, with values taking on 4 if prohibited, 3 if some activities are permissible through subsidiaries, 2 if all activities are permissible through subsidiaries, and 1 if all activities are permissible within bank itself.

concentration ratio, (vi) the H-Statistic of bank competition,[8] and (vii) the Lerner index of banks' market power[9], averaged across banks of each country, are significantly associated with cross-country variation in Mortgage Depth and Penetration. We expect regulatory restrictions have—a priori—an ambiguous relationship with the mortgage market, as they restrict banks from becoming active in this area, but might foster the development of alternative providers of mortgages (and might be driven by their existence), such as housing banks, building societies, or mortgage financing companies, thus specialized lending institutions. It is a priori unclear whether and how bank ownership is associated with mortgage market development. Government-owned banks might have a specific mandate to provide mortgage finance, but might, on the other hand, be less efficient in doing so, especially if they face lack of appropriate funding sources and/or if they face political interference. Foreign banks might be more reluctant to commit to long-term mortgage contracts, but might, on the other hand, have better capacity to manage risks related to long-term financial contracts. Finally, while the relationship between depth and breadth of financial markets and competition has been traditionally conjectured to be a positive one, recent theoretical and empirical work has shown that the opposite is also possible.[10]

The results in Table 4 show that a higher share of government-owned banks is associated with lower Mortgage Depth and Housing Loan Penetration, while variation in foreign bank ownership is not associated with the depth or breadth of the mortgage market. Activity restrictions on banks' activities, especially on their real estate activities, are negatively associated with Mortgage Depth and Penetration. While the Lerner index is negatively and significantly associated with Housing Loan Penetration, suggesting a positive relationship of bank competition with mortgage market development, neither the concentration ratio nor the H-Statistic of competition enters in any of the other regressions significantly at the 5% level. In summary, government ownership is—in line with the literature on financial sector deepening (La Porta et al., 2001; Beck and Levine, 2002) —negatively associated with the development of mortgage markets, as are regulatory restrictions on banks. There is limited evidence for market structure per se and competition to be significantly associated with the development of mortgage finance markets. Undertaking the robustness tests of controlling for GDP per capita or Private Credit to GDP or limiting the sample to high-income countries broadly confirms our findings.

Table 5 presents regressions of Mortgage Depth and Housing Loan Penetration on different indicators of financial structure. Specifically, we explore the empirical relationship between Mortgage Depth and Penetration and (i) Life Insurance Penetration (Premium volume to GDP), (ii) Insurance Assets to GDP, (iii) Stock Market Capitalization to GDP, (iv) Stock Market Turnover, (v) Private Bond Market Capitalization to GDP, and (vi) Public Bond

[8] The H-Statistic measures market power by the extent to which a change in factor input prices translates into changes in revenue. A value of one denotes perfect competition, while values of zero or less denote monopoly equilibrium, with values between zero and one denote monopolistic competition.

[9] The Lerner index is the ratio of the differences between marginal price and cost, and costs. See Beck et al. (2013) for a more detailed discussion of this and other indicators of bank competition.

[10] See Beck, Demirguc-Kunt and Maksimovic (2004) for cross-country work on firms' access to credit and market structure and Berger et al.(2004) for a literature survey.

Market Capitalization. Deep and efficient mortgage markets depend on long-term funding sources, which are rarely available through retail deposits and which come from non-banking financial institutions, including insurance companies and through financial markets. Securitization of mortgage portfolios requires deep and liquid markets, while deep public bond markets might provide the necessary pricing reference with a long yield curve. However, there might also be crowding-out effects from high public debt. We use stock market indicators as proxy gauges for capital market development, as bond market indicators are not available for as large a sample.

The results in Table 5 show that both Mortgage Depth and Housing Loan Penetration increase with the development of the insurance sector. Both Life Insurance Penetration and Insurance Assets to GDP enter significantly and positively in the regressions of both Mortgage Depth and Penetration, confirming that the development of the mortgage market goes hand in hand with the development of this financial sector segment so critical for long-term finance. We also find that a larger stock market is associated with higher Mortgage Depth, but not higher Housing Loan Penetration, while more liquid stock markets are associated with both higher Mortgage Depth and Housing Loan Penetration. While private bond market capitalization to GDP is significantly and positively associated with Housing Loan Penetration, but not Mortgage Depth, public bond market capitalization to GDP is negatively and significantly associated with both Mortgage Depth and Penetration. Undertaking the robustness tests of controlling for GDP per capita or Private Credit to GDP or limiting the sample to high-income countries broadly confirms our findings. In summary, these results confirm the importance of the development of non-bank financial institutions and financial markets for the mortgage segment of the financial system. It is interesting to note, however, that a larger public bond market—often conjectured to provide benchmark interest rates for mortgage finance products—is negatively associated with the depth and penetration of mortgage finance, which might be due to crowding-out effects.

Table 6 presents regressions of Mortgage Depth and Penetration on variables gauging different dimensions of the contractual and information framework in which banks operate. Previous research has shown the importance of the contractual and information frameworks for financial deepening (e.g., Djankov, McLiesh and Shleifer, 2007) and given the long-term nature of mortgage finance, theory suggests that they should be at least as important for the mortgage finance segment. In addition, we explore several housing-specific dimensions of the business environment. Specifically, we relate Mortgage Depth and Penetration to (i) the efficiency of credit registries, (ii) a creditor rights index, (iii) the costs of registering property, (iv) the costs of enforcing contracts, and (v) the number of procedures to obtain a construction permit. All five indicators come from the Doing Business database of the World Bank Group. While we expect a positive relationship between the development of mortgage markets and the efficiency of credit registries and creditor rights, we expect a negative relationship with a more cumbersome business environment and contract enforcement.

The results in Table 6 suggest that Mortgage Depth is higher in countries with a lower number of procedures for construction permits and stronger creditor rights, while it is not significantly associated with cross-country variation in the cost of property registration, cost

of enforcing contracts, and the depth of credit information sharing. Housing Loan Penetration is higher in countries with a lower number of procedures for construction permits, stronger creditor rights, and lower costs of contract enforcement. In summary, there is strong evidence for the importance of creditor rights and effective construction permit procedures, but not for other elements of the institutional framework and business environment. These results suggest a strong role for creditor rights, but not for the informational framework. These findings are consistent with Djankov, McLiesh and Shleifer (2007) who show the importance of credit registries for low-income and contractual frameworks for high-income countries and the fact that mortgage markets do not really take on importance until relatively high levels of income. These findings are confirmed when we undertake the different robustness tests mentioned above, except that the number of construction permits does not enter significantly once we limit the sample to middle- and low-income countries.

Table 7 presents regressions of Mortgage Depth and Penetration on indicators of government's involvement in the mortgage finance system and dummies indicating funding sources of funding for mortgage finance. The index of government involvement is from the IMF's Global Financial Stability Report 2011 and is based on dummy variables indicating whether there are subsidies for first-time or other home buyers upfront or through savings accounts, subsidies for specific income groups, possible use of pension fund savings for home purchases, government guarantees on home loans, tax deductibility of mortgage interest payments, and the existence of government-owned housing banks. The dummy variables indicating primary and secondary source of funding for mortgage finance are from Hofinet and indicate to which extent the primary (or secondary) source of mortgage finance are (i) retail funding through deposits, (ii) wholesale funding through financial markets, (iii) mortgage bonds, or (iv) other sources. Deposit funding of mortgages is connected with the originate-and-hold model and thus provides strong incentives for lenders to properly screen and monitor, but poses challenges in terms of asset-liability mismatch and funding restrictions. Wholesale funding does not pose such funding restrictions, but can misalign incentives as seen during the recent U.S. sub-prime crisis. Mortgage bond financing, finally, combines market financing with originate-and-hold and has proved a relatively stable financing source. We would expect a positive relationship between government participation in the mortgage market and mortgage market development, though this might not be sustainable, while it is a-priori not clear which funding model might be the most appropriate one for mortgage market development. Funding models might also change with the development of the mortgage market over time.

The results in Table 7 suggest that government involvement in the mortgage market is not significantly associated with cross-country variation in Mortgage Depth or Penetration. These regressions, however, are limited to mostly high-income countries, given data restrictions. Mortgage Depth is higher in countries where the primary funding source is mortgage bonds. We also find some evidence that retail funding is associated with higher Mortgage Depth, although the coefficient estimates turn insignificant once we control for the secondary source of funding. Wholesale funding, on the other hand, is not associated with higher Mortgage Depth or Housing Loan Penetration. Our findings are confirmed when we control for GDP

per capita or Private Credit to GDP. Limiting our sample to non-high-income countries, however, produces a negative and significant sign on Mortgage Bond Funding, suggesting that mortgage bonds as primary funding source is negatively associated with Mortgage Depth. In unreported robustness tests, we also consider the individual components of the Government Participation Index. We find capital gains tax deductibility is positively and significantly associated with Mortgage Depth, while subsidies to buyers through savings account distribution enter negatively and significantly (at the 10% level). Subsidies for low- and middle-income groups, the option to withdraw from pension and provident fund for house purchase, and state-owned housing finance institutions are negatively and significantly associated with Housing Loan Penetration, while capital gain tax deductibility again enters positively and significantly. It is important to stress again, that the sample for these regressions is mostly high-income countries and that we cannot infer any causality from these regressions.

We gauge the robustness of our Mortgage Depth regressions with fixed effects panel regressions.[11] As discussed above, the panel is highly unbalanced; in order to reduce the impact of this, we present regressions for a sample of countries with at least three observations and confirm our results with a more restricted sample of countries with at least 10 observations. We only use regressors with sufficient annual variation. We use fixed effects panel regressions to control for unobserved country-specific effects, having confirmed with Hausman tests that the random effects model is not appropriate in our sample.

The results in Table 8 show that increases in the urban population share are associated with increases in Mortgage Depth. We also find that higher population growth and density are associated with increases in Mortgage Depth, while the old (young) age dependency ratio enters positively (negatively) and significantly, in line with the cross-sectional results. While inflation does not enter significantly in these regressions, we find a positive effect of inflation volatility.

