How Effective Are Macroprudential Policies? An Empirical Investigation*

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Abstract

In recent years, policymakers have generally relied on macroprudential policies to address financial stability concerns. However, our understanding of these policies and their efficacy is limited. In this paper, we construct a novel index of macroprudential policies in 57 advanced and emerging economies covering the period from 2000:Q1 to 2013:Q4, with tightenings and easings recorded separately. The effectiveness of these policies in curbing credit growth and house price appreciation is then assessed using a dynamic panel data model. The main findings of the paper are: (1) Macroprudential policies have been used far more actively after the global financial crisis in both advanced and emerging economies. (2) These policies have primarily targeted the housing sector, especially in the advanced economies. (3) Macroprudential policies are usually changed in tandem with bank reserve requirements, capital flow restrictions, and monetary policy. (4) Our analysis suggests that macroprudential tightening is associated with lower bank credit growth, housing credit growth, and house price appreciation. (5) Targeted policies—for example, those specifically intended to limit house price appreciation—seem to be more effective, especially in economies where bank finance is important.

Keywords: Bank Credit, House Prices, Macroprudential Policy, Dynamic Panel Data Model
JEL classification: E32, F41, F44, G15

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1 Introduction

In recent years, many countries have experienced boom-bust cycles in credit and asset prices, some of which resulted in severe financial crises. In response to these cycles, authorities in many countries have used macroprudential policies as a first line of defense against financial instability risks.[1] Examples of the macroprudential tools employed are capital and provision requirements, credit growth limits in specific sectors, and time-varying loan-to-value (LTV) or debt-service-to-income ratio (DSTI) caps for mortgage loans.

Even though macroprudential policies have been used intensively in recent years, our understanding of these policies and their efficacy is limited. This paper focuses on cyclical risks that are primarily associated with elevated asset prices and excessive credit growth and makes three contributions to the literature: First, it develops a new set of indexes of macroprudential policies in 57 advanced and emerging countries covering the period from 2000:Q1 to 2013:Q4. Second, it documents how these macroprudential policy indexes are correlated with other policy measures, such as monetary policy and capital flow management policies. Third, it uses these indexes in a dynamic panel data model to investigate the effectiveness of macroprudential policies in restraining the growth of credit and of asset prices. Domestic bank credit growth, housing credit growth, and house price appreciation have often been the target of macroprudential policy because of their links to boom-bust financial cycles.[2] Hence the paper focuses on these three variables to measure the effect of macroprudential policy changes.

In this paper we construct several macroprudential policy indexes for different types of macroprudential policy tools (e.g. capital requirements, and caps on LTV or DSTI ratios) as well as an aggregate index, with tightening and easing actions in a given month coded separately. The aggregate index used in the baseline dynamic panel data model characterizes the macroprudential policy stance in each country by cumulating the number of tightenings net of easings since 2000. The dependent variables (quarterly growth rate of real bank credit, real housing credit, and real house prices) are regressed on various indexes of macroprudential policy and on control variables, including real GDP growth, the change in the nominal monetary policy rate, and a global risk aversion variable proxied by the VIX.

The main findings of the paper are: (1) Macroprudential policies have been used far more

[1] Prior to the global financial crisis, the general consensus was that monetary policy was not well-suited to address financial stability concerns. Since the crisis, many policymakers remain reluctant to shift monetary policy away from targeting core macroeconomic objectives such as inflation and output stabilization, preferring to retain monetary policy as a last line of defense against financial instability risks, with cyclical macroprudential tools constituting the first line of defense.

[2] Recent literature, for example, Schularick and Taylor (2012), Gourinchas and Obstfeld (2012) and Mendoza and Terrones (2012), suggests that credit and asset price boom events often end in financial crises.

actively after the global financial crisis in both advanced and emerging economies, with the number of tightening actions significantly outweighing the easing actions in the last decade. (2) These policies have primarily targeted the housing sector, especially in the advanced economies. (3) Macroprudential policies are usually changed in tandem with bank reserve requirements, capital flow management measures, and monetary policy. (4) Empirical analysis suggests that macroprudential policy variables exert a statistically significant negative effect on bank credit growth and house price appreciation. (5) Targeted policies specifically intended to limit house price appreciation seem to be more effective, especially in economies where bank finance is important. For example, we find that the negative effect of the macroprudential policy variables on housing loans and house price appreciation is driven entirely by measures directed at the housing market. The effects of macroprudential policy measures are economically significant as well. Our counterfactual exercise reveals that if the authorities had not used these measures, average credit growth and house price appreciation over the period from 2011 to 2013 would have been significantly higher.[3]

In addition to macroprudential policies, authorities in several countries have used other policy measures such as capital flow management tools and changes in reserve requirements, in part to deal with financial instability concerns. In particular, capital flow management tools—such as portfolio and banking inflow restrictions—have been included in the policy toolkit in several emerging economies to deal with fast-growing bank credit. However, our baseline regressions on the effectiveness of macroprudential policies control only for monetary policy changes (besides non-policy control variables, such as income and global risk aversion), due to the fact that data for these additional policy control variables are available only for subset of countries. An extension of our model that uses these additional policy variables as controls in the regressions for a subset of countries[4] reveals that macroprudential tightening continue to exert a statistically significant negative effect on credit growth when capital flow management tools and changes in reserve requirements are also considered.

This paper is related to a growing body of empirical research on financial stability. Recent evidence about the effectiveness of macroprudential policy is mixed and still preliminary. Most empirical work on the subject relies on the 2011 IMF survey data presented in Lim et al. (2011). Using this database, Lim et al. (2011) find that several different macroprudential tools reduce the procyclicality of credit growth by reducing the correlation between credit growth and GDP growth. IMF (2012) explores the relationship between monetary and

[3]In the counterfactual exercise we restrict our attention to the last three years of the sample period when macroprudential measures were used most actively.

[4]These countries are: Argentina, Brazil, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Poland, Romania, South Africa, Taiwan, Thailand, and Turkey.

macroprudential policies using the same IMF survey. Focusing on capital requirements, reserve requirements, and LTV and DSTI caps, that paper finds that capital requirements and reserve requirements constrain credit growth but that the effects differ in credit busts versus credit booms for capital requirements. By reviewing case studies, DellAriccia et al. (2012) find that some macroprudential policies can help soften the blow of financial crises.

Although our database suggests that the use of macroprudential policy measures has increased significantly since 2011, only a few papers use more recent data on these tools. For example, Cerutti et al. (2015a) uses a 2013 IMF survey to create an annual dataset of macroprudential policies in 119 countries. This dataset records, for each year, whether different types of policies were in place, without capturing if and when the instrument was adjusted. They find that an index summing all the different types of policies is correlated with lower credit growth, especially in emerging market economies. Another recent paper by Bruno et al. (2014) uses a Bank for International Settlements (BIS) macroprudential policy database presented in Shim et al. (2013) and a database of capital flow management policies to study the effects of these policies on credit, banking flows, and bond flows in 12 Asian countries. They find that monetary policy, banking inflow controls, and macroprudential policies were used as complements in Asia from 2004 to 2013 and that bank inflow controls reduced the growth of bank inflows from 2004 to 2007, but not recently.

More empirical work has been done with regard to housing markets. Several studies using panel data for different regions find that housing measures may reduce mortgage credit booms (Zhang and Zoli (2014) and IMF (2014)). Case studies from emerging Europe (Vandenbussche et al. (2012)) and Asia (Craig and Hua (2011)) show that macroprudential tools, especially housing measures, limited house price growth in those regions. On the other hand, Kuttner and Shim (2013) use the BIS database presented in Shim et al. (2013) of macroprudential measures covering as far back as 1980 for some countries. Using three different econometric techniques, they find evidence for the economic and statistical significance of DSTI and housing taxes on house price appreciation. LTV caps, limits on banks' exposure to the housing market, and housing taxes are also found to be significant in curbing housing credit, but only in the panel data approach. Of all the macroprudential measures considered, only housing-related taxes are found to affect house price growth.

Other studies use bank-level data rather than country-level data. Such micro-level evidence is also mixed: For example, Claessens et al. (2014) use balance-sheet data to argue that credit growth declines when credit growth ceilings, LTV and DSTI caps are put in place. Zhang and Zoli (2014) present bank-level data on 74 Asian banks in addition to their country-level data to demonstrate that macroprudential policies limited the supply of credit from Asian banks. However, Aiyar et al. (2014) use bank-level data from the UK to show that

bank capital requirements were somewhat ineffective due to increased lending from resident foreign bank branches. Similarly, Acharya (2013) finds that risk weights imposed to achieve macroprudential goals can perversely lead to the buildup of financial risks because higher risk weights on certain asset classes—such as mortgages—encourage the buildup of exposure to other assets that are not deemed as risky, but that can contribute to vulnerability due to such concentrated exposure.

The literature has clearly not reached a consensus about which policies, if any, are effective. Our panel dataset—which includes a variety of advanced and emerging economies, a longer history than most studies, and the recent period in which macroprudential policy use has become much more common—allows us to evaluate these policies with a great deal of breadth and depth. To our knowledge, this is the first paper that uses a systematically created database that is based on a comprehensive set of sources: surveys conducted by the IMF, a BIS database, and feedback from national central banks and financial stability authorities. Moreover, we study the effect of macroprudential policies on general credit conditions, as well as more specifically on housing credit and house prices. We also consider some other aspects of countries' policy toolkits—such as capital controls—that might be relevant, especially in emerging economies, for achieving financial stability objectives as additional policy control variables in assessing the effectiveness of macroprudential policy measures.

The remainder of the paper is organized as follows: Section 2 explains our macroprudential policy database and the construction of the macroprudential policy indexes. It also analyzes the incidence and evolution over time of the use of macroprudential measures in our sample and documents how macroprudential policies are used in conjunction with other policies that affect credit conditions. Section 3 discusses the Korean experience with the use of macroprudential instruments as a typical case and analyzes the effectiveness of these instruments using an event study methodology. Section 4 presents the empirical model and panel estimation results, including results from several extensions and subsamples. Section 5 concludes.

2 Macroprudential Policy Measures

This section describes our macroprudential policy tools database and the construction of the macroprudential policy index. The use of macroprudential policies over time and across advanced economy and emerging market economy groups[5] is also reviewed, as well as the relationship between macroprudential policies and other policies that affect financial stability.

[5]For a description of the country classifications into advanced and emerging economies see Appendix A.

2.1 Data

The first step in our analysis is to build a database of macroprudential measures. To do this, we relied on national sources wherever possible. A starting point for our database was the 2011 IMF survey database on macroprudential measures presented in Lim et al. (2011). We also supplemented our database using the publicly available macroprudential database presented in Shim et al. (2013). We used national sources and a 2013 IMF survey called Global Macroprudential Policy Instruments (GMPI) to update our database through 2013. We also cross-checked our database against a cross-country database by Cerutti et al. (2015a) and Cerutti et al. (2015b), as well as the IMF's GMPI survey for a comparison of the historical data. Our database covers the period from 2000:Q1 to 2013:Q4.