The results in Table 9 show that—within countries over time—a stronger insurance sector, as measured by Insurance Assets to GDP, a more liquid stock market, and higher private and public bond market capitalization are associated with deeper mortgage markets. Finally, the results in Table 10 indicate that improvements in creditor rights and credit information sharing are associated with deepening of mortgage markets, while within-country variation of none of the other indicators of the business environment is associated with deeper mortgage markets. It is interesting to note that in the panel regressions we find a significant relationship between the efficiency of credit registries and mortgage market, a relationship that is insignificant in the cross-sectional regressions.

In summary, the panel regressions confirm—where possible—many of our findings of the cross-sectional regressions using within-country variation. Compared to cross-sectional regressions, fixed effects regressions allow controlling for time-invariant unobserved effects and thus for omitted variable bias. Nonetheless, concerns of persistence and auto-correlation in the dependent variables pose new challenges. These regressions should therefore not be

[11] Since we have data for Housing Loan Penetration for only one year (2011), panel regressions are not possible.

interpreted in a causal sense. Longer time series for a more limited sample of countries might allow tests of Granger causality for specific variables.

4. Benchmarking Housing Finance

This section discusses a benchmarking exercise with our two housing finance indicators and follows Beck et al. (2008) and Barajas et al. (2013). Specifically, we want to compare countries' depth and penetration of mortgage markets taking into account country factors that are outside policy makers' reach, at least in the short-term. Such an exercise also recognizes that a mortgage market can grow too big for the benefit of a society and beyond a sustainable size, often resulting in a banking crisis.

This exercise is also related to the conceptual framework of the access possibilities and financial depth frontier (Beck and de la Torre, 2007; Barajas et al., 2013).[12] This conceptual framework starts from the observations that transaction costs and—both idiosyncratic and systemic—risk constitute the main market frictions in financial sector development. The extent to which financial institutions and markets can overcome these frictions is a function of both country-level constraints, such as the macroeconomic environment, institutional development, market size, and demographic factors, as well as competitive market pressures and regulatory policies. Taking into account certain state variables that cannot be changed in the short term and that include both the structural variables mentioned above as well as long-term institutional factors, we can define a frontier as the constrained optimum for the mortgage market, both in terms of depth and in terms of penetration. This will then allow us to determine the "location" of a country's mortgage finance system relative to the frontier. Broadly speaking, we can differentiate between three different scenarios; first, a frontier that is low due to either structural country characteristics or institutional factors; second, mortgage depth or penetration below the frontier due to regulatory restrictions or lack of competition; and third, mortgage depth or penetration beyond the frontier at an unsustainable equilibrium, due to government interference or a housing boom.

We follow Beck et al. (2008) and regress our two indicators on a set of non-policy country factors. We do this both for the cross-sectional sample with data averaged over the period 2006 to 2010 and the unbalanced panel version, using all available data for 1995 to 2010. Specifically, we regress the log of Mortgage Depth and the log of Penetration on (i) log of GDP per capita and its square—to thus account for possible non-linearities, (ii) log of population to proxy for market size, (iii) population density to proxy for the ease of service provision, (iv) the young and the old age dependency ratios to control for demographic trends and corresponding savings trends, and (v) an off-shore center dummy, a transition country dummy, and an oil-exporting country dummy to account for specific country circumstances. The results of the three regressions are reported in Table 11.

The results in Table 11 show a convex relationship between GDP per capita and Mortgage Depth and Penetration in the cross-sectional regressions, with log of GDP per capita entering

[12] See also Porteous, (2005) for a similar concept and Melzer(2006) for an application of the access frontier to South Africa

negatively and its square entering positively though neither of the two coefficients enters significantly at the 5% level. In the panel regressions, on the other hand, we find a concave relationship between GDP per capita and Mortgage Depth. As most of the time-series variation comes from high-income countries, this result suggests that the positive relationship between GDP per capita and Mortgage Depth decreases at higher income levels. None of the other explanatory variables enters significantly in the Housing Loan Penetration regression, with the exception of the transition dummy, which enters negatively and significantly at the 10% level. Overall, the benchmarking model performs quite poorly for Housing Loan Penetration, with an R square of only 42%. The model performs considerably better for Mortgage Depth, especially the panel version. Total population, our gauge of country size enters positively and significantly in the panel regression, providing evidence for scale effects. Higher population density is negatively and significantly associated with Mortgage Depth in the panel regression. A higher share of older dependent population enters positively and significantly in the panel regression, while the share of younger dependents enters negatively and significantly in both the cross-sectional and the panel regression. The off-shore dummy enters positively and significantly in both panel and cross-sectional regressions, while the transition dummy enters negatively and significantly. The oil-exporting country dummy, finally, enters negatively in both cross-sectional and panel regressions, but not significantly.

The predicted values of this regression indicate a structural depth or penetration for the mortgage market, i.e. a level of mortgage market development, consistent with socio-economic and demographic characteristics of the host economy. It is important to note the difference between this structural line and the actual frontier as the constrained optimum as the benchmarking exercise does not take into account long-term institutional factors.[13] Next, we compute the Housing Finance Gap computing the difference between the predicted and the actual value of Housing Finance Depth and Penetration. A positive value therefore indicates that the actual value is below the predicted value or that Mortgage Depth or Penetration is below the structural depth or penetration line, while a negative value indicates that the actual is above the predicted value, which might be a potential warning sign of an unsustainable housing boom. Mortgage Depth and Penetration Gaps based on both the cross-sectional and the panel regressions are reported in Appendix Table A3, where for the panel version we use the predicted and actual values for 2006-2010 averages.[14]

Figure 10 presents the predicted and actual values of Mortgage Depth across different World Bank regions, while Figure 11 presents them across income groups, using cross-sectional regressions, averaged over 2006 to 2010. As before, we use medians rather than averages to reduce the impact of outliers. We find that Mortgage Depth is above its predicted value in East Asia and Pacific and the Middle East and North Africa region, while it is at the predicted value in Europe and Central Asia, South Asia and Sub-Saharan Africa. On the other hand, it is below its predicted value in Latin America. The variation of the Mortgage Depth Gap

[13] It is important to note that unlike the structural depth or penetration, the frontier is a concept that varies with the time horizon, i.e. certain institutions and policies are part of a shorter-term frontier but not of a longer-term frontier. See Barajas et al. (2013) for a more detailed discussion on this.

[14] In a few cases, the predicted value is negative and we therefore censor the values at zero.

across income groups is consistent with this variation, with the upper-middle-income group being the only group where the actual median value is below the predicted value.

Figure 10: Predicted and actual values of Mortgage Depth by region

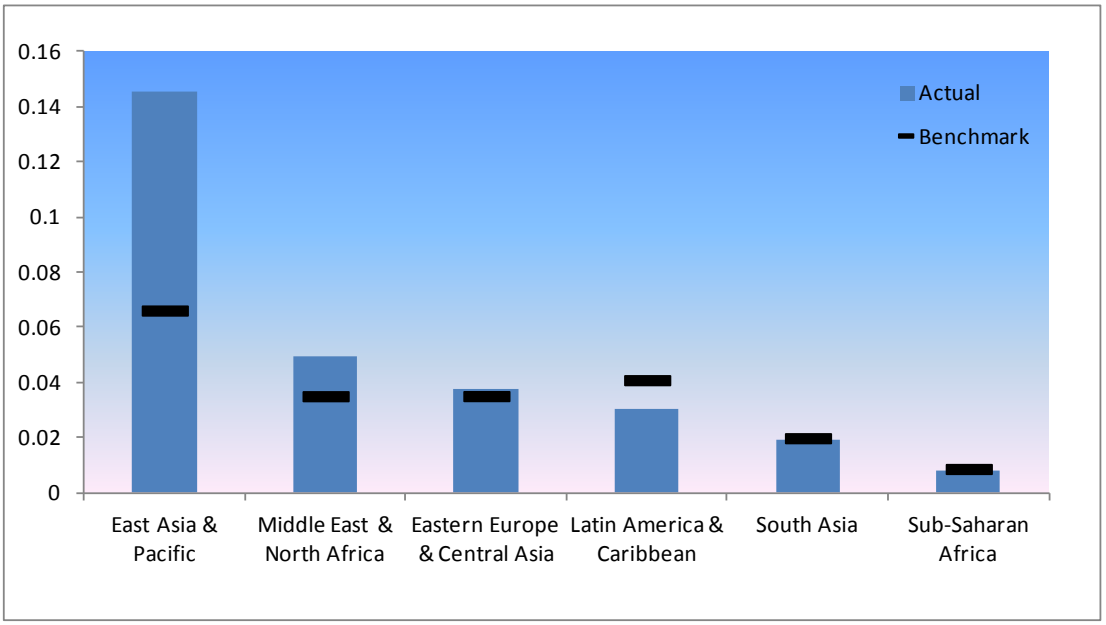
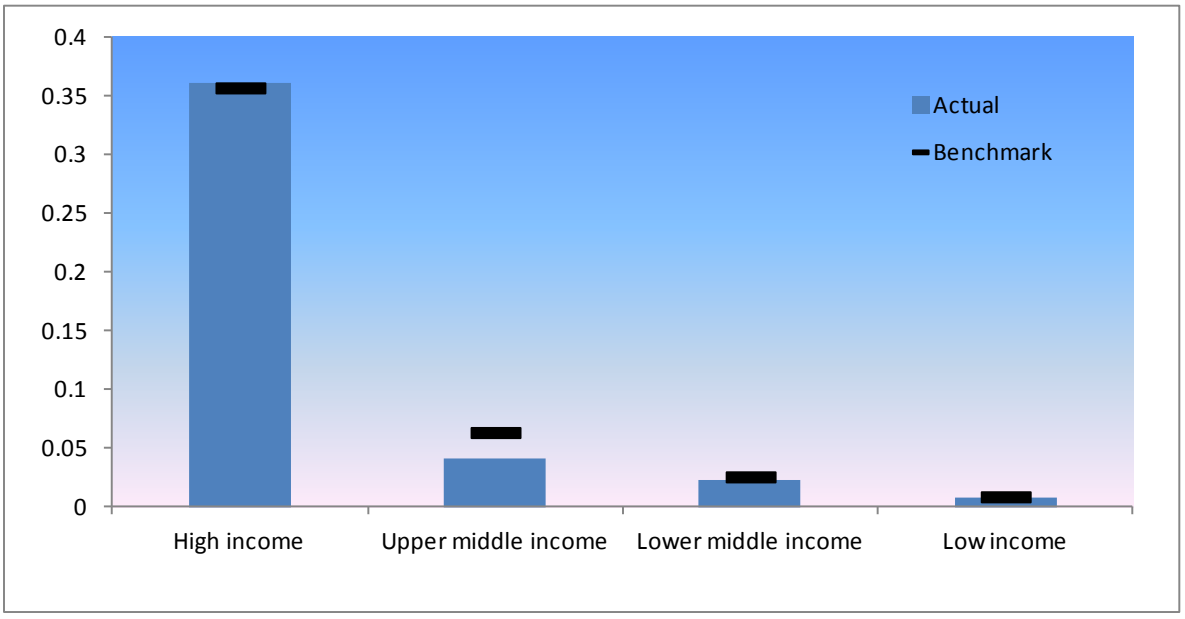


Figure 11: Predicted and actual values of Mortgage Depth by World Bank region



Figures 12 and 13 present the Housing Loan Penetration Gaps across regions and income groups, respectively. We find that Housing Loan Penetration is at its predicted level in Europe and Central Asia and in Sub-Saharan Africa, while it is well below in Latin America. In the Middle-East and North Africa region, East Asia and Pacific, and South Asia, the actual

Housing Loan Penetration is above the predicted level. When considering the difference between the actual and predicted levels of Housing Loan Penetration across income groups, we cannot find any significant difference across any of the income groups.

Figure 12: Housing Loan Penetration gaps across World Bank regions

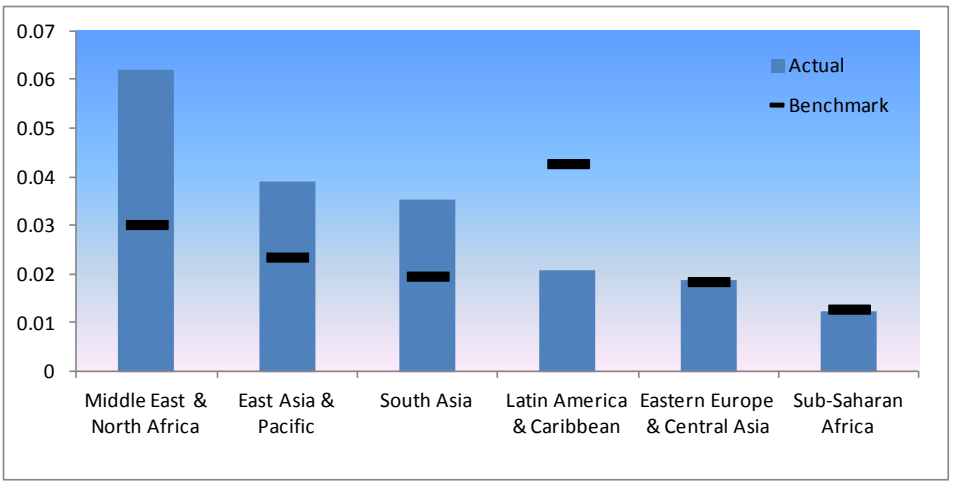
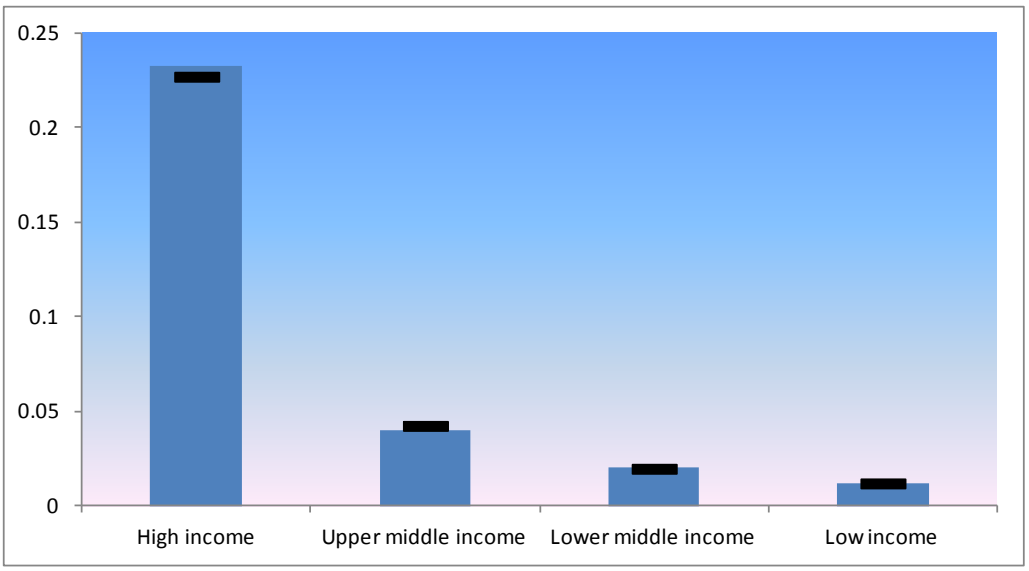


Figure 13: Housing Loan Penetration gaps across income groups



Considering medians across regional or income groups ignores the large variation within each of these groups. Gauging Mortgage Depth Gaps across countries shows that many of the countries with mortgage finance systems beyond the value predicted by structural factors are in high-income countries. The composition of the group with mortgage finance systems below the structural depth line, on the other hand, is very diverse, including high-income countries such as Germany, Italy, and Japan; transition economies such as Czech Republic, Poland, and Slovak Republic; and emerging markets such Argentina and Brazil. Low-income countries, such as Burkina Faso, Burundi, Ghana, Kenya, Nicaragua, Tanzania, Togo,

Uganda, and Uzbekistan, have Mortgage Gaps that are close to zero, i.e. the development of their mortgage finance system is approximately at the level predicted by structural factors.

Gauging the Housing Loan Penetration Gap across countries provides a similar picture. The countries with the highest positive or negative gaps are high-income countries, with Japan and Hong Kong SAR, China leading on the positive side, i.e. actual Housing Loan Penetration being significantly below its predicted level, while Netherlands, Denmark, Sweden, and New Zealand lead on the negative side, i.e. with actual levels of Housing Loan Penetration being well above their predicted levels. Among the countries whose actual Housing Loan Penetration is close to the predicted value are diverse economies such as the UK, Kenya, Honduras, Singapore, and China.

Considering variation within groups and within countries over time also provides interesting comparisons. Germany had positive Mortgage Gaps throughout the 2000s, suggesting a mortgage finance system below the structural depth line, while both Denmark and the Netherlands had high negative Mortgage Depth Gaps, suggesting mortgage finance systems that have grown well beyond the value predicted by structural factors.

The Mortgage Frontier concept also implies that the mortgage market can overheat. Several periphery countries of the Eurozone had negative gaps, i.e. actual values of Mortgage Depth above the predicted value in the years leading up to the 2008 crisis. Ireland started having negative gaps in 2000, increasing from originally three percentage points to well above 20 percentage points after 2004. Similarly, Portugal's Mortgage Gap turned negative in 1997, reaching 27 percentage points in 2007. Spain's Mortgage Gap also reached -19 percentage points in 2010. On the other hand, Greece's Mortgage Depth Gap was positive throughout the period for which we have data.

Table 12 presents correlations of the three mortgage gap variables with some of the variables discussed in the previous section. Specifically, we would like to gauge whether the market structure and competitiveness of the banking system, the structure of the financial system, regulatory policies, institutional variables, and government participation and the funding structure of the mortgage finance systems can explain the difference between the actual and the predicted value of Mortgage Depth and Penetration. We would like to stress that these are correlations that do not imply any causal relationships. Also these correlations are relative to the structural depth line and not to the possibilities frontier, i.e. do not allow making inferences on overshooting. While we use the same regressors as in the previous section, the results have a different interpretation as here we control for a full set of socio-economic country factors and thus for the "natural" level of mortgage depth or penetration.

The correlations in Table 12 point to several public policy areas that might restrict mortgage markets from growing to their predicted size. We find that regulatory restrictions on banks being involved in real estate activities are associated with mortgage finance systems being below the structural depth line, i.e. not exploiting their possibilities. Similarly, larger public bond markets are associated with mortgage finance systems being below the structural depth

line, but also being below the structural penetration line. We also find reliance on retail funding retains a mortgage finance system below the structural penetration line.

The correlations in Table 12 also point to several public policy areas which can help the mortgage market beyond the structural depth and penetration lines. More developed insurance sectors and stock markets are associated with mortgage depth moving beyond the structural depth line, as are stronger creditor rights and a more effective credit information sharing system. There is also evidence that the use of wholesale funding and mortgage bonds as second most important funding source for the mortgage market is associated with mortgage systems moving beyond their structural depth line. Overall, many of these correlations are in line with the regression results of Section 3, with the notable exception of funding sources.

5. Conclusions and Looking Forward

This paper presented new data on mortgage depth and penetration across countries. We related this cross-country (and time-series in the case of Mortgage Depth) variation to variation in different socio-economic, policy and mortgage market specific variables. We also used an established benchmarking exercise to compare actual values of mortgage market development to values predicted by structural country factors.

We find a large variation across both dimensions of mortgage market development, both across countries but also—in terms of depth—within countries. Mortgage markets seem to develop only at relatively high levels of GDP per capita. Policies associated with financial system development are also associated with mortgage market development, including price stability and the efficiency of contractual and information frameworks. We find that the development of the insurance sector and the stock market, sources of long-term funding, is strongly associated with mortgage market development, while government subsidies and support are not. Similarly, the benchmarking exercise shows a large variation across countries and over time in the gap between predicted and actual values in mortgage depth and penetration.