This paper focuses on seven categories of macroprudential tools. Three of these are targeted at the housing market. The first, caps on LTV ratios for mortgage loans, restricts the amount of the loan to a certain fraction of the total value of the property. In our sample, LTV caps imposed by the authorities range from 40 percent to 95 percent. More than half the countries in our sample have used LTV caps to limit mortgage lending since 2000, making LTVs the most commonly used macroprudential tool in our sample. Another way to prohibit risky lending is to implement a cap on the DSTI (or debt service ratio) of the borrower—that is, to restrict the value of the borrower's monthly debt service payments relative to the borrower's monthly income. The third category of housing measures considered is not so easily classified: We refer to these tools as "other housing measures," which can include changes in regulatory risk weights for mortgage loans, quantitative limits on mortgage lending, property gains taxes, and stricter requirements for mortgage borrower creditworthiness, among others.

We also examine four broader measures to limit credit growth that are targeted at banks' balance sheets. Time-varying capital requirements (CR) are one such tool. In the category of CRs we include countercyclical capital buffers (CCB) proposed under Basel III[6], changes in capital risk weights used to determine banks' capital adequacy ratios (excluding those on housing loans), capital surcharges for banks, and limits on profit distribution. Authorities in several emerging market economies as well as Norway and Switzerland have adjusted banks capital requirements countercyclically by adjusting either overall capital requirements or the risk weights of specific asset classes. For example, Brazilian authorities raised banks' required capital ratios on long-term consumer loans to help contain the surge in credit growth associated with capital inflows in late 2010 and later lowered them for some consumer loans as capital inflows slowed in late 2011. Risk weights were increased for fast-growing consumer

[6]Switzerland, which activated a countercyclical capital buffer in early 2013, is the only country that adopted countercyclical capital buffers proposed under Basel III in our database that covers the period until 2013:Q4.

loans in Turkey, and for residential mortgages in Israel, Switzerland, and Thailand.[7]

A second measure targeted at banks' balance sheets is loan-loss provisioning requirements, which involve adjusting provisions over the financial cycle, either on a general basis or for specific assets such as housing loans or consumer loans (we include specific provision requirements on housing loans in the "other housing" category). Similar to risk weights, increases (or reductions) in such requirements can be used to make overall or sector specific banking loans more (or less) costly and thus help slow (or spur) growth in total or sector-specific credit. For example, India increased general provisions several times between 2005 and 2007, Israel increased the provision requirements for housing loans in early 2013, and Turkey increased general provision requirements for banks with high levels of consumer loans in 2011. Most countries in our sample have used judgment when designing and calibrating provision requirements. A few exceptions include *dynamic* provisioning as used in Spain and several Latin American countries, where the amount of provisioning is based on a formula and varies with the economic cycle.

A third measure we consider in this category is consumer loan limits, such as stricter requirements for the creditworthiness of credit card holders. The fourth macroprudential measure in this group is ceilings on credit growth. For example, Bulgaria imposed ceilings on the extension of credit in April 2005 by introducing prohibitively high minimum reserve requirements in cases where the growth of bank's loan portfolio exceeded a certain threshold.

2.2 Construction of Macroprudential Policy Variables

This paper constructs aggregate indexes of macroprudential policy actions based on these seven tools. First, for each of the seven policy measures, i.e. caps on LTV and DSTI ratios, other housing, capital requirements, loan-loss provision requirements, credit growth limits, and consumer loan limits, we create a monthly dummy variable assigned a value of one if the measure was introduced or tightened to restrict credit or asset price growth and a value of negative one if the measure loosened macroprudential restrictions. If no action was taken in a given month, we assigned the variable a value of zero. While we typically know the month of implementation for each macroprudential action taken, we aggregate the individual indexes to a quarterly frequency to match the frequency of other variables in the database, such as GDP. If a tool was used more than once in a quarter, we sum all changes over the

[7]CRs in our database have often been implemented by adjusting the risk weights of specific asset classes, such as housing and consumer loans. Risk weights have been raised during an upturn as a restraint on credit expansion and reduced during a downturn to provide a cushion so that banks do not reduce assets to meet the capital requirements. For the purpose of classification adopted in this paper, risk weights for housing loans are considered in the category of macroprudential policies that target the housing market.

quarter. For example, if risk weights on housing loans were tightened two separate times in the same quarter, the "other housing" index would take a value of 2 in that quarter. With these dummy variables for each of seven macroprudential policies we create seven cumulative indicator variables that, in each quarter, sum the tightenings net of easings of that policy since 2000.

Ideally, we would like to measure the intensity of macroprudential policies. For example, for LTVs we would like to use the actual percentage requirement (e.g., the LTV cap was lowered from 70 percent to 60 percent), but obtaining the level of the LTV cap is more difficult than it seems. In countries like Korea and Hong Kong, which have used LTV caps actively, different borrowers face different LTV caps based on where the property is located, whether it is the borrower's first or second home, and how expensive the home is. It is not straightforward, then, to record the overall LTV cap in a country, and it becomes even more difficult when comparing across countries. The same issue applies to many other types of macroprudential policies. For this reason, we chose to use indicator variables instead.[8]

Once we constructed the cumulative indicator variables for individual measures in each country, we created cumulative indexes of housing and nonhousing measures, as well as a cumulative index for all macroprudential policy measures in place in a given quarter (hereafter referred to as the MAPP–macroprudential policy–index). These cumulative variables sum the indicator variables (tightenings net of easings) to get an idea of a country's "macroprudential policy stance" in a given quarter. We use cumulative indexes in our analysis rather than the quarterly changes because it is difficult to know when macroprudential regulations impose binding constraints on borrowers and lenders—for example, a cap on mortgage credit growth for banks could become binding several quarters after it is imposed, depending on financial conditions.

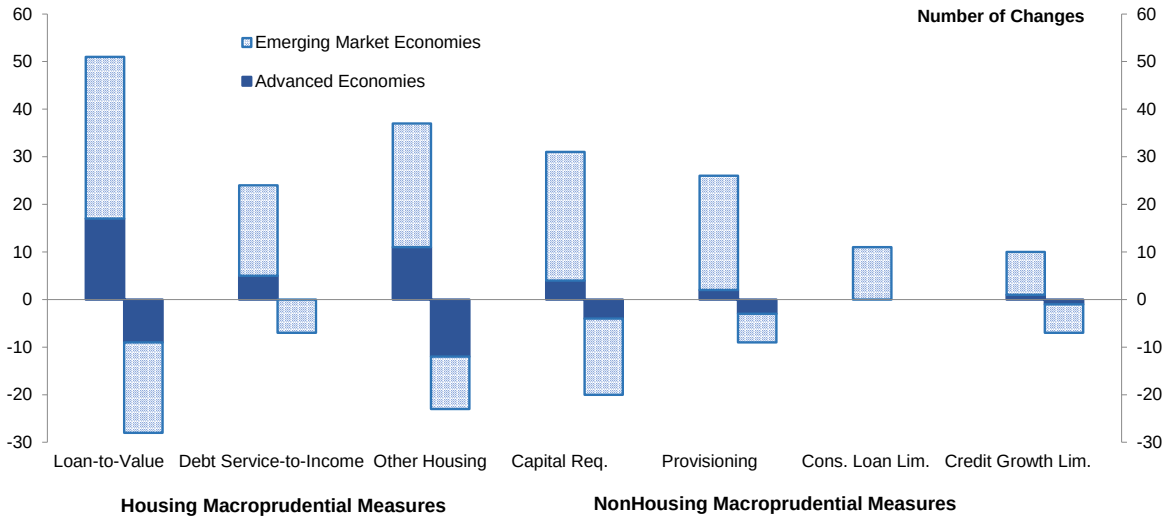
The macroprudential policy housing index (MAPPH) sums the cumulative variables for the LTV, DSTI, and other housing measures. CRs and provisioning requirements that target the housing sector (most commonly risk weights on housing loans) are included in "other housing". The macroprudential policy nonhousing index (MAPPNH) includes CRs (excluding risk weights on housing loans), provision requirements (excluding specific provisions for housing loans), credit growth limits, and consumer loan limits. Summing the housing and nonhousing indexes yields the overall MAPP index.

[8]In fact, given that the use of indicator variables imperfectly measures the magnitude of the policy changes and such measurement error will create attenuation bias for the coefficient estimates on the macroprudential policy variables, we should be especially encouraged if we find a significant relationship between these indicator variables and credit or house price growth despite the measurement error. The fact that we do not know whether the policy is binding or not also creates attenuation bias.

2.3 Usage of Macroprudential Policies

To illustrate what type of macroprudential tools have been most popular, figure 1 shows the total incidence in 57 countries from 2000 to 2013 of each of the seven macroprudential policy tools we study. LTV caps on housing loans were the most commonly used macroprudential tool, though capital requirements and other housing measures were also popular. It should be noted that risk weights on housing loans, a type of CR, are by far the most common "other housing" measure in our sample and are included only in the housing macroprudential category in figure 1. DSTI caps and provision requirements were less popular but nonetheless were each used more than 40 times (when counting tightenings and easings) since 2000. Credit growth and consumer loan limits were used relatively less. It is clear from this figure that tightenings were much more common than easings across all macroprudential tools and that emerging market economies used these policies more actively.