Our findings are in line with the literature on policies and institutions to foster financial deepening. Specifically, monetary stability has been found to be a strong predictor of mortgage market development as have been specific dimensions of the contractual and information frameworks. Similarly, the negative relationship between government ownership and financial deepening identified by previous work also holds for mortgage market development, while there is no consistent relationship between competition and mortgage market development. However, we also find an important role for socio-economic factors, most importantly economic development as a driver for the development of mortgage markets.

Since our empirical findings are correlations rather than causal inferences, it is hard to draw policy conclusions. However, the empirical relationships that we identified allow us to make predictions about the development of mortgage markets in many low- and middle-income countries. Take the example of the strong empirical relationship between mortgage finance

development and the development of the insurance sector and capital markets. This suggests that it will be difficult to develop a mortgage finance systems in countries with banks-only financial systems, such as in many smaller Sub-Saharan African countries. This does not imply that mortgage market development is an elusive goal for these countries, but rather that it should be part of a more comprehensive financial sector strategy that aims at "lengthening financial contracts." Our results, however, are also consistent with previous work on the "income elasticity" of specific financial system segments—well-developed mortgage markets seem to be a "luxury good" that develops relatively late in the financial development process. The insignificant relationship between government subsidies and support and the development of the mortgage finance system and the negative relationship between government ownership of banks and mortgage market development shed doubt on the role of interventionist government policies in developing mortgage markets.

There are several venues for further research. First, our analysis has been reduced to two mortgage market indicators—volume and client base—and a few rather crude indicators of the funding structure of mortgage markets and government subsidies and support. Future data collection work should focus on additional important dimensions of the mortgage market, including maturity structure, loan-to-value ratios, range of financing products, loan currency, and structure of mortgage providers. Similarly, contrasting different funding mechanisms with more detailed data will be important. Related to this, information on regulatory and taxation policies related to mortgage markets would be useful, including the deductibility of interest payments, legal or regulatory limits on loan-value ratios or other contract terms, stamp duties or taxes, and other rules. Collecting such detailed data might also give insights into the multiple outlier countries that we have found in our analysis but not discussed in depth. Given the critical importance of the housing finance sector (for households and as part of the long-term financing agenda, but also being at the core of many banking crises), there is a surprising dearth of data. Some institutions have recently started systematic data collection efforts, including the BIS on housing prices and HOFINET on characteristics of mortgage markets, but these are still limited to a relatively small number of countries.[15] Several household surveys, such as the Life in Transition survey by the EBRD, include questions on housing finance, but—similar to the Global Findex—do not include survey components with more detailed questions on mortgage contract details or different sources for housing finance.

Second, a more in-depth exploration of policies that can foster mortgage market development is warranted. This implies collection of more detailed data on specific policies affecting the development of mortgage markets, but also exploiting specific policy changes to address the identification challenge.[16] Exploiting the differential or staggered introduction of specific rules across sub-national units and/or differential applications across different borrower groups allows controlling for other unobservable effects and is thus a substantial step towards causal inference.

[15] For BIS data, see: http://www.bis.org/statistics/pp.htm for Hofinet, see: http://www.hofinet.org/index.aspx

[16] There is an extensive and still growing literature on linking specific changes in the contractual framework with expansion of access to credit. Most of these studies are limited to individual countries, however, but often exploit sub-national variation. See for example, Chemin (20120 and Visaria (2009) on India, Gine and Love (2010) on Colombia, and Araujo, Ferreira and Funchal (2012) and Costa and de Mello (2006) for Brazil.

Third, the recent experience has shown both the bright and dark sides of financial deepening, a trade-off that also applies to the mortgage market as much as to other segments of the financial systems, especially as housing boom and bust cycles have been at the center of the recent financial crises in the U.S., Ireland, and Spain. Developing the benchmarking model that we introduced above further to be able to properly gauge the "temperature" of the mortgage market is an important extension. Such an expansion of the benchmarking exercise would require, however, more detailed data on the mortgage market as detailed above, including price data and longer time series.

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Table 1: Descriptive statistics of cross-sectional data

	Mortgage Depth Regressions					Housing Loan Penetration Regressions				
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Basic Model										
Mortgage Depth	96	0.2	0.3	0.0	1.1	140	0.1	0.1	0.0	0.6
GDP per capita (in logs)	96	8.5	1.5	4.7	10.9	140	7.8	1.6	4.6	10.9
Urban population share (in logs)	96	4.1	0.4	2.3	4.6	140	4.0	0.5	2.3	4.6
Inflation (in logs)	96	0.1	0.0	0.0	0.1	140	0.1	0.4	0.0	4.9
Socioeconomic Variables										
Inflation volatility	95	2.9	2.6	0.6	18.7	139	121.9	1,398	0.6	16,485.7
Age dependency ratio (in logs)	96	3.9	0.3	3.0	4.6	140	4.0	0.3	3.0	4.7
Population growth (annual %)	96	1.3	2.0	-0.8	15.2	140	1.5	1.8	-0.8	15.2
Population density (in logs)	96	4.4	1.5	0.5	9.8	140	4.2	1.4	0.5	8.8
Banking Sector Variables										
Government-Owned Banks	88	15.2	20.9	0.0	92.9	112	15.9	21.0	0.0	92.9
Foreign-Owned Banks	88	36.7	30.8	0.0	99.1	112	38.1	30.5	0.0	100.0
Overall Activities Restrictiveness	90	9.9	2.3	4.5	16.0	121	10.1	2.2	4.5	16.0
Bank Concentration - Assets	90	68.7	19.1	27.5	100.0	117	69.7	18.6	27.5	100.0
Real Estate	91	2.8	1.1	1.0	4.0	123	2.9	1.0	1.0	4.0
H-statistic	69	0.6	0.2	0.0	1.3	86	0.6	0.2	0.0	1.3
Lerner Index	81	0.2	0.1	0.0	0.6	109	0.2	0.1	-0.1	0.6
Financial Markets Variables										
Insurance Premiums (Life) / GDP (%)	94	1.9	2.4	0.0	11.9	131	1.5	2.3	0.0	11.9
Insurance Company Assets / GDP (%)	79	19.3	24.9	0.3	95.8	101	14.5	22.0	0.1	95.8
Stock Market Capitalization / GDP (%)	80	64.7	52.3	1.2	258.7	96	61.1	66.9	0.6	516.4
Stock Market Turnover Ratio (%)	80	58.8	59.7	0.0	245.0	96	53.6	58.8	0.0	245.0
Private Bond Market Capitalization / GDP	38	0.4	0.6	0.0	3.6	38	0.3	0.3	0.0	1.5
Public Bond Market Capitalization / GDP	44	0.4	0.3	0.0	1.6	45	0.4	0.3	0.0	1.6
Institutional Variables										
Dealing with Construction Permits - Procedures (number)	93	17.7	8.4	5.0	61.4	139	17.2	7.5	5.0	61.4
Registering Property - Cost (% of property value)	93	4.8	4.1	0.1	22.2	139	6.5	5.5	0.0	28.6
Enforcing Contracts - Cost (% of claim)	93	27.6	19.8	7.7	142.4	139	34.2	26.3	9.0	151.8
Getting Credit - Strength of legal rights index (0-10)	93	6.2	2.3	1.0	10.0	139	5.4	2.5	1.0	10.0
Getting Credit - Depth of credit information index	93	3.6	2.0	0.0	6.0	139	3.1	2.0	0.0	6.0
Mortgage Market Variables										
Index of Government Participation in Housing Finance Markets	31	0.4	0.2	0.1	0.8	31	0.4	0.2	0.1	0.8
Dummy, equal to one if primary funding source is retail	96	0.2	0.4	0.0	1.0	140	0.1	0.3	0.0	1.0
Dummy, equal to one if primary funding source is wholesale	96	0.0	0.2	0.0	1.0	140	0.0	0.1	0.0	1.0
Dummy, equal to one if primary funding source is mortgage bonds	96	0.0	0.2	0.0	1.0	140	0.0	0.1	0.0	1.0
Dummy, equal to one if secondary funding source is retail	96	0.0	0.2	0.0	1.0	140	0.0	0.1	0.0	1.0
Dummy, equal to one if secondary funding source is wholesale	96	0.1	0.3	0.0	1.0	140	0.1	0.3	0.0	1.0
Dummy, equal to one if secondary funding source is mortgage bonds	96	0.0	0.1	0.0	1.0	140	0.0	0.1	0.0	1.0

Table 2: Correlation between mortgage debt, penetration, and regressors[a]

	Mortgage depth	Housing Loan Penetration
Mortgage depth	1	
Housing Loan Penetration	0.8711*	1
GDP per capita (in logs)	0.6480*	0.7195*
Urban population share (in logs)	0.079	0.0974
Inflation (in logs)	-0.5340*	-0.0972
Inflation volatility	-0.3530*	-0.0546
Age dependency ratio (in logs)	-0.1625	-0.3530*
Population growth (annual %)	-0.1327	-0.021
Population density (in logs)	0.0275	0.0774
Government-Owned Banks	-0.3175*	-0.2489*
Foreign-Owned Banks	-0.1117	-0.1675
Overall Activities Restrictiveness	-0.4192*	-0.3949*
Bank Concentration - Assets	0.0703	-0.0299
Real Estate	-0.3106*	-0.2532*
H-statistic	0.0562	0.0078
Lerner Index	-0.2745*	-0.1832
Insurance Premiums (Life) / GDP (%)	0.6717*	0.6013*
Insurance Company Assets / GDP (%)	0.7964*	0.8161*
Stock Market Capitalization / GDP (%)	0.4957*	0.3261*
Stock Market Turnover Ratio (%)	0.5496*	0.5141*
Private Bond Market Capitalization / GDP	0.2902	0.7295*
Public Bond Market Capitalization / GDP	-0.079	0.0299
Dealing with Construction Permits - Procedures (number)	-0.3902*	-0.3150*
Registering Property - Cost (% of property value)	-0.1036	-0.1810*
Enforcing Contracts - Cost (% of claim)	-0.2583*	-0.2934*
Getting Credit - Strength of legal rights index	0.4195*	0.3765*
Getting Credit - Depth of credit information index	0.3485*	0.2976*
Index of Government Participation in Housing Finance Markets	-0.1858	-0.2783
Dummy, equal to one if primary funding source is retail	0.2403*	0.1815*
Dummy, equal to one if primary funding source is wholesale	-0.0419	-0.0757
Dummy, equal to one if primary funding source is mortgage bonds	0.3094*	0.2355*
Dummy, equal to one if secondary funding source is retail	0.127	0.0681
Dummy, equal to one if secondary funding source is wholesale	0.2374*	0.1928*
Dummy, equal to one if secondary funding source is mortgage bonds	0.2644*	0.1463

[a] * indicates significance at the 5% level.

Table 3: Results for cross-sectional regression (Socioeconomic variables)

	Panel A Mortgage Depth						Panel B Mortgage Penetration					
VARIABLES	**I**	**II**	**III**	**IV**	**V**	**VI**	**I**	**II**	**III**	**IV**	**V**	**VI**
Urban population share (in logs)	0.124***	0.132***	0.0672	0.0726	0.117***	0.121***	0.113***	0.0854***	0.0746***	0.0694***	0.111***	0.114***
	(0.0408)	(0.0423)	(0.0415)	(0.0511)	(0.0425)	(0.0414)	(0.0186)	(0.0163)	(0.0178)	(0.0164)	(0.0191)	(0.0182)
Inflation (in logs)	-3.591***	-3.115***	-2.964***	-3.430***	-3.690***	-3.678***	-0.0241*	-1.350***	-0.0182*	-0.0152	-0.0264**	-0.0219
	(0.566)	(0.590)	(0.511)	(0.583)	(0.662)	(0.593)	(0.0137)	(0.250)	(0.0101)	(0.0111)	(0.0116)	(0.0134)
Inflation volatility		-0.0146***						0.00157***				
		(0.00528)						(0.000294)				
Age dependency ratio- Old (in logs)			0.133***						0.0689***			
			(0.0325)						(0.0192)			
Age dependency ratio- Young (in logs)				-0.0927**						-0.0788***		
				(0.0449)						(0.0161)		
Population growth (annual %)					-0.00441						-0.0126	
					(0.0232)						(0.00831)	
Population density (in logs)						-0.00877						0.00760
						(0.0147)						(0.00704)
Constant	-0.115	-0.131	-0.251	0.415	-0.0783	-0.0603	-0.353***	-0.164***	-0.358***	0.116	-0.337***	-0.389***
	(0.167)	(0.173)	(0.157)	(0.331)	(0.175)	(0.185)	(0.0674)	(0.0626)	(0.0621)	(0.0971)	(0.0690)	(0.0681)
Observations	96	94	95	95	84	96	142	137	142	142	129	142
R-squared	0.332	0.362	0.413	0.345	0.323	0.334	0.209	0.336	0.307	0.281	0.228	0.216

Note: Panel A cross-sectional regressions are estimated with variables averaged over the 2006-2010 period. Results presented in Panel B are estimated with 2011 dependent variable as a function of averaged lagged regressors over the 2006-2010 period. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 4: Results for cross-sectional regression (Banking Sector)

	Panel A Mortgage Depth								Panel B Mortgage Penetration							
VARIABLES	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Urban population share (in logs)	0.124***	0.140***	0.138***	0.0917**	0.151***	0.132***	0.169*	0.155***	0.113***	0.119***	0.121***	0.0955***	0.133***	0.113***	0.0836**	0.0868***
	(0.0408)	(0.0394)	(0.0437)	(0.0419)	(0.0441)	(0.0421)	(0.0906)	(0.0582)	(0.0186)	(0.0195)	(0.0210)	(0.0182)	(0.0226)	(0.0195)	(0.0325)	(0.0230)
Inflation (in logs)	-3.591***	-3.414***	-3.582***	-3.470***	-3.568***	-3.418***	-4.369***	-4.018***	-0.0241*	-0.0252**	-0.0238*	-0.0259**	-0.0198	-0.0261**	-1.799***	-1.475***
	(0.566)	(0.562)	(0.566)	(0.542)	(0.568)	(0.549)	(0.798)	(0.655)	(0.0137)	(0.0118)	(0.0130)	(0.0123)	(0.0129)	(0.0122)	(0.389)	(0.270)
Government-Owned Banks		-0.00283***								-0.00147***						
		(0.000737)								(0.000408)						
Foreign-Owned Banks			-0.000744								-0.000624					
			(0.000738)								(0.000389)					
Overall Activities Restrictiveness				-0.0307***								-0.0173***				
				(0.00958)								(0.00441)				
Bank Concentration - Assets					0.00182								0.00102			
					(0.00116)								(0.000688)			
Real Estate						-0.0531**								-0.0274**		
						(0.0242)								(0.0108)		
H-statistic							0.0993								-0.0522	
							(0.121)								(0.0835)	
Lerner Index								-0.651***								-0.241**
								(0.205)								(0.0973)
Constant	-0.115	-0.140	-0.138	0.325	-0.348	0.00249	-0.321	-0.0512	-0.353***	-0.346***	-0.354***	-0.101	-0.498***	-0.267***	-0.0921	-0.0929
	(0.167)	(0.162)	(0.186)	(0.221)	(0.211)	(0.193)	(0.389)	(0.250)	(0.0674)	(0.0698)	(0.0777)	(0.0852)	(0.116)	(0.0816)	(0.135)	(0.0972)
Observations	96	88	88	90	90	91	69	81	142	112	112	121	117	123	86	109
R-squared	0.332	0.418	0.361	0.422	0.369	0.402	0.349	0.399	0.209	0.273	0.242	0.289	0.242	0.252	0.358	0.361

Note: Panel A cross-sectional regressions are estimated with variables averaged over the 2006-2010 period. Results presented in Panel B are estimated with 2011 dependent variable as a function of averaged lagged regressors over the 2006-2010 period. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 5: Results for Cross-sectional regressions (Financial Sector)

	Panel A							Panel B						
	Mortgage Depth							Home Loan Penetration						
VARIABLES	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**
Urban population share (in logs)	0.124***	0.0946***	0.0742**	0.0892*	0.117**	0.178	0.305**	0.113***	0.0655***	0.0349**	0.0589***	0.0568**	0.119**	0.198***
	(0.0408)	(0.0351)	(0.0292)	(0.0530)	(0.0537)	(0.123)	(0.129)	(0.0186)	(0.0142)	(0.0135)	(0.0213)	(0.0220)	(0.0545)	(0.0677)
Inflation (in logs)	-3.591***	-1.839***	-1.032**	-3.468***	-2.951***	-6.661***	-7.521***	-0.0241*	-0.725***	-0.368*	-1.606***	-1.291***	-1.189**	-2.010***
	(0.566)	(0.501)	(0.459)	(0.608)	(0.652)	(1.542)	(1.454)	(0.0137)	(0.228)	(0.189)	(0.360)	(0.333)	(0.454)	(0.548)
Insurance Premiums (Life) / GDP (%)		0.0554***							0.0253***					
		(0.0105)							(0.00703)					
Insurance Company Assets / GDP (%)			0.00729***							0.00441***				
			(0.00118)							(0.000573)				
Stock Market Capitalization / GDP (%)				0.00159***							0.000230			
				(0.000454)							(0.000253)			
Stock Market Turnover Ratio (%)					0.00161***							0.000820***		
					(0.000400)							(0.000197)		
Private Bond Market Capitalization / GDP						0.126							0.283***	
						(0.0777)							(0.0509)	
Public Bond Market Capitalization / GDP							-0.357***							-0.0169
							(0.130)							(0.0653)
Constant	-0.115	-0.190	-0.180	-0.0584	-0.189	-0.220	-0.557	-0.353***	-0.158***	-0.0825	-0.0397	-0.0794	-0.363	-0.573**
	(0.167)	(0.140)	(0.118)	(0.218)	(0.230)	(0.516)	(0.523)	(0.0674)	(0.0546)	(0.0531)	(0.0907)	(0.0959)	(0.219)	(0.277)
Observations	96	94	79	80	80	38	44	142	131	101	96	97	38	45
R-squared	0.332	0.534	0.661	0.452	0.475	0.412	0.419	0.209	0.486	0.708	0.353	0.443	0.617	0.342

Note: Panel A cross-sectional regressions are estimated with variables averaged over the 2006-2010 period. Results presented in Panel B are estimated with 2011 dependent variable as a function of averaged lagged regressors over the 2006-2010 period. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 6: Results for cross-sectional regressions (Institutional variables)

	Panel A						Panel A					
	Mortgage Depth						Homer Loan Penetration					
VARIABLES	I	II	III	IV	V	VI	I	II	III	IV	V	VI
Urban population share (in logs)	0.124***	0.138***	0.119***	0.104**	0.118***	0.0960**	0.113***	0.112***	0.109***	0.0981***	0.102***	0.101***
	(0.0408)	(0.0426)	(0.0413)	(0.0444)	(0.0411)	(0.0478)	(0.0186)	(0.0179)	(0.0191)	(0.0185)	(0.0164)	(0.0212)
Inflation (in logs)	-3.591***	-2.893***	-3.617***	-3.545***	-3.382***	-3.420***	-0.0241*	-0.0282**	-0.0200	-0.0249*	-0.0300**	-0.0196
	(0.566)	(0.526)	(0.586)	(0.564)	(0.525)	(0.598)	(0.0137)	(0.0112)	(0.0147)	(0.0130)	(0.0116)	(0.0133)
Dealing with Construction Permits - Procedures (number)		-0.00771***						-0.00528***				
		(0.00262)						(0.00129)				
Registering Property - Cost (% of property value)			-0.00401						-0.00121			
			(0.00503)						(0.00142)			
Enforcing Contracts - Cost (% of claim)				-0.00134						-0.000674***		
				(0.000866)						(0.000239)		
Getting Credit - Strength of legal rights index (0-10)					0.0416***						0.0171***	
					(0.00909)						(0.00361)	
Getting Credit - Depth of credit information index						0.0168						0.00578
						(0.0116)						(0.00513)
Constant	-0.115	-0.0672	-0.0739	0.00191	-0.359*	-0.0686	-0.353***	-0.258***	-0.329***	-0.269***	-0.398***	-0.322***
	(0.167)	(0.174)	(0.176)	(0.185)	(0.193)	(0.178)	(0.0674)	(0.0604)	(0.0718)	(0.0688)	(0.0685)	(0.0713)
Observations	96	93	93	93	93	93	142	141	141	141	141	141
R-squared	0.332	0.387	0.335	0.340	0.464	0.343	0.209	0.305	0.208	0.222	0.319	0.212