Figure 1: Use of Various Macroprudential Tools, 2000:Q1 to 2013:Q4

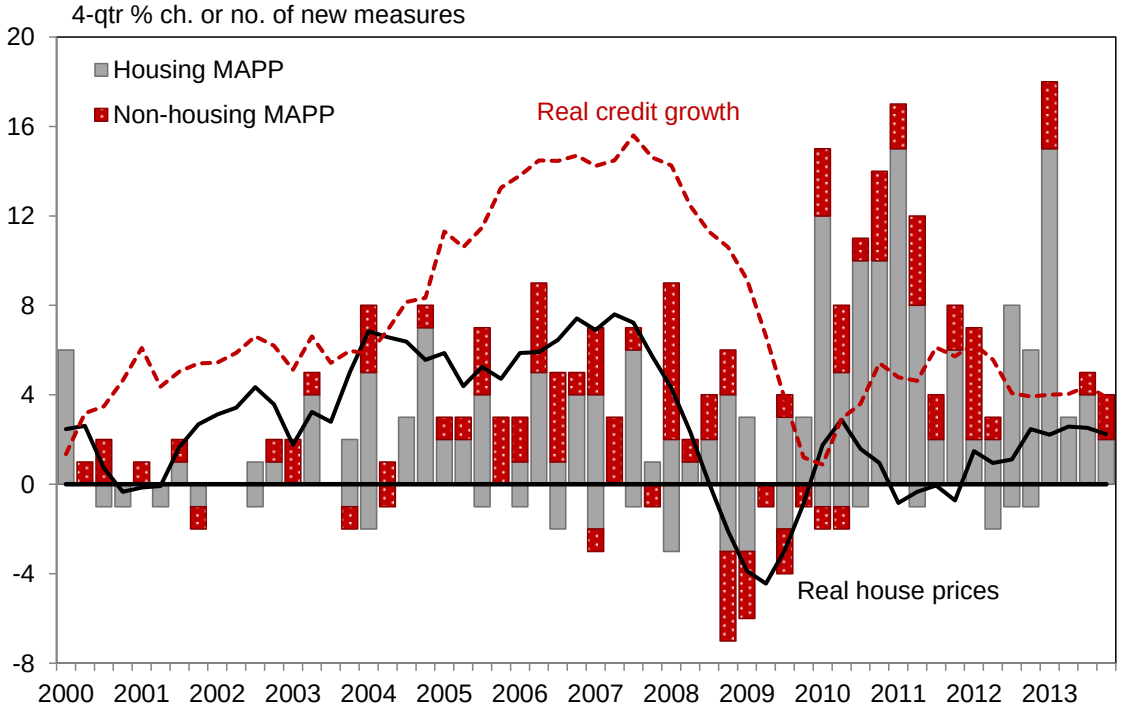


Note: The light colored, patterned bars show the total number of each of the seven macroprudential instruments summed across all 34 emerging market economies in our sample for the period 2000 to 2013. The solid dark-colored bars indicate the number of measures of each type used by 23 advanced economies over the same period. Positive values indicate tightenings and negative values indicate loosenings of macroprudential regulations. Capital and provision requirements exclude housing-related measures.

Figure 2 shows the evolution of macroprudential measures introduced in each quarter across the 57 countries in our sample from 2000 to 2013 compared with average credit growth and house price appreciation. Macroprudential policies have been used far more actively since the global financial crisis of 2008 compared with the pre-crisis period despite the fact that real credit growth and real house price appreciation were more pronounced in the periods preceding the global financial crisis.[9] Moreover, housing measures have been much more

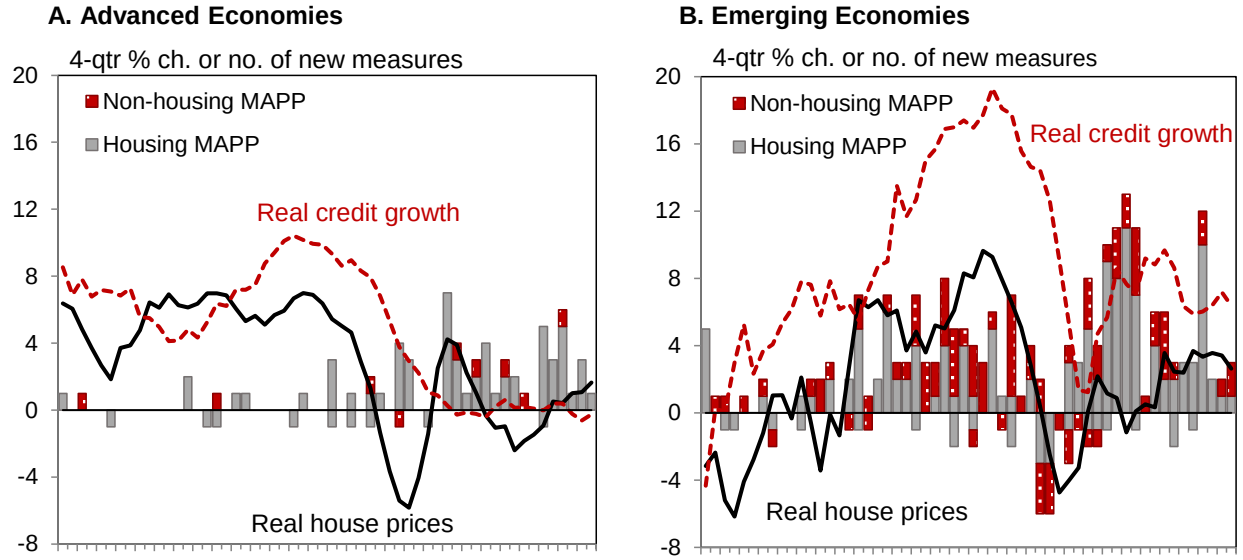
[9]Many observers are concerned that macroprudential policies may be implemented in the middle of credit

Figure 2: Evolution of MAPP Use, 2000:Q1 to 2013:Q4



Note: The figure shows average real credit growth (dashed line) and average real house price appreciation (solid line) across all 57 countries. The dotted bars (solid bars) show the total number of new nonhousing-related measures (housing-related measures) introduced by all countries in our sample in each quarter. Positive (negative) values indicate tightenings (easings).

Figure 3: Evolution of MAPP Use in Advanced and Emerging Economies, 2000:Q1 to 2013:Q4



Note: The figure in panel A (panel B) shows average real credit growth and average real house price appreciation across advanced economies (emerging economies). The dotted bars in panel A (panel B) show the total number of new nonhousing-related measures introduced by advanced economies (emerging economies) in our sample in each quarter. The solid bars show the same information for housing measures.

booms and thus a positive relationship between credit growth and macroprudential policies—the so-called endogeneity bias—might occur. This figure indicates that macroprudential polices were in part implemented in response to the global financial crisis after which credit growth has been relatively muted.

widely used than nonhousing measures, particularly since the crisis, as housing markets in many countries recovered more quickly than the overall economy and began to overheat in some cases. It appears that policies were tightened during credit and house price booms and loosened when growth in these two variables slowed. Overall, tightenings have been much more common than easings. The largest number of easings came during the global financial crisis when countries sought to encourage lending, suggesting that macroprudential tools are being used in a countercyclical manner.

Figure 3 shows macroprudential policy use, average credit growth and house price appreciation for advanced and emerging economies separately. It reveals that nearly all of the measures used in the advanced economies targeted the housing sector rather than more general credit conditions. Interestingly, macroprudential policies have been used far more actively in this group after the global financial crisis compared with the pre-crisis period, despite the fact that average real credit growth and house price appreciation have been relatively subdued in advanced economies since the crisis. The average real house prices, however, mask some significant differences across the countries in the group. The housing sector in some advanced economies, such as Spain, Italy and Portugal, are depressed, dragging the average down. On the other hand, a small set of advanced countries, including Canada, New Zealand, and Switzerland, have experienced quick rebounds in house prices after the crisis. In fact, most of the macroprudential tightenings shown by the solid bars in the figure, have been concentrated in the latter group of countries.[10]

In emerging market economies, excessive credit growth has also been an important concern, and thus nonhousing measures have been used almost as frequently as housing measures. As shown in panel B of figure 3, the use of macroprudential measures increased after the global financial crisis in emerging economies as well. But the reasons for this activity are likely somewhat different from those motivating most of the advanced economies. Speedy economic recovery in emerging economies, combined with accommodative monetary policies in advanced economies, attracted capital inflows, contributing to some of the rebound in credit growth and house prices that occurred after the global financial crisis. With output quickly going above potential for several emerging economies, significant monetary tightening might have been warranted, but fears that such tightening would exacerbate capital inflows and currency appreciation likely motivated a heavier reliance on macroprudential tightening instead.

[10]Macroprudential tightening in advanced economies, in general, may also have been motivated by increased awareness of macroprudential measures combined with concerns about the potential effects on financial markets of extended periods of ultra-low interest rates.

2.4 Macroprudential Policy as Part of the Policy Toolkit

The goal of this section is twofold. First, it studies how much various types of macroprudential policies are synchronized with one another. Second, it explores how the use of macroprudential measures is correlated with other policy actions that may affect credit growth and house price appreciation. Such policy actions include monetary policy rate changes and changes to reserve requirements on domestic currency deposits as well as capital flow restrictions. We find that individual macroprudential measures have often been used together. We also document that macroprudential policies are usually changed in tandem with domestic currency reserve requirements, capital flow management measures, and monetary policy.

Quarterly data on domestic currency reserve requirements comes from Cordella et al. (2014). Our data for capital flow measures comes from Ahmed and Zlate (2014) and covers 19 emerging market economies[11] from 2002-2012. These quarterly, cumulative capital control indexes were constructed using information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database. In contrast to the IMF capital control indexes based on the AREAER database, the Ahmed and Zlate (2014) indexes seek to capture some of the intensity of capital controls by changing as measures are adjusted, not just when they are introduced or eliminated, similar to our MAPP indexes. The capital control indexes focus exclusively on restrictions on inflows. The overall capital control index cumulates restrictions on foreign direct investment, portfolio investment (divided into bond and equity restrictions), and banking investment into the country. The banking subcomponent includes measures such as taxes on short-term external borrowing, quantitative limits on banks' foreign exchange exposure, and reserve requirements on foreign exchange liabilities.

Table 1 shows pairwise correlations of the seven macroprudential policy tools that we study in this paper. Individual macroprudential measures, particularly housing measures, were often used simultaneously by countries in our sample. LTV and DSTI caps, in particular, are strongly positively correlated. Positive correlations among housing measures appear in the emerging and advanced economy subsamples as well. Among the measures that target general credit conditions, capital requirements are most strongly positively correlated with all other nonhousing measures. In general, of the seven measures, most are at least weakly positively correlated.[12]

Table 2 shows how the housing and nonhousing macroprudential policy indexes are correlated with the policy rate and reserve requirements. It seems that policymakers generally use

[11] These countries are: Argentina, Brazil, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Poland, Romania, South Africa, Taiwan, Thailand, and Turkey.

[12] We also checked that these relationships have not changed since the financial crisis. When we compare 2000-2008 with 2009-2013, the results are extremely similar.

Table 1: Correlations Between Individual Measures: Complete Set of Countries

Variables	LTV	DSTI	Oth. Hous.	CR	Prov.	Cons. Loan	Cred. Limit
LTV	1.000						
DSTI	0.636*	1.000					
Oth. Hous.	0.443*	0.164*	1.000				
CR	0.105*	0.070*	0.180*	1.000			
Prov.	0.315*	0.312*	0.150*	0.316*	1.000		
Cons. Loan	0.086*	0.076*	0.151*	0.182*	0.083*	1.000	
Cred. Limit	0.110*	0.054*	0.030	0.215*	0.128*	0.148*	1.000

Note: Correlation between the cumulative indexes of seven domestic macroprudential policy tools for 57 countries from 2000 to 2013. LTV=Loan-to-value caps, DSTI=Debt-service-to-income caps, Oth. Hous.=Other housing measures, CR=Capital requirements (excl. those on mortgages), Prov.=Provision requirements (excl. those on mortgages), Cons. Loan=Consumer loan limits, Cred. Limit=Credit growth ceilings. A * signifies the correlation is significant to the 5 percent level.

Table 2: Correlations Between MAPP and Other Policy Measures: Complete Set of Countries

Variables	Housing MAPP	Nonhousing MAPP	Policy Rate	Reserve Requirements
MAPPH	1.000			
MAPPNH	0.294*	1.000		
Pol. Rate	-0.092*	0.133*	1.000	
Res. Req	0.265*	0.115*	0.057*	1.000

Note: Table showing correlation between the cumulative macroprudential policy indexes for housing-related macroprudential policy measures (MAPPH) and nonhousing related macroprudential policy measures (MAPPNH), which captures the level of these measures, the monetary policy rate (Pol. Rate), and a cumulative index of reserve requirements on domestic currency deposits (Res. Req.) for 57 countries from 2000 to 2013. A * signifies the correlation is significant to the 5 percent level.

Table 3: Correlations Between MAPP and Other Policy Measures: 19 Emerging Economies

Variables	MAPPH	MAPPNH	Bank CFM	Port. CFM	Policy Rate	Res. Req.
MAPPH	1.000					
MAPPNH	0.388*	1.000				
Bank CFM	0.143*	0.341*	1.000			
Port. CFM	0.059	0.206*	0.354*	1.000		
Pol. Rate	-0.124*	-0.021	0.136*	-0.007	1.000	
Res. Req	-0.090*	0.130*	0.107*	-0.103*	0.180*	1.000

Note: Table showing correlation between the cumulative macroprudential policy indexes for housing measures (MAPPH) and nonhousing measures (MAPPNH), and cumulative indexes of capital controls from Ahmed and Zlate (2014) including banking inflow restrictions (Bank CFM) and portfolio inflow restrictions (Port. CFM), the monetary policy rate (Pol. Rate), and a cumulative index of reserve requirements on domestic currency deposits (Res. Req.) for 19 emerging market economies from 2002 to 2012. A * signifies the correlation is significant to the 5 percent level.

macroprudential policy measures and the monetary policy as complements (the correlations are weakly positive), with the exception of housing-related macroprudential measures and policy rate changes, which are negatively correlated. The negative relationship is perhaps due to the fact that several countries—in particular advanced economies—have kept policy rates low since the financial crisis, and have simultaneously tightened macroprudential policies related to the housing sector in recent years.[13] This finding might also reflect the difficulty faced by policymakers in dealing with housing booms using monetary policy. Analyzing the pre- and post-crisis periods separately, it seems that the relationships among these measures have not changed much since the crisis.

Capital flow measures can also affect the supply of credit. Several countries used capital flow management tools—such as portfolio and banking inflow restrictions—along with macroprudential policies to deal with fast-growing bank credit.[14] Brazil, for example, tightened macroprudential policies along with capital inflow restrictions, especially restrictions on banking flows, from 2000 through 2012. Policy rate hikes in Brazil from 2010 through mid-2011 acted to curb inflation but also tempered the rapid expansion of credit. Brazil has also used reserve requirements actively since 2000, tightening them considerably from 2004 to 2005 as well as in 2012.

Table 3 displays the correlations between MAPP measures, capital flow measures, and monetary policy for the 19 emerging countries covered by Ahmed and Zlate (2014)'s capital flow measure database.[15] In this subset of emerging markets, the correlations between macroprudential measures, monetary policy rate and reserve requirements are similar to their relationship in the sample as a whole shown in table 2. In these 19 countries, two different types of capital controls—those on banking and portfolio inflows—are strongly positively correlated with each other. Perhaps not surprisingly, banking inflow restrictions are also positively correlated with nonhousing measures like capital requirements and credit growth ceilings, since tightening these types of measures is likely aimed at reducing bank credit growth. Similarly, banking inflow restrictions are positively correlated with policy rate increases and higher reserve requirements.

[13] When we calculate the same correlations among measures only for advanced economies we find a much stronger negative correlation between housing measures and the policy rate.

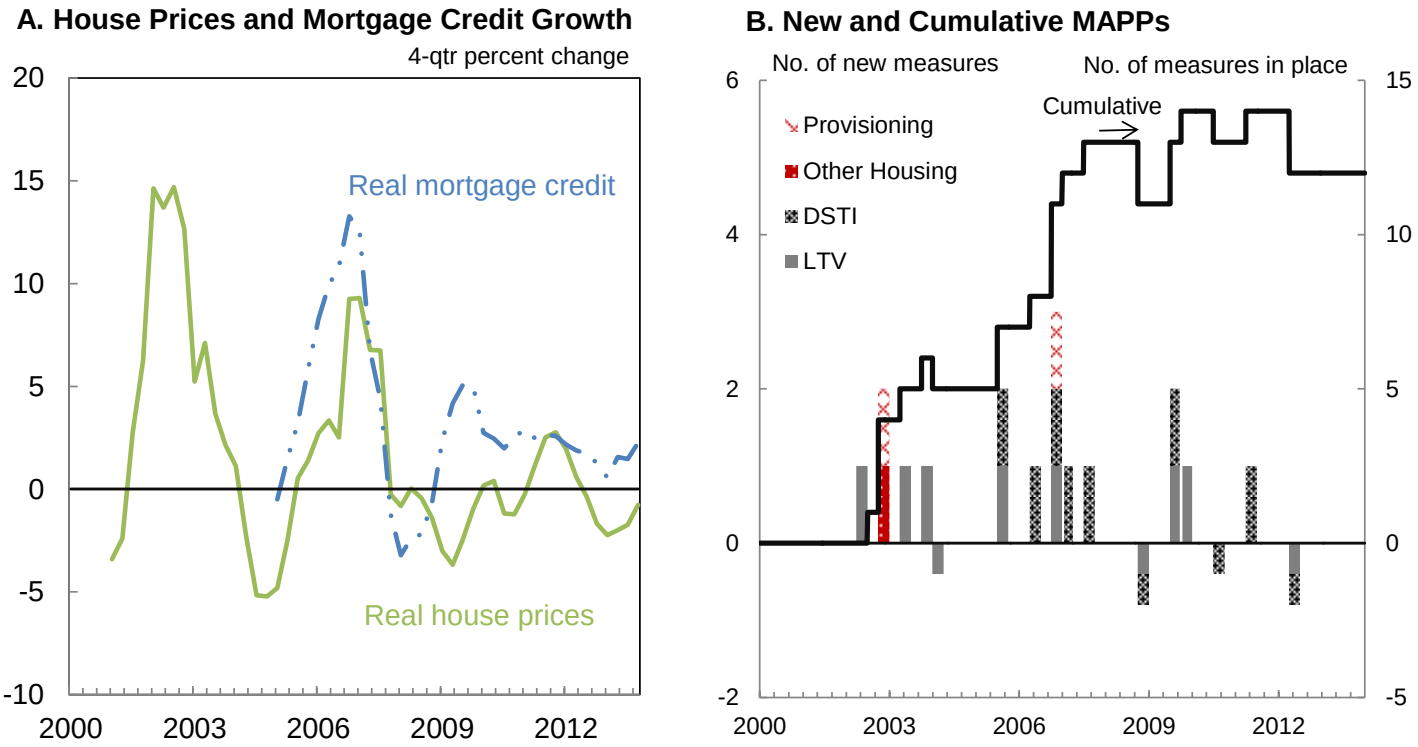
[14] Several papers investigate the relationship between capital flows, capital flow management tools, and macroprudential policies. See Ostry et al. (2012) and Beirne and Friedrich (2014).

[15] For India, we have assumed no change in capital flow measures over the sample period because the changes recorded in the Ahmed and Zlate (2014) database reflect a structural shift to greater financial openness rather than pursuit of financial stability goals.

3 Event Study Analysis: The Case of Korea

This section turns to an event study for Korea to offer some clarity about how macroprudential tools can be adjusted to address particular vulnerabilities. After the Asian crisis of the late 1990s, house prices and mortgage credit in Korea began to grow rapidly, starting in 2001. Since then, Korea has experienced both rapid growth and rapid slowdowns in credit and house prices. The Bank of Korea responded with measures, mostly housing-related, to attenuate these cycles. This section explores the lessons learned from the Korean experience with macroprudential tools from 2000 to 2013.[16]

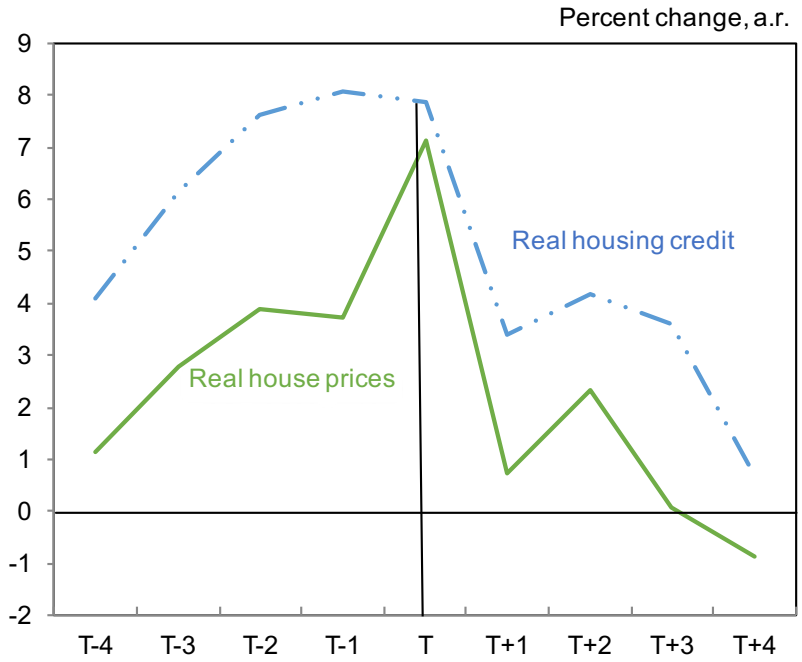
Figure 4: Case Study: Housing Boom-Bust Cycles and Macroprudential Response in Korea



At their peak in 2002, real house prices increased 15 percent compared with a year earlier (figure 4, panel A). The boom was largely concentrated in so-called "speculative zones" of Seoul, Korea's capital. In September 2002, at the height of the boom, Korean authorities capped the LTV ratio of mortgage loans from banks and insurance companies at 60 percent

[16]Korea also used a capital control type measure to limit foreign exchange exposure, among other measures, during the sample period. During the 2008 financial crisis foreign bank branches and some Korean banks faced liquidity shortages as they tried to roll over their maturing short-term external liabilities but were unable to do so because of tight global financial conditions. To address the maturity and currency mismatches of these banks, Korean authorities have introduced a series of measures to limit foreign exchange exposure of banks.