Note: Panel A cross-sectional regressions are estimated with variables averaged over the 2006-2010 period. Results presented in Panel B are estimated with 2011 dependent variable as a function of averaged lagged regressors over the 2006-2010 period. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 7: Results for cross-sectional regression (Mortgage market structure)

	Panel A				Panel A			
	Mortgage Depth				Home Loan Penetration			
VARIABLE	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Urban population share (in logs)	0.124***	0.420**	0.101**	0.0922**	0.113***	0.209**	0.101***	0.0971***
	(0.0408)	(0.155)	(0.0396)	(0.0375)	(0.0186)	(0.0792)	(0.0172)	-0.0174
Inflation (in logs)	-3.591***	-3.645**	-3.646***	-3.455***	-0.0241*	-2.649***	-0.0383**	-0.0409**
	(0.566)	(1.767)	(0.611)	(0.592)	(0.0137)	(0.732)	(0.0159)	-0.0186
Index of Government Participation in Housing Finance Markets, 2008		-0.0489				-0.0853		
		(0.267)				(0.119)		
Dummy, equal to one if primary funding source is retail			0.129*	0.0488			0.0649	0.0319
			(0.0667)	(0.0713)			(0.0394)	-0.0509
Dummy, equal to one if primary funding source is wholesale			0.0921	0.0603			-0.0471	-0.0532
			(0.109)	(0.0877)			(0.0564)	-0.0669
Dummy, equal to one if primary funding source is mortgage bonds			0.452**	0.423**			0.174	0.161
			(0.189)	(0.209)			(0.117)	-0.129
Dummy, equal to one if secondary funding source is retail				0.165				0.0526
				(0.181)				-0.0956
Dummy, equal to one if secondary funding source is wholesale				0.113				0.0453
				(0.114)				-0.0712
Dummy, equal to one if secondary funding source is mortgage bonds				0.306				0.156***
				(0.240)				-0.0507
Constant	-0.115	-1.297*	-0.0604	-0.0385	-0.353***	-0.573	-0.311***	-0.299***
	(0.167)	(0.658)	(0.172)	(0.162)	(0.0674)	(0.338)	(0.0625)	-0.0632
Observations	96	31	96	96	142	31	142	142
R-squared	0.332	0.327	0.458	0.495	0.209	0.422	0.272	0.287

Note: Panel A cross-sectional regressions are estimated with variables averaged over the 2006-2010 period. Results presented in Panel B are estimated with 2011 dependent variable as a function of averaged lagged regressors over the 2006-2010 period. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 8: Results for panel data fixed effects models (Socioeconomic variables)

VARIABLES	1	2	3	4	5	6	7
Urban population share (in logs)	1.747***	1.815***	1.831***	1.741***	1.051**	1.103**	1.142**
	(0.410)	(0.424)	(0.432)	(0.446)	(0.504)	(0.424)	(0.509)
Inflation (in logs)	0.00592	0.0111	0.0124	0.0289	-0.0129	0.0336	0.0413
	(0.0176)	(0.0162)	(0.159)	(0.148)	(0.0269)	(0.0283)	(0.0290)
Inflation volatility		9.10e-05**					
		(4.30e-05)					
Population growth (annual %)			0.0299***				
			(0.0110)				
Age dependency ratio (in logs)				-0.00563			
				(0.126)			
Population density (in logs)					0.662**		
					(0.300)		
Age dependency ratio- Old (in logs)						0.654***	
						(0.200)	
Age dependency ratio- Young (in logs)							-0.394**
							(0.186)
Constant	-7.078***	-7.362***	-7.403***	-7.019***	-7.172***	-6.180***	-3.190
	(1.718)	(1.775)	(1.810)	(2.099)	(1.856)	(1.659)	(2.568)
Observations	817	812	678	719	812	812	812
R-squared	0.185	0.195	0.232	0.202	0.250	0.300	0.284
Number of countries	79	79	68	69	79	78	78

Note: These are fixe-effect panel regressions with annual values. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively.

Table 9: Results for panel data fixed effects models (Financial sector)

VARIABLES	1	2	3	4	5	6	7
Urban population share (in logs)	1.747***	1.664***	1.951***	1.773***	1.743***	0.974***	1.913***
	(0.410)	(0.474)	(0.529)	(0.474)	(0.401)	(0.355)	(0.577)
Inflation (in logs)	0.00592	0.0669	0.180	0.0187	0.129	0.171	0.0511
	(0.0176)	(0.0792)	(0.300)	(0.0218)	(0.141)	(0.162)	(0.168)
Insurance Premiums (Life) / GDP (%)		0.0182					
		(0.0148)					
Insurance Company Assets / GDP (%)			0.00680***				
			(0.00148)				
Stock Market Capitalization / GDP (%)				0.000244			
				(0.000198)			
Stock Market Turnover Ratio (%)					0.000861***		
					(0.000193)		
Private Bond Market Capitalization / GDP						0.508***	
						(0.0883)	
Public Bond Market Capitalization / GDP							-0.0722
							(0.121)
Constant	-7.078***	-6.811***	-8.139***	-7.250***	-7.165***	-4.004**	-7.800***
	(1.718)	(1.982)	(2.214)	(1.998)	(1.692)	(1.499)	(2.440)
Observations	817	713	411	671	651	433	487
R-squared	0.185	0.204	0.342	0.191	0.257	0.449	0.206
Number of countries	79	74	57	65	65	35	41

Note: These are fixe-effect panel regressions with annual values. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively

Table 10: Results for panel data fixed effects models (Institutional variables)

VARIABLES	1	2	3	4	5	6
Urban population share (in logs)	1.747***	0.703***	0.931***	1.209***	0.829***	0.854***
	(0.410)	(0.198)	(0.251)	(0.263)	(0.223)	(0.236)
Inflation (in logs)	0.00592	-0.102**	-0.0764*	-0.0279	-0.0865**	-0.0796*
	(0.0176)	(0.0436)	(0.0423)	(0.0518)	(0.0431)	(0.0426)
Dealing with Construction Permits - Procedures (number)		0.000863				
		(0.00116)				
Registering Property - Cost (% of property value)			-0.000862			
			(0.00273)			
Enforcing Contracts - Cost (% of claim)				0.00299		
				(0.00229)		
Getting Credit - Strength of legal rights index (0-10)					0.0136**	
					(0.00663)	
Getting Credit - Depth of credit information index						0.00748***
						(0.00278)
Constant	-7.078***	-2.646***	-3.580***	-4.813***	-3.249***	-3.293***
	(1.718)	(0.819)	(1.042)	(1.092)	(0.911)	(0.973)
Observations	817	335	394	453	394	393
R-squared	0.185	0.085	0.105	0.122	0.125	0.128
Number of countries	79	70	72	75	72	72

Note: These are fixe-effect panel regressions with annual values. Robust standard errors are presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%, respectively

Table 11: Results for benchmarking regressions

	Pooled Panel	Cross Section	
	Mortgage Depth	Mortgage Depth	Mortgage Penetration
GDP per capita (in logs)	1.504***	-0.488	-0.618
	(0.386)	(0.906)	(0.627)
GDP per capita squared (in logs)	-0.0531**	0.0608	0.0762*
	(0.0228)	(0.0537)	(0.0390)
Total population (in logs)	0.0545**	0.0243	0.0898
	(0.0263)	(0.0760)	(0.0645)
Population density	-0.0752***	-0.0824	-0.0373
	(0.0284)	(0.0872)	(0.0716)
Log of Age dependency ratio-Old	0.620***	0.276	0.245
	(0.0939)	(0.258)	(0.216)
Log of Age dependency ratio-Young	-0.390*	-1.284**	-0.213
	(0.228)	(0.528)	(0.419)
Dummy for Off-shore centers	1.103***	1.365**	0.860
	(0.194)	(0.520)	(0.642)
Dummy for transition economies	-1.069***	-0.798*	-0.635*
	(0.177)	(0.459)	(0.362)
Dummy for oil-exporting countries	0.132	-0.880	0.516
	(0.0974)	(0.657)	(0.387)
Constant	0.132	1.080	-4.232
	(0.0974)	(5.170)	(3.675)
Observations	871	97	142
R-squared	0.4200	0.5032	0.4220

All models were estimated with median regression. Panel regressions included year dummy variables (ommitted) for the period 1995-2010. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Table 12: Correlation between mortgage depth and penetration gaps and housing finance regressors[a]

VARIABLES	Mortgage Depth Gap		Mortgage Penetration Gap
	Cross-section	Panel	
Government-Owned Banks	0.046	0.1078	0.0935
Foreign-Owned Banks	0.056	-0.1447	-0.0504
Overall Activities Restrictiveness	0.1766	0.1995	0.1242
Bank Concentration - Assets	-0.1554	-0.1676	-0.3034*
Real Estate	0.2358*	0.2406*	0.1436
H-statistic	-0.2335	-0.212	0.0828
Lerner Index	0.1303	0.0736	0.0379
Insurance Premiums (Life) / GDP (%)	-0.2586*	-0.2067*	-0.0564
Insurance Company Assets / GDP (%)	-0.3346*	-0.2215*	-0.2037*
Stock Market Capitalization / GDP (%)	-0.2236*	-0.2290*	0.1155
Stock Market Turnover Ratio (%)	-0.1709	-0.0397	0.0115
Private Bond Market Capitalization / GDP	-0.0489	-0.0567	-0.3425*
Public Bond Market Capitalization / GDP	0.4077*	0.4234*	0.4337*
Dealing with Construction Permits - Procedures (number)	0.1228	0.0727	0.1571
Registering Property - Cost (% of property value)	0.138	0.1692	-0.0197
Enforcing Contracts - Cost (% of claim)	0.0179	0.0313	0.0444
Getting Credit - Strength of legal rights index (0-10)	-0.1755	-0.2222*	-0.0883
Getting Credit - Depth of credit information index	-0.2207*	-0.1198	0.1023
Index of Government Participation in Housing Finance Markets	-0.0786	-0.0658	0.1436
Dummy, equal to one if primary funding source is retail	-0.17	-0.1301	-0.092
Dummy, equal to one if secondary funding source is retail	-0.1503	-0.1207	0.1814*
Dummy, equal to one if primary funding source is wholesale	-0.0753	-0.0835	0.0266
Dummy, equal to one if secondary funding source is wholesale	-0.2441*	-0.2056*	-0.1201
Dummy, equal to one if primary funding source is mortgage bonds	-0.2720*	-0.2748*	-0.128
Dummy, equal to one if secondary funding source is mortgage bonds	-0.1142	-0.1105	-0.0127