Figure 5: Event Study: House Prices and Housing Credit in Korea



Note: For all macroprudential tightenings in Korea from 2000 to 2013, we study real housing credit growth and real house price appreciation for four quarters before and after the event. The dot-dashed line displays the average housing credit growth before and after macroprudential tightening measures. The solid line shows the average house price appreciation around the tightening events. For housing credit the data begins in 2005, so some early events are lost.

in these speculative zones. The following month authorities mandated additional loan loss provisioning for housing loans and raised the regulatory risk weights on mortgages used to calculate the capital base of banks from 50 percent to between 60 percent and 70 percent.

The LTV ratio was further tightened several times between 2002 and late 2003 before being loosened in March 2004 as credit and house price growth slowed to near zero (figure 4, panel A). The loosening applied only to loans with maturities greater than 10 years. By 2005, growth in mortgage credit and house prices picked up once more and the government introduced a cap on DSTI ratios for the first time in August 2005. The ratio was set at 40 percent for housing loans by banks in speculative zones if the borrower were single or the borrower's spouse were in debt. In November 2006, this cap was extended to cover non-speculative zones in Seoul as well. Later, in August 2007, non-bank financial institutions were subject to DSTI caps of between 40 percent and 70 percent. Panel B of figure 4 illustrates how LTV, DSTI, and provision requirements were subsequently tightened and loosened in response to movements in credit growth and house prices.

Given the variety and intensity of the measures Korea has employed, Korea is a good candidate for a simple event study of the potential effects of macroprudential policies on the housing sector. For both real house prices and real mortgage credit, we identify each

macroprudential tightening and study a four-quarter window before and after the event (figure 5). For house prices, this simple exercise suggests that house price appreciation falls in the four quarters after a tightening. The reduction is dramatic: average house price appreciation in the quarters with MAPP tightenings was 7 percent, while growth in the following quarter fell to just 1 percent. In subsequent quarters, house prices actually began to contract following MAPP tightenings. We conduct the same analysis for mortgage credit; however, the mortgage credit data begin in late 2005, so we lose some events at the beginning of the period. Still, mortgage credit growth also appears to have been contained by the use of housing measures. A similar event study for the *loosening* actions Korea took over the sample period shows symmetric results that house prices tended to increase after macroprudential regulations were relaxed.

There are caveats associated with these findings. In the event study analysis, we simply look at the evolution of house prices and mortgage credit before and after the implementation of macroprudential measures, as is typical in this type of analysis. Several other variables, such as the state of the business and financial cycle, monetary policy and global risk aversion, might have changed at the same time, none of which were controlled for in the event study analysis. Therefore, in the sections that follow, we undertake a more rigorous examination of the effectiveness of macroprudential policies that exploits our large panel dataset, building off of the encouraging results of the case study for Korea.

4 Empirical Analysis

This section lays out the empirical model used in the analysis and presents estimates of the macroprudential policies' effects on bank credit, housing credit, and house prices. The specification we used in our analysis extends the empirical specification in Kuttner and Shim (2013) along three dimensions: First, a global risk aversion variable proxied by the VIX index is included in the regression. Real and financial conditions in small open economies have been shown to be highly correlated with global risk conditions that are exogenous to these countries (see, for example, Akinci (2013)). Inclusion of this variable controls for global cycles in financial conditions in order to disentangle the effect of macroprudential policies on domestic credit conditions. Second, we chose one lag of the change in the monetary policy rate rather than two lags of the level because using the first and second lags of the level together causes each lag to enter with the same coefficient but opposite sign. Including just one lag of the change allows us to better estimate the effect of the other coefficients. Finally, we included two or three lags of the dependent variable as explanatory variables in the regressions in order to correct for serial correlation in the error terms.

We estimate a dynamic panel data regression model with country fixed effects using the Generalized Method of Moments (GMM) method developed by Arellano and Bond (1991). Our empirical model has additive individual time invariant intercepts (fixed effects) along with parameters common to every country used in the sample. The simple Least Square Dummy Variable (LSDV) method also controls for the fixed effects, but a potential concern with the LSDV estimation of dynamic models is the inconsistency of the least squares estimates due to the combination of fixed effects and lagged dependent variables. The GMM estimator developed by Arellano and Bond (1991) is known to correct this bias; hence, it is one of the most widely used techniques in the literature to estimate dynamic panel data models.

4.1 The Empirical Model

The empirical reduced-form regression model used in the analysis is as follows:

$$C_{i,t} = \eta_i + \sum_{k=1}^{p1} \rho_k C_{i,t-k} + \beta VIX_t + \sum_{k=1}^{p2} \theta_k X_{i,t-k} + \delta MAPP_{i,t-1} + \epsilon_{i,t} \tag{1}$$

where i denotes countries, t indicates time period, and η_i is a country fixed effect. The dependent variable, $C_{i,t}$, denotes the quarterly (annualized) growth rate of *domestic bank credit*. The variable denoted by $MAPP_{i,t}$ is the macroprudential policy index (or the housing/nonhousing subindex). As mentioned earlier, we chose to use cumulative measures in the analysis because macroprudential measures can affect credit growth and house price appreciation not just in the quarter of implementation but in subsequent quarters as well. Some of these policies may be delayed in their effect: Though we record the date the measure was put in place, it could be the case that these measures do not bind until years later. For these reasons, we chose to use the country's overall macroprudential stance as our variable of interest. We include a vector of control variables, $X_{i,t}$, that consists of two lags of quarterly (annualized) real GDP growth and one lag of the change in the nominal monetary policy rate. A global risk aversion variable proxied by the VIX index is also included in the regression. An analogous specification is used for the *housing credit* and *house price* regressions.[17]

We estimate model (1) by pooling quarterly data from 57 economies (23 advanced and 34 emerging market economies) using the GMM method.[18] The sample begins in 2000:Q1 and

[17] In the analysis, all nominal variables are deflated by the country's GDP deflator to calculate real variables.

[18] We also worked with a slightly different version of the empirical model proposed in equation (1), without any lags of the dependent variable, but instead we used four lags of the macroprudential policy index to introduce dynamics into the model. We used the ordinary least square method with country fixed effects to estimate the parameters of this alternative model. In this setup, the sum of the coefficients on the macroprudential policy index lags is statistically significant and negative for all three dependent variables.

ends in 2013:Q4. One common concern in reduced-form regressions, like the one presented in equation (1), is that explanatory variables could be endogenous. In particular, it is likely that high-risk countries that experienced rapid growth of house prices and credit are more likely to implement macroprudential policies. However, it is also possible, especially in recent years, that macroprudential policies were implemented at the end of financial boom cycles and credit growth would have naturally declined absent macroprudential policies (note that the VIX index included in our estimation helps account for this problem to the extent that these natural declines are driven by global factors). In addition, one could also expect that GDP growth and the stance of monetary policy in a country are affected by the conditions in the credit market. These and other potential endogeneity issues make it hard to correctly interpret the estimated coefficients.

Although it is difficult to fully solve these endogeneity issues, there are at least two reasons to believe that the endogeneity bias will not be large in our estimated model. First, the GMM technique, which is primarily designed to address the inconsistency of the least squares parameter estimates due to the combination of fixed effects and lagged dependent variables, mitigates some of these concerns. In the estimation of the empirical model, the macroprudential policy variable as well as the control variables of lagged credit growth (or house price appreciation), GDP growth and the monetary policy stance are all treated as endogenous.[19] The empirical model is estimated in first differences and deeper lags of the dependent variable and the explanatory variables, except VIX, in levels are used as instruments.[20] Second, we lag the MAPP index and the other explanatory variables by at least one quarter in the estimation in order to address the possible endogeneity of macroprudential measures, GDP growth and the stance of monetary policy with respect to financial conditions.

4.2 Estimation Results with MAPP Index

Table 4 reports the regression results for domestic real bank credit growth. The baseline results without our macroprudential indexes (column 1) show all control variables entering significantly with the expected sign. The VIX index, which spikes during episodes of financial stress, is negatively correlated with real credit growth.[21] High GDP growth in the previous

[19] All the explanatory variables but the VIX index are treated as endogenous in the estimation of the empirical model. Given that countries in our sample are small open economies, it is plausible to assume that global financial conditions, as proxied by VIX, are exogenous to these countries.

[20] The exogeneity of instruments is confirmed, and the relevant test statistics are presented in the tables summarizing the estimation results.

[21] We ran the same regression replacing VIX with country-specific banking crisis dummies derived from Laeven and Valencia (2012) and a dummy variable for Eurozone countries during the Eurozone crisis and found similar results.

two quarters is associated with higher credit growth, while policy rate increases are expected to lower the rate of credit growth. All three lags of credit growth are positive and significant, around 0.2 on average, indicating persistence in credit developments.[22]

The next three columns in table 4 show the estimated effect of macroprudential measures on real credit growth. The coefficients on the control variables do not change much when the MAPP indexes are added. Column 2 displays the results for the overall MAPP index, which includes both housing and nonhousing measures. One additional macroprudential measure put in place (or tightened), measured by an increase in the MAPP index, is associated with a 0.3 percentage point decline in credit growth in the following quarter. The magnitude of the effect is about the same as that of a 1 percentage point decrease in GDP growth in the previous quarter. As can be seen from columns 3 and 4, both housing and nonhousing measures have played an important role in containing fast growth in bank credit, with nonhousing measures appearing to have a greater effect than housing-related policies.

To test whether housing measures are more effective at curbing housing credit growth, we run the same set of regressions with the growth of housing credit as the dependent variable. These results are shown in table 5. The baseline and overall MAPP results for housing credit are much the same as for total bank credit (columns 1 and 2), though GDP growth has a smaller predicted effect on housing credit growth, and policy rate increases are not associated with reductions in housing credit growth. All three lags of housing credit growth are positive and significant, but estimated coefficients are slightly higher than those associated with total bank credit. From the results in columns 3 and 4, it is clear that housing-related measures drive the significance of the overall MAPP index, while nonhousing measures appear to have no significant effect on housing credit growth.