ANNEX

Table A1. Mortgage depth data sources

Country	Region	No. of Obs	Period	Source
Albania	Europe & Central Asia	5	2007-2011	Central Bank
Algeria	Middle East & North Africa	3	2004-2007	SRH, 2006 FSAP
Argentina	Latin America & Caribbean	21	1991-2011	Central Bank
Armenia	Europe & Central Asia	7	2005-2011	National Bank of Georgia
Australia	East Asia & Pacific	16	1995-2010	ECRI
Austria	Europe & Central Asia	13	1998-2010	ECRI
Azerbaijan	Europe & Central Asia	2	2005-2007	Central Bank of the Republic of Azerbaijan
Bahamas, The	Latin America & Caribbean	7	2005-2011	The Central Bank of the Bahamas
Bahrain	Middle East & North Africa	5	2006-2010	Central Bank of Bahrain
Bangladesh	South Asia	1	2004-2004	Other
Barbados	Latin America & Caribbean	31	1980-2010	Central Bank of Barbados
Belgium	Europe & Central Asia	14	1997-2010	ECRI
Bolivia	Latin America & Caribbean	13	1999-2011	Financial Regulatory/Oversight Agency
Botswana	Sub-Saharan Africa	1	2009-2009	Other
Brazil	Latin America & Caribbean	17	1995-2011	Central Bank
Brunei Darussalam	East Asia & Pacific	5	2004-2008	IMF
Bulgaria	Europe & Central Asia	16	1995-2010	ECRI
Burkina Faso	Sub-Saharan Africa	5	2006-2010	Central Bank
Burundi	Sub-Saharan Africa	5	2007-2011	Central Bank of Burundi
Cameroon	Sub-Saharan Africa	1	2005-2005	Other
Canada	North America	16	1995-2010	ECRI
Central African Republic	Sub-Saharan Africa	1	2005-2005	Other
Chad	Sub-Saharan Africa	1	2005-2005	Other
Chile	Latin America & Caribbean	12	2000-2011	Financial Regulatory/Oversight Agency
China	East Asia & Pacific	10	1997-2006	World Bank Study
Colombia	Latin America & Caribbean	10	2002-2011	Central Bank
Congo, Rep.	Sub-Saharan Africa	1	2005-2005	Other
Croatia	Europe & Central Asia	12	1999-2010	ECRI
Cyprus	Europe & Central Asia	6	2005-2010	ECRI
Czech Republic	Europe & Central Asia	14	1997-2010	ECRI
Denmark	Europe & Central Asia	11	2000-2010	ECRI
Dominica	Latin America &	1	2005-2005	Central Bank

	Caribbean			
Dominican Republic	Latin America & Caribbean	6	2006-2011	Financial Regulatory/Oversight Agency
Egypt, Arab Rep.	Middle East & North Africa	3	2007-2009	Central Bank
El Salvador	Latin America & Caribbean	10	2002-2011	Financial Regulatory/Oversight Agency
Estonia	Europe & Central Asia	14	1997-2010	ECRI
Finland	Europe & Central Asia	13	1998-2010	ECRI
France	Europe & Central Asia	16	1995-2010	ECRI
Gabon	Sub-Saharan Africa	1	2005-2005	Other
Georgia	Europe & Central Asia	6	2006-2011	Central Bank
Germany	Europe & Central Asia	16	1995-010	ECRI
Ghana	Sub-Saharan Africa	2	2006-2008	Other
Greece	Europe & Central Asia	16	1995-2010	ECRI
Guatemala	Latin America & Caribbean	2	2006 -2007	Other
Guinea	Sub-Saharan Africa	1	2005-2005	Other
Hong Kong SAR, China	East Asia & Pacific	6	2000-2005	Central Bank
Hungary	Europe & Central Asia	11	2000-2010	ECRI
Iceland	Europe & Central Asia	4	2007-2010	ECRI
India	South Asia	13	1999-2011	National Housing Bank (NHB)
Indonesia	East Asia & Pacific	2	2010-2011	Central Bank
Iran, Islamic Rep.	Middle East & North Africa	1	2005-2005	Other
Ireland	Europe & Central Asia	13	1998-2010	ECRI
Israel	Middle East & North Africa	13	1999-2011	Central Bank
Italy	Europe & Central Asia	13	1998-2010	ECRI
Jamaica	Latin America & Caribbean	8	2004-2011	Central Bank
Japan	East Asia & Pacific	16	1995-2010	ECRI
Jordan	Middle East & North Africa	1	2004-2004	Other
Kazakhstan	Europe & Central Asia	7	2001-2007	National Bank of Kazakhstan
Kenya	Sub-Saharan Africa	5	2006-2010	Other
Korea, Rep.	East Asia & Pacific	9	2003-2011	Central Bank
Kosovo	Europe & Central Asia	2	2010-2011	Central Bank
Kyrgyz Republic	Europe & Central Asia	1	2007-2007	Other
Latvia	Europe & Central Asia	13	1998-2010	ECRI
Lebanon	Middle East & North Africa	2	2006-2007	Other
Lithuania	Europe & Central Asia	12	1999-2010	ECRI
Luxembourg	Europe & Central Asia	13	1998-2010	ECRI
Macao SAR, China	East Asia & Pacific	27	1985-2011	Central Bank

Macedonia, FYR	Europe & Central Asia	2	2009-2010	Other
Malawi	Sub-Saharan Africa	2	2006-2007	Central Bank
Malaysia	East Asia & Pacific	16	1996-2011	Central Bank
Malta	Europe & Central Asia	16	1995-2010	ECRI
Mexico	Latin America & Caribbean	18	1994-2011	Central Bank
Moldova	Europe & Central Asia	9	2003-2011	Other
Mongolia	East Asia & Pacific	1	2007-2007	Other
Morocco	Middle East & North Africa	4	2004-2007	Other
Namibia	Sub-Saharan Africa	1	2011-2011	Hofinet
Netherlands	Europe & Central Asia	16	1995-2010	ECRI
New Zealand	East Asia & Pacific	13	1998-2010	OECD
Nicaragua	Latin America & Caribbean	1	2006-2006	Central Bank
Nigeria	Sub-Saharan Africa	2	2006-2008	Other
Norway	Europe & Central Asia	14	1996-2009	ECRI
Oman	Middle East & North Africa	6	2006-2011	Central Bank
Pakistan	South Asia	2	2003-2004	Other
Panama	Latin America & Caribbean	2	2006-2007	Regulatory/Oversight Agency
Peru	Latin America & Caribbean	1	2004-2004	Other
Philippines	East Asia & Pacific	13	1999-2011	Central Bank
Poland	Europe & Central Asia	15	1996-2010	ECRI
Portugal	Europe & Central Asia	16	1995-2010	ECRI
Qatar	Middle East & North Africa	4	2008-2011	Central Bank
Romania	Europe & Central Asia	6	2005-2010	ECRI
Russian Federation	Europe & Central Asia	7	2005-2011	VTB - Klepikova presentation May 2008
Samoa	East Asia & Pacific	6	2006-2011	Central Bank
Saudi Arabia	Middle East & North Africa	20	1975-1994	Central Bank
Senegal	Sub-Saharan Africa	1	2004-2004	Other
Serbia	Europe & Central Asia	4	2008-2011	Regulatory/Oversight Agency
Seychelles	Sub-Saharan Africa	5	2006-2010	Central Bank
Singapore	East Asia & Pacific	23	1989-2011	Monetary Authority of Singapore
Slovak Republic	Europe & Central Asia	8	2003-2010	ECRI
Slovenia	Europe & Central Asia	7	2004-2010	ECRI
South Africa	Sub-Saharan Africa	12	2000-2011	South African Reserve Bank
Spain	Europe & Central Asia	14	1997-2010	ECRI
Sweden	Europe & Central Asia	9	2002-2010	ECRI
Switzerland	Europe & Central Asia	16	1995-2010	ECRI
Tajikistan	Europe & Central Asia	1	2005-2005	Statistics Agency
Tanzania	Sub-Saharan Africa	1	2009-2009	World Bank Mission April

				2009
Thailand	East Asia & Pacific	7	2004-2011	Thailand's Real State Information Center
Togo	Sub-Saharan Africa	5	2006-2010	Other
Tunisia	Middle East & North Africa	7	2003-2009	Merrill Lynch
Turkey	Europe & Central Asia	6	2005-2010	ECRI
Uganda	Sub-Saharan Africa	2	2010-2011	Central Bank
Ukraine	Europe & Central Asia	6	2006-2011	Central Bank
United Arab Emirates	Middle East & North Africa	12	2000-2011	Central Bank
United Kingdom	Europe & Central Asia	16	1995-2010	ECRI
United States	North America	16	1995-2010	ECRI
Uruguay	Latin America & Caribbean	1	2005-2005	Central Bank
Uzbekistan	Europe & Central Asia	3	2007-2009	Central Bank
Vanuatu	East Asia & Pacific	7	2005-2011	Other

Source: Authors

Table A2. Housing Loan Penetration by country (2011)