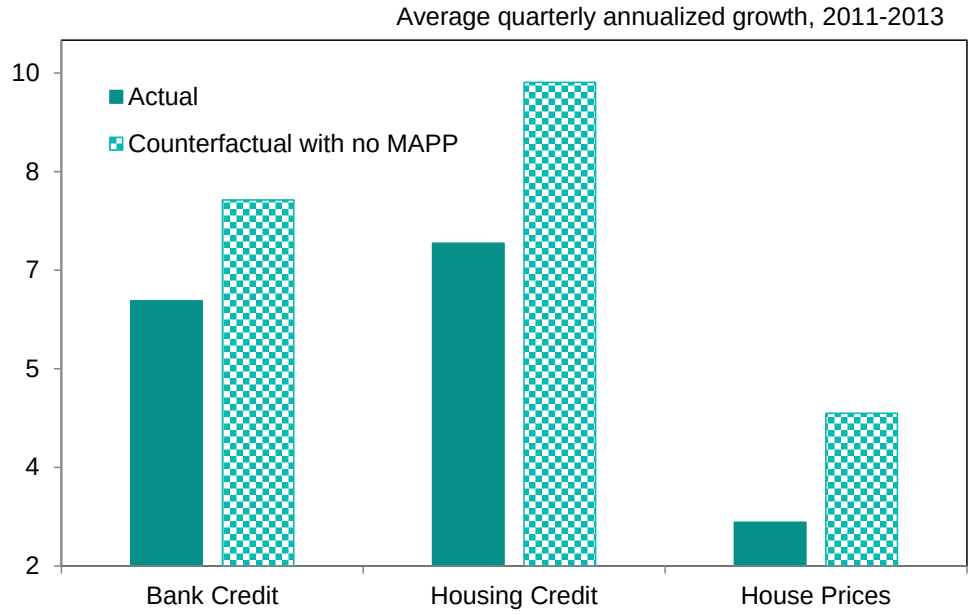
Finally, we investigate whether measures targeted at the housing sector can also affect house prices, which can themselves be a source of financial vulnerability. Indeed, in line with our expectation, it seems that housing-related macroprudential measures can significantly lower house price appreciation while nonhousing measures do not (table 6). The baseline results are fairly similar to those for bank credit. Next, we use these estimates for bank credit, housing credit, and house prices to investigate how economically important the macroprudential policy measures were in the countries that used them.

[22] We included three lags of the dependent variable as controls in the regressions to correct for autocorrelation in levels. As discussed in Roodman (2004) in greater detail, in the context of an Arellano-Bond GMM regression, which is run on first differences, AR(1) is to be expected, and therefore the Arellano-Bond AR(1) test result is usually ignored in that context. The AR(2) test on the residuals in first differences is used to detect AR(1) in the underlying level variables. As documented in the tables summarizing regression results, there is no first order autocorrelation in levels in the empirical models presented in the paper.

4.2.1 Counterfactuals

Are the restraining effects of tighter macroprudential policies economically important? To examine this question, figure 6 shows actual average quarterly credit growth (the first solid dark-colored bar) for countries that used at least one macroprudential tool from 2011 to 2013. The actual credit growth that occurred in the presence of macroprudential policy is compared with credit growth implied by the model under the counterfactual that no macroprudential measures were in place (the first patterned light-colored bar). The measures appear to have made a difference: Although average bank credit growth in these countries continued to increase over the 2011-2013 period even with macroprudential measures in place, it would have been about 25 percent higher in the absence of these measures.

Figure 6: Counterfactuals Illustrating Economic Importance of MAPP Measures, 2011–2013



Note: The solid-colored bars show actual average real bank and real housing credit growth and real house price appreciation across all countries in our sample that had at least one macroprudential policy (MAPP) in place from 2011 to 2013 (or at least one housing-related MAPP for the housing credit and house price estimates). The patterned light-colored bars show, for each dependent variable, our re-estimated average growth, under the counterfactual assumption that no (housing-related) macroprudential policies were in place.

Figure 6 also shows the analogous results for housing credit and house prices.[23] Consistent with the results of the event study for Korea discussed earlier, our model predicts that house price appreciation in countries that enacted at least one housing measure would have been, on average, nearly double its actual level during the 2011-2013 period if macroprudential

[23]For housing credit and house prices, the figure shows the growth rate of the respective variables for the countries that used at least one housing-related macroprudential measure.

measures had not been used. Housing credit growth would have been about one and a half times more. Clearly, the macroprudential measures had a nontrivial effect on credit growth and house price appreciation over the study period.

This counterfactual exercise suggests that the effects of macroprudential policy measures are economically significant. Note, however, that a macroprudential measure should not be expected to have a permanent effect on asset price growth. Using the estimated house price growth model (recall that the parameter estimates of the model are presented in table 6) we simulate an economy with a temporary, unexpected one-unit increase in the housing-related MAPP index. According to our estimated model, the growth rate of real house prices decreases by about 0.4 percentage point in the following quarter.[24] Moreover, it takes about two years for the effects of such a shock on price *growth* to die out, and real house prices are permanently lower than they were before the policy was implemented. The largest price drop comes in the quarter after implementation. Impulse responses for bank credit growth have similar dynamics.

4.3 Estimation Results with Individual MAPP Measures

It is of considerable interest to policymakers which specific instruments are most effective at reducing credit and asset price growth. However, we must proceed with caution when interpreting the results of the regressions with individual measures given that the number of these measures is small, particularly for DSTI caps and loan loss provision requirements. It may be premature to say that measures not shown to be statistically significant are not effective. With these caveats in mind, this section presents the results of the dynamic panel estimation for the five most common individual macroprudential tools on each of the dependent variables, as well as domestic reserve requirements.

For bank credit, three of the five measures are statistically significant, as shown in table 7, and all five enter with the correct sign. The strongest is provision requirements: Our model predicts that one additional provision requirement reduces credit growth in the following quarter by 1.4 percentage points, though we again note the relatively small number of provision requirement measures in the sample. Housing measures, including LTV caps and other housing measures (mostly made up of risk weights on mortgage loans), are also significant. This result is in line with the findings in table 4 for the overall indexes, which showed both housing and nonhousing measures have a significant effect on credit. It seems that provision requirements—both sectoral requirements on housing loans and general provi-

[24]Note that because of our model specification a macroprudential policy measure affects real house prices with a one quarter lag, hence there is no effect on impact.

sion requirements—are quite effective in reducing bank credit growth, and that LTV measures targeted at borrowers can also be effective.

Across all five estimations shown in table 7, the control variables enter significantly with the correct sign. One notable result is the fact that in the majority of regressions where the individual measures are significant, the predicted effect of the policy rate declines slightly and loses some significance. This could be because of correlation between the policy rate and the level of macroprudential policies (see table 2), as these two types of instruments are sometimes used in conjunction to address financial stability concerns.[25]

Turning to housing credit, we expect to find that LTV and DSTI caps as well as other housing measures reduce housing credit growth, and we do find the borrower-targeted policies (LTV and DSTI) are associated with lower housing credit growth (see table 8). The estimated effect of these measures on housing credit is much larger than for total credit, with LTV caps reducing housing credit growth by 1.4 percentage points and DSTI caps by about 2 percentage points. Because housing credit growth is higher, on average, than bank credit growth, and because these measures target mortgage borrowers specifically, these results make sense. The individual nonhousing measures do not appear to significantly affect housing credit.

Finally, we consider the effect of each individual measure on house prices with the same expectation that the measures targeted at the housing sector will be more effective. This is indeed the case, as shown in table 9. DSTI caps have the greatest predicted effect, reducing quarterly house price appreciation by 1 percentage point, followed by LTV caps (0.7 percentage points) and other housing measures (0.6 percentage points). We do not find any significant relationship between nonhousing measures and house prices.

4.4 Estimation Results with Additional Policy Control Variables

Policymakers around the world have used a variety of policy tools to deal with financial instability risks. Among those tools are monetary policy rate changes and changes to reserve requirements on domestic currency deposits as well as capital flow restrictions (see section 2.4 for more detail). The ideal approach would be to use all of these additional policy variables as controls in regressions that relate macroprudential policies to credit and house price variables. However, limitations to data availability for the policy control variables of capital inflow restrictions and reserve requirements make it hard to include them in the

[25]We investigated whether macroprudential policies have been more effective when used in tandem with other policy tools such as the monetary policy rate. To this aim, we extended the empirical model to include an interaction term between the monetary policy rate and the macroprudential policy index. The interaction term is insignificant in our sample of countries. This result might reflect the fact that our sample consists of heterogeneous set of countries, some of which used these two instruments as complements while others used them as substitutes. Section 2.4 discusses this issue in a greater detail.

baseline regressions. Therefore, the purpose of this section is to evaluate the sensitivity of our results on the effectiveness of macroprudential measures to including capital flow restrictions and reserve requirements in the regressions for a subset of countries.[26]

The results are shown in table 10. For the 19 countries for which we have capital inflow restrictions data, the control variables enter with the expected sign and are significant (except for the change in the policy rate, and for the VIX in the housing credit regressions). As with the full panel of countries, the MAPP index (MAPPH index) is predicted to reduce credit growth (housing credit growth) regardless of whether capital inflow restrictions and reserve requirement changes are used in the estimation or not (compare columns 1 and 2 for bank credit, and 3 and 4 for housing credit). So, our results on the effectiveness of macroprudential policies are robust to including these additional policy variables in the regressions.[27]

Regarding the impact of these policy measures on credit growth, we found that neither reserve requirements nor capital flow restrictions have any significant effect on total bank and housing credit when control variables like GDP, global risk, and the policy rate are included in the regressions. Tighter reserve requirements are weakly positively correlated with bank credit in our sample, a result that is is primarily driven by the effect on the euro area of the actions taken by the European Central Bank, which may or may not be countercyclical for individual countries. There appears to be no significant relationship between credit growth and reserve requirements once the euro area is excluded from the sample.[28] Moreover, it appears that for these countries general capital controls (made up of restrictions on banking and portfolio inflows, and foreign direct investment) did not significantly reduce credit growth.[29]

4.5 Subgroup Analysis

The results in the previous sections lend support to the view that macroprudential policies are effective in curbing bank credit growth and house price appreciation. In this section, we present the GMM estimation results for two sample splits, by income level and by degree of importance of bank finance.

[26] Monetary policy changes were already controlled for in the baseline regressions presented earlier.

[27] The regressions results for house prices are not presented in the table. Although they have expected signs, most of the coefficients on both the control variables and the policy variables are insignificant even in the baseline regressions without capital inflow restrictions and reserve requirements, potentially due to very short sample size. We can provide these results upon request.

[28] We also checked whether there was any interaction between the effectiveness of reserve requirements and macroprudential policy and found no significant relationship.

[29] We find that tighter banking inflow restrictions are correlated with lower bank credit growth, but the relationship is not significant.

4.5.1 Income

Do our results hold up for both advanced and emerging markets? Or is one group of countries driving the results for the sample as a whole? We are particularly interested in sample split by income group because our analysis in section 2.3 suggests that there are large differences across advanced economy and emerging economy groups in their use of macroprudential policies. In particular, advanced economies almost entirely used macroprudential polices in a targeted manner to deal with overheating in specific sectors such as housing. In emerging market economies, on the other hand, excessive bank credit growth has also been an important concern, and thus nonhousing measures have been used almost as frequently as housing measures. Moreover, emerging economies have used these policies more actively over the sample period. In this section, we investigate how the effects of macroprudential policies vary in advanced economies versus emerging markets.

In table 11 we show the regression results for bank credit with the sample split into advanced and emerging economies. The control variables do not change much for the subsamples, though it appears that global risk plays a smaller role in determining credit growth in emerging economies. The overall MAPP index is negative and significant for both cases, suggesting that macroprudential policies matter for credit growth in both emerging and advanced economies. An interesting result is that housing measures drive the results for advanced economies while nonhousing policies matter more in emerging markets, consistent with what we observe in figure 3 that emerging markets have chosen to use broad, non-housing policies, while advanced economies have generally used policies that specifically apply to the housing sector. The nonhousing policies used in advanced economies do not appear to be significantly associated with lower bank credit growth.

For house prices, we find that macroprudential policy tightenings matter in both advanced and emerging markets (table 13). In both groups, it is housing-related macroprudential policies that drive the results for the overall index. It seems that monetary policy tightenings are significantly (weakly) associated with lower house price appreciation in advanced economies (emerging markets). The results for housing credit also indicate that monetary policy can be a powerful tool in dealing with housing credit growth, while the impact of macroprudential polices on housing credit is negative but insignificant (table 12). Housing-related policies matter for housing credit in emerging markets while nonhousing measures do not.

4.5.2 Importance of Bank Finance

We next use sample splits to identify the impact of macroprudential policies on house price appreciation. Our hypothesis is that housing-related policies such as caps on LTV and DSTI

ratios should matter more in economies where housing finance is important, as measured by bank finance relative to GDP.[30] To test this hypothesis, we first rank countries in the sample based on their bank credit-to-GDP ratios, and determine the group of countries that fall into the top tertile and the bottom tertile. We then estimate the house price regression model for the group of countries in the top tertile and in the bottom tertile separately.[31]

The results are presented in table 14. The first column with numbers (Top Tertile) shows the estimation results for a group of countries in which bank finance is important. The coefficient estimates for controls (such as the lagged house prices, VIX, GDP growth and the change in monetary policy rate) belong to the regression in which housing macroprudential policies (MAPPH) is used in the estimations. The estimated coefficients on control variables do not change much when individual tools, such as LTV, DSTI, or other housing measures, are used in the estimation, and therefore are not shown in the table. House prices seem to display persistence in this group of countries. The global risk aversion variable, VIX, is negative and significant, as expected, and so is the change in the monetary policy rate. GDP growth has the expected sign but is not statistically significant. In line with our hypothesis, housing related macroprudential policies (both the aggregate index, MAPPH, and the individual measures such as caps on LTV and DSTI ratios) are associated with lower house price appreciation in countries where bank finance is important.

Estimation results for a group of countries in which bank finance is not so important are presented in the second column with numbers (Bottom Tertile). The impact of housing related macroprudential measures on house price appreciation is smaller and estimated with greater imprecision, yielding significantly larger standard errors (as shown in the parenthesis). Therefore our analysis in this section gives support to the hypothesis that housing-related policies matter more for preventing house price appreciation in economies where bank finance is important.

[30] We thank the referee for suggesting this approach.

[31] Countries included in the top tertile are: Hong Kong, Denmark, Switzerland, New Zealand, Taiwan, Portugal, Spain, Malta, Korea, China, Malaysia, Ireland, Netherlands, Japan, Australia, Sweden, Thailand, United Kingdom, and Singapore. Average bank credit is about 120 percent of GDP in these group of countries. Countries included in the bottom tertile, in which average bank credit is about 35 percent of GDP, are: Ukraine, Romania, Bulgaria, India, Hungary, Slovakia, Brazil, Czech Republic, Lithuania, Serbia, Poland, Philippines, Russia, Peru, Colombia, Turkey, Indonesia, Mexico, Argentina. Although both top and bottom tertile include 19 countries based on bank credit-to-GDP ratio, the actual number of countries used in the housing regression might differ based on data availability for house prices. Our results are robust to sub-grouping countries based on quartile, or 2-quantile.

5 Conclusion

In this paper, we have used a dynamic panel data model to assess the effectiveness of macroprudential policies. To do so, we developed a novel set of indexes for seven macroprudential tools (LTV caps, DSTI caps, other housing measures, time-varying capital requirements, provision requirements, consumer loan limits, and credit growth ceilings) as well as an aggregate index to measure the overall macroprudential policy stance of 57 countries. We have used national sources and IMF survey results to update and improve existing databases of macroprudential policies to cover three years more than most of the empirical literature, a period in which macroprudential policies were heavily used.

This study analyzes how a country's general macroprudential policy stance, as well as its stance with regard to one particular sector, housing, affects credit growth and house prices. We find that bank credit growth is restrained by both housing and nonhousing measures. Analysis on the individual level suggests provision requirements are effective, along with LTV caps, risk weights on mortgages, and other housing measures. Our results predict that only housing-related macroprudential policies, particularly LTV and DSTI caps, constrain housing credit growth and house price appreciation. Counterfactual simulations from the model assuming countries had not used any macroprudential measures predict that average bank credit growth, housing credit growth, and house price appreciation would all have been significantly higher between 2011 to 2013 in the absence of macroprudential policy. Our results also suggest that housing-related policies matter more for preventing house price appreciation in economies where bank finance is important.

Future work on the efficacy of macroprudential policy should address several concerns. More research should be done to understand the domestic spillovers from macroprudential policy in some sectors, especially the effect of housing-related policies on other sectors. Moreover, although we find little mutual reinforcement of macroprudential policies and capital controls with regard to bank credit growth, it is likely that the two policy options both affect capital flows, and this relationship should also be investigated further.

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Table 4: Panel Estimation Results: Bank Credit, 2000:Q1-2013:Q4

	Baseline	With MAPP	With MAPPH	With MAPPNH
Cred. growth, L1	0.177***	0.176***	0.176***	0.176***
	(0.03)	(0.03)	(0.03)	(0.03)
Cred. growth, L2	0.219***	0.220***	0.218***	0.220***
	(0.03)	(0.03)	(0.03)	(0.03)
Cred. growth, L3	0.169***	0.168***	0.169***	0.169***
	(0.02)	(0.02)	(0.02)	(0.02)
VIX (log)	-1.468**	-1.589**	-1.618**	-1.444**
	(0.67)	(0.66)	(0.67)	(0.66)
GDP growth, L1	0.237***	0.225***	0.228***	0.231***
	(0.05)	(0.05)	(0.05)	(0.05)
GDP growth, L2	0.230***	0.217***	0.221***	0.224***
	(0.04)	(0.04)	(0.04)	(0.04)
Chg. in pol. rate, L1	-1.187*	-1.094*	-1.149*	-1.090*
	(0.61)	(0.60)	(0.61)	(0.60)
MAPP, L1		-0.289***		
		(0.10)		
MAPPH, L1			-0.304**	
			(0.14)	
MAPPNH, L1				-0.529***
				(0.20)
Observations	2603	2603	2603	2603
No. of countries	55	55	55	55
AB AR(1) Test - p value	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.75	0.84	0.71	0.87
Sargan Test - p value	0.24	0.25	0.25	0.25
Hansen Test - p value	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 5: Panel Estimation Results: Housing Credit, 2000:Q1-2013:Q4

	Baseline	With MAPP	With MAPPH	With MAPPNH
H. Cred. Growth, L1	0.290***	0.287***	0.285***	0.290***
	(0.06)	(0.06)	(0.06)	(0.06)
H. Cred. Growth, L2	0.266***	0.264***	0.262***	0.266***
	(0.04)	(0.04)	(0.04)	(0.04)
H. Cred. Growth, L3	0.156***	0.155***	0.153***	0.156***
	(0.04)	(0.04)	(0.04)	(0.04)
VIX (log)	-1.359*	-1.560**	-1.603**	-1.360*
	(0.74)	(0.74)	(0.74)	(0.74)
GDP growth, L1	0.133***	0.122**	0.123**	0.132***
	(0.05)	(0.05)	(0.05)	(0.05)
GDP growth, L2	0.038	0.030	0.030	0.037
	(0.05)	(0.05)	(0.05)	(0.06)
Chg. in pol. rate, L1	-0.037	0.043	0.033	-0.034
	(0.60)	(0.56)	(0.57)	(0.61)
MAPP, L1		-0.409**		
		(0.19)		
MAPPH, L1			-0.585***	
			(0.22)	
MAPPNH, L1				-0.057
				(0.61)
Observations	2287	2287	2287	2287
No. of countries	53	53	53	53
AB AR(1) Test - p value	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.17	0.15	0.15	0.16
Sargan Test - p value	0.10	0.12	0.10	0.12
Hansen Test - p value	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 6: Panel Estimation Results: House Prices, 2000:Q1-2013:Q4

	Baseline	With MAPP	With MAPPH	With MAPPNH
H. Price Growth, L1	0.158***	0.158***	0.157***	0.159***
	(0.06)	(0.06)	(0.06)	(0.06)
H. Price Growth, L2	0.212***	0.212***	0.211***	0.213***
	(0.03)	(0.03)	(0.03)	(0.03)
VIX (log)	-3.903***	-4.068***	-4.086***	-3.940***
	(0.89)	(0.92)	(0.91)	(0.90)
GDP growth, L1	0.231***	0.217***	0.219***	0.223***
	(0.08)	(0.08)	(0.08)	(0.08)
GDP growth, L2	0.100*	0.091	0.094	0.096
	(0.06)	(0.06)	(0.06)	(0.06)
Chg. in pol. rate, L1	-1.327**	-1.257**	-1.273**	-1.301**
	(0.52)	(0.51)	(0.52)	(0.51)
MAPP, L1		-0.298**		
		(0.11)		
MAPPH, L1			-0.375***	
			(0.14)	
MAPPNH, L1				-0.305
				(0.32)
Observations	2302	2302	2302	2302
No. of countries	53	53	53	53
AB AR(1) Test - p value	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.23	0.23	0.23	0.23
Sargan Test - p value	0.19	0.24	0.19	0.22
Hansen Test - p value	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 7: Individual Measures: Panel Estimation Results, Bank Credit, 2000:Q1-2013:Q4