Country	%	Country	%	Country	%
Afghanistan	10.2	Honduras	2.1	New Zealand	42.6
Angola	4.3	Croatia	4.6	Oman	18.5
Albania	2.3	Haiti	3.4	Pakistan	2.3
United Arab Emirates	23.0	Hungary	14.2	Panama	12.2
Argentina	0.5	Indonesia	0.8	Peru	1.4
Armenia	1.1	India	2.5	Philippines	3.9
Australia	43.8	Ireland	39.2	Poland	3.1
Austria	29.1	Iran, Islamic Rep.	16.0	Portugal	25.9
Azerbaijan	0.4	Iraq	17.3	Paraguay	1.6
Burundi	0.1	Israel	17.7	Qatar	20.4
Belgium	39.2	Italy	12.9	Romania	4.3
Benin	0.6	Jamaica	3.8	Russian Federation	1.8
Burkina Faso	0.7	Jordan	4.0	Rwanda	2.1
Bangladesh	2.9	Japan	18.1	Saudi Arabia	16.1
Bulgaria	2.2	Kazakhstan	5.3	Sudan	6.4
Bahrain	5.0	Kenya	1.2	Senegal	0.1
Bosnia and Herzegovina	4.0	Kyrgyz Republic	0.6	Singapore	21.8
Belarus	10.9	Cambodia	2.2	Sierra Leone	0.5
Bolivia	4.5	Korea, Rep.	25.6	El Salvador	2.0
Brazil	1.6	Kosovo	2.0	Somalia	6.9
Botswana	1.8	Kuwait	23.5	Serbia	1.7
Central African	1.1	Lao PDR	1.2	Slovak Republic	8.5

Republic					
Canada	33.4	Lebanon	6.1	Slovenia	12.0
Chile	4.2	Liberia	3.6	Sweden	59.7
China	5.4	Sri Lanka	4.2	Swaziland	6.6
Cameroon	1.7	Lesotho	0.8	Syrian Arab Republic	5.9
Congo, Rep.	0.3	Lithuania	6.7	Chad	6.3
Colombia	3.3	Luxembourg	41.5	Togo	2.3
Comoros	0.7	Latvia	9.6	Thailand	5.8
Costa Rica	4.2	Morocco	6.3	Tajikistan	0.6
Cyprus	29.2	Moldova	0.7	Turkmenistan	1.0
Czech Republic	9.1	Madagascar	0.6	Trinidad and Tobago	1.9
Germany	23.7	Mexico	3.1	Tunisia	3.2
Djibouti	6.3	Macedonia, FYR	4.3	Turkey	1.6
Denmark	53.5	Mali	0.8	Tanzania	5.4
Dominican Republic	2.0	Malta	20.5	Uganda	1.2
Algeria	7.1	Montenegro	5.2	Ukraine	1.2
Ecuador	2.2	Mongolia	4.4	Uruguay	2.0
Egypt, Arab Rep.	2.2	Mozambique	1.1	United States	36.7
Spain	35.3	Mauritania	6.1	Uzbekistan	0.0
Estonia	19.0	Mauritius	5.7	Venezuela, RB	0.6
Finland	33.1	Malawi	6.5	Vietnam	2.4
France	31.1	Malaysia	16.9	West Bank and Gaza	7.1
Gabon	0.6	Niger	1.0	Yemen, Rep.	1.2
United Kingdom	34.3	Nigeria	0.3	South Africa	5.4
Georgia	0.5	Nicaragua	0.4	Congo, Dem. Rep.	0.7
Ghana	2.8	Netherlands	45.0	Zambia	1.8
Guinea	0.2	Nepal	6.7	Zimbabwe	1.3
Greece	7.2				
Guatemala	1.3				
Hong Kong SAR, China	13.5				

Table A3: Mortgage gap for cross-sectional and panel benchmarking regression models

	Panel	Cross section			Panel	Cross section			Panel	Cross section	
Country	(2010)	Mortgage Depth	Mortgage Penetration	Country	(2010)	Mortgage Depth	Mortgage Penetration	Country	(2010)	Mortgage Depth	Mortgage Penetration
East Asia & Pacific				Estonia	-0.292	-0.172	-0.073	**Latin America & Caribbean**			
Australia	-0.376	-0.391	-0.127	Finland	0.072	0.125	-0.007	Argentina	0.309	0.201	0.160
Brunei Darussalam		0.432		France	0.122	0.130	-0.018	Bahamas, Th	0.459	0.386	
Cambodia			-0.017	Georgia	-0.049	-0.036	-0.005	Barbados		0.001	
China		-0.051	-0.024	Germany	0.172	0.092	0.065	Bolivia	-0.051	-0.006	-0.031
Hong Kong SAR, China			0.052	Greece	-0.013	-0.001	0.140	Brazil	0.197	0.116	0.069
Indonesia	0.099	-0.021	-0.005	Hungary	0.008	0.008	-0.052	Chile	0.034	0.118	0.083
Japan	0.451			Iceland	0.289	0.218		Colombia	0.109	0.089	0.025
Korea, Rep.	0.070	-0.046	-0.045	Ireland	-0.137	-0.120	-0.057	Costa Rica			0.048
Lao PDR			0.001	Italy	0.242	0.247	0.132	Dominican Re	0.044	0.078	0.046
Macao SAR, China	0.022	0.039		Kazakhstan		-0.044	-0.036	Ecuador			0.003
Malaysia	-0.007	-0.087	-0.026	Kyrgyz Republic		-0.016	-0.002	El Salvador	-0.222	-0.094	0.024
Mongolia		-0.023	-0.044	Latvia	-0.259	-0.179	-0.001	Guatemala		0.091	0.018
New Zealand		-0.497	-0.195	Lithuania	-0.090	-0.039	0.020	Haiti			-0.027
Philippines	0.033	0.039	-0.029	Luxembourg	0.216	0.275	0.038	Honduras			-0.003
Samoa	-0.196	-0.120		Macedonia, FYR	-0.037	0.078	-0.015	Jamaica	0.013	0.048	0.024
Singapore	-0.099	-0.129	-0.056	Malta	-0.254	-0.093	-0.051	Mexico	0.142	0.176	0.087
Thailand	-0.039	-0.070	-0.014	Moldova	-0.005	-0.003	-0.007	Nicaragua		-0.035	0.001
Vanuatu	-0.203	-0.067		Netherlands	-0.358	-0.329	-0.144	Panama		-0.050	0.035
Vietnam			-0.024	Norway		0.000		Paraguay			0.003
Europe & Central Asia				Poland	0.064	0.091	0.076	Peru			0.044
Albania	-0.023	0.092	-0.003	Portugal	-0.353	-0.277	-0.069	Trinidad and Tobago			0.138
Armenia	-0.025	0.017	-0.007	Romania	0.001	0.002	-0.018	Uruguay			0.125
Austria	0.243	0.240	0.024	Russian Federati	0.117	-0.018	0.010	Venezuela, RB			0.082
Azerbaijan		-0.009	0.011	Serbia	-0.086			**Middle East & North Africa**			
Belarus			-0.092	Slovak Republic	0.077	0.110	0.045	Algeria		0.039	-0.043
Belgium	0.036	0.075	-0.097	Slovenia	0.148	0.253	0.079	Bahrain		0.231	0.118
Bosnia and Herzegovina			-0.013	Spain	-0.208	-0.214	-0.114	Djibouti			-0.054
Bulgaria	-0.109	-0.067	0.001	Sweden	0.067	0.112	-0.244	Egypt, Arab Rep.		-0.003	-0.001
Croatia	-0.062	0.067	0.062	Switzerland	-0.413	-0.340		Iran, Islamic Rep.			-0.137
Cyprus	-0.250	-0.166	-0.009	Tajikistan			0.015	Iraq			-0.167
Czech Republic	0.035	0.093	0.036	Turkey	0.166	0.065	0.077	Israel	0.176	0.223	0.097
Denmark	-0.631	-0.570	-0.191	Ukraine	-0.036	-0.065	-0.012	Jordan			0.003
				United Kingdom	-0.268	-0.374	-0.022	Kuwait			0.059

Table A3: Mortgage gap for cross-sectional and panel benchmarking regression models (cont'n)

Country	Panel (2010)	Cross section Mortgage Depth	Cross section Mortgage Penetration	Country	Panel (2010)	Cross section Mortgage Depth	Cross section Mortgage Penetration
Lebanon		0.174	0.046	Lesotho			0.004
Morocco		-0.020	-0.033	Liberia			0.029
Oman		0.209	-0.015	Madagascar			0.028
Qatar		0.241	0.138	Malawi		0.053	-0.008
Saudi Arabia			-0.005	Mali			0.035
Syrian Arab Republic			-0.042	Mauritania			-0.050
Tunisia		0.006	0.022	Mauritius			0.017
United Arab Emirates	0.289			Mozambique			0.010
Yemen, Rep.			-0.003	Niger			0.058
North America				Nigeria		0.005	0.005
Canada	-0.077	-0.094	-0.023	Rwanda			-0.006
United States	0.035	-0.152	0.020	Senegal			0.017
South Asia				Seychelles	0.191	0.066	
Bangladesh			-0.029	Sierra Leone			0.024
India	0.128	-0.019	-0.025	South Africa	-0.245	-0.339	0.006
Nepal			-0.040	Sudan			-0.054
Pakistan			-0.023	Swaziland			-0.039
Sri Lanka			-0.042	Tanzania		0.032	-0.038
Sub-Saharan Africa				Togo	-0.004	0.090	0.011
Angola			-0.027	Uganda	-0.012	0.050	0.009
Benin			0.019	Zambia			0.000
Botswana		0.073	0.059	Zimbabwe			-0.013
Burkina Faso	-0.002	0.128	0.035				
Burundi	0.118	0.010	0.078				
Cameroon			-0.002				
Central African Republic			0.032				
Chad			-0.028				
Comoros			0.015				
Congo, Dem. Rep.			0.094				
Congo, Rep.			0.014				
Gabon			0.074				
Ghana		-0.004	-0.012				
Guinea			0.008				
Kenya	-0.025	-0.019	-0.003				