	(1)	(2)	(3)	(4)	(5)	(6)
Cred. Growth, L1	0.174***	0.175***	0.176***	0.177***	0.175***	0.172***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Cred. Growth, L2	0.218***	0.218***	0.218***	0.219***	0.218***	0.224***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Cred. Growth, L3	0.167***	0.167***	0.170***	0.169***	0.169***	0.162***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
VIX (log)	-1.653**	-1.479**	-1.545**	-1.462**	-1.425**	-1.487**
	(0.69)	(0.66)	(0.66)	(0.66)	(0.66)	(0.68)
GDP growth, L1	0.229***	0.233***	0.234***	0.235***	0.236***	0.239***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
GDP growth, L2	0.223***	0.226***	0.227***	0.227***	0.229***	0.230***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Chg. in pol. rate, L1	-1.152*	-1.180*	-1.182*	-1.157*	-1.142*	-1.290**
	(0.61)	(0.61)	(0.61)	(0.60)	(0.61)	(0.59)
LTV, L1	-0.751*					
	(0.40)					
DSTI, L1		-0.915				
		(0.74)				
Other Housing, L1			-0.600*			
			(0.35)			
CR, L1				-0.325		
				(0.36)		
Prov., L1					-1.390**	
					(0.62)	
Res. Req., L1						0.195*
						(0.11)
Observations	2603	2603	2603	2603	2603	2670
No. of countries	55	55	55	55	55	55
AB AR(1) Test - p value	0.00	0.00	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.81	0.80	0.72	0.73	0.77	0.27
Sargan Test - p value	0.17	0.17	0.22	0.24	0.26	0.23

Note: LTV is caps on loan-to-value, and DSTI is caps on debt-service-to-income ratio for mortgage loans. Other housing includes measures such as changes in regulatory risk weights for mortgage loans and quantitative limits on mortgage lending. CR is capital requirements, Prov. is provision requirements and Res. Req. is domestic bank reserve requirement ratio. Capital and provision requirements excludes housing related measures. The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected (Hansen test's p-value=1). The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 8: Individual Measures: Panel Estimation Results, Housing Credit, 2000:Q1-2013:Q4

	(1)	(2)	(3)	(4)	(5)	(6)
H. Cred. Growth, L1	0.284***	0.285***	0.289***	0.288***	0.289***	0.291***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
H. Cred. Growth, L2	0.262***	0.261***	0.266***	0.264***	0.265***	0.266***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
H. Cred. Growth, L3	0.153***	0.151***	0.156***	0.154***	0.155***	0.157***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
VIX (log)	-1.667**	-1.372*	-1.465**	-1.320*	-1.367*	-1.322*
	(0.75)	(0.73)	(0.73)	(0.76)	(0.74)	(0.73)
GDP growth, L1	0.121**	0.127**	0.129**	0.140**	0.133**	0.131**
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
GDP growth, L2	0.030	0.033	0.035	0.044	0.039	0.038
	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)
Chg. in pol. rate, L1	-0.065	0.020	-0.017	-0.070	-0.061	-0.028
	(0.57)	(0.58)	(0.58)	(0.59)	(0.59)	(0.60)
LTV, L1	-1.411**					
	(0.59)					
DSTI, L1		-1.963*				
		(1.09)				
Other Housing, L1			-0.552			
			(0.40)			
CR, L1				1.426		
				(0.91)		
Prov., L1					0.992	
					(1.30)	
Res. Req., L1						-0.143
						(0.35)
Observations	2287	2287	2287	2287	2287	2268
No. of countries	53	53	53	53	53	53
AB AR(1) Test - p value	0.00	0.00	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.16	0.16	0.16	0.18	0.17	0.17
Sargan Test - p value	0.10	0.10	0.11	0.10	0.10	0.17

Note: LTV is caps on loan-to-value, and DSTI is caps on debt-service-to-income ratio for mortgage loans. Other housing includes measures such as changes in regulatory risk weights for mortgage loans and quantitative limits on mortgage lending. CR is capital requirements, Prov. is provision requirements and Res. Req. is domestic bank reserve requirement ratio. Capital and provision requirements excludes housing related measures. The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected (Hansen test's p-value=1). The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 9: Individual Measures: Panel Estimation Results, House Prices, 2000:Q1-2013:Q4

	(1)	(2)	(3)	(4)	(5)	(6)
H. Price Growth, L1	0.157***	0.157***	0.158***	0.158***	0.157***	0.159***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
H. Price Growth, L2	0.211***	0.211***	0.212***	0.212***	0.210***	0.213***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
VIX (log)	-4.099***	-3.934***	-4.010***	-3.926***	-3.907***	-3.926***
	(0.92)	(0.90)	(0.91)	(0.90)	(0.90)	(0.90)
GDP growth, L1	0.221***	0.229***	0.223***	0.228***	0.232***	0.227***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
GDP growth, L2	0.095	0.095	0.098	0.097*	0.101*	0.098
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Chg. in pol. rate, L1	-1.311**	-1.338**	-1.302**	-1.308**	-1.331**	-1.325**
	(0.51)	(0.52)	(0.52)	(0.51)	(0.52)	(0.51)
LTV, L1	-0.714**					
	(0.31)					
DSTI, L1		-1.042**				
		(0.51)				
Other Housing, L1			-0.560*			
			(0.30)			
CR, L1				-0.555		
				(0.70)		
Prov., L1					0.605	
					(0.74)	
Res. Req., L1						0.111
						(0.12)
Observations	2302	2302	2302	2302	2302	2283
No. of countries	53	53	53	53	53	53
AB AR(1) Test - p value	0.00	0.00	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.23	0.23	0.23	0.23	0.23	0.24
Sargan Test - p value	0.19	0.19	0.20	0.18	0.19	0.31

Note: LTV is caps on loan-to-value, and DSTI is caps on debt-service-to-income ratio for mortgage loans. Other housing includes measures such as changes in regulatory risk weights for mortgage loans and quantitative limits on mortgage lending. CR is capital requirements, Prov. is provision requirements and Res. Req. is domestic bank reserve requirement ratio. Capital and provision requirements excludes housing related measures. The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected (Hansen test's p-value=1). The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Table 10: Estimation Results with Additional Policy Control Variables: 2000:Q1-2013:Q4

	Bank Credit	Bank Credit	Hous. Credit	Hous. Credit
Cred. Growth, L1	0.138***	0.127***	0.284***	0.267***
	(0.04)	(0.04)	(0.06)	(0.06)
Cred. Growth, L2	0.187***	0.187***	0.219***	0.213***
	(0.03)	(0.03)	(0.05)	(0.06)
Cred. Growth, L3	0.094**	0.103**		
	(0.04)	(0.04)		
VIX (log)	-2.356*	-2.485*	-0.848	-1.133
	(1.21)	(1.28)	(1.65)	(1.74)
GDP growth, L1	0.258***	0.265**	0.069	0.045
	(0.09)	(0.09)	(0.07)	(0.07)
GDP growth, L2	0.356***	0.341***	0.148*	0.132*
	(0.10)	(0.09)	(0.08)	(0.07)
Chg. in pol. rate, L1	-0.765	-0.721	0.978	0.948
	(0.87)	(1.00)	(0.65)	(0.66)
MAPP, L1	-0.430**	-0.610**		
	(0.18)	(0.24)		
MAPPH, L1			-1.578**	-1.213*
			(0.61)	(0.68)
MAPPNH, L1			1.292	1.136
			(1.28)	(1.21)
CFM, L1		0.052		-0.068
		(0.20)		(0.19)
Res. Req., L1		1.138		1.026
		(0.59)		(1.06)
Observations	738	716	606	588
No. of countries	19	19	18	18
AB AR(1) Test - p value	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.56	0.19	0.26	0.21
Sargan Test - p value	0.63	0.23	0.54	0.44

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). CFM represents the capital flow management measures. Res. Req. is the domestic currency required reserve ratio. The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively. Sample includes 19 countries for which there is capital flow management index data. These countries are Argentina, Brazil, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Poland, Romania, South Africa, Taiwan, Thailand, and Turkey.

Table 11: Sample Splits by Income Level: Bank Credit, 2000:Q1-2013:Q4

	AFE	EME	AFE	EME	AFE	EME
Cred. Growth, L1	0.171***	0.171***	0.171***	0.172***	0.173***	0.171***
	(0.05)	(0.03)	(0.05)	(0.03)	(0.05)	(0.03)
Cred. Growth, L2	0.224***	0.220***	0.224***	0.220***	0.226***	0.221***
	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
Cred. Growth, L3	0.272***	0.155***	0.273***	0.155***	0.275***	0.156***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
VIX (log)	-1.928**	-1.400	-1.916**	-1.432	-1.886**	-1.202
	(0.79)	(1.06)	(0.78)	(1.08)	(0.79)	(1.05)
GDP growth, L1	0.181***	0.245***	0.181***	0.249***	0.186***	0.250***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
GDP growth, L2	0.192**	0.216***	0.191**	0.219***	0.196**	0.221***
	(0.08)	(0.05)	(0.08)	(0.05)	(0.08)	(0.05)
Chg. in pol. rate, L1	-1.188	-1.083	-1.184	-1.134*	-1.242	-1.070
	(0.89)	(0.13)	(0.90)	(0.68)	(0.90)	(0.66)
MAPP, L1	-0.203*	-0.316**				
	(0.12)	(0.13)				
MAPPH, L1			-0.197*	-0.363*		
			(0.12)	(0.19)		
MAPPNH, L1					-0.305	-0.560**
					(0.57)	(0.21)
Observations	1137	1466	1137	1466	1137	1466
No. of countries	22	33	22	33	22	33
AB AR(1) Test - p value	0.00	0.00	0.00	0.00	0.00	0.00
AB AR(2) Test - p value	0.29	0.91	0.27	0.92	0.29	0.90
Sargan Test - p value	0.15	0.49	0.14	0.49	0.15	0.47
Hansen Test - p value	1.00	1.00	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively. AFE=Advanced economies, EME=Emerging economies.

Table 12: Sample Splits by Income Level: Housing Credit, 2000:Q1-2013:Q4

	AFE	EME	AFE	EME	AFE	EME
H. Cred. Growth, L1	0.061	0.375***	0.060	0.373***	0.065	0.378***
	(0.09)	(0.06)	(0.09)	(0.06)	(0.08)	(0.06)
H. Cred. Growth, L2	0.201***	0.267***	0.199***	0.265***	0.206***	0.269***
	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)
H. Cred. Growth, L3	0.264***	0.095**	0.264***	0.093**	0.272***	0.095**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
VIX (log)	-2.092*	-1.923*	-2.086*	-2.005*	-1.882*	-1.662
	(1.17)	(1.14)	(1.15)	(1.13)	(1.12)	(1.16)
GDP growth, L1	0.257***	0.116	0.261***	0.116	0.271***	0.126**
	(0.07)	(0.07)	(0.07)	(0.08)	(0.07)	(0.08)
GDP growth, L2	0.104*	0.022	0.105**	0.022	0.110**	0.028
	(0.06)	(0.08)	(0.05)	(0.08)	(0.05)	(0.08)
Chg. in pol. rate, L1	-3.168***	0.813	-3.211***	0.801	-3.247***	0.733
	(0.88)	(0.52)	(0.88)	(0.54)	(0.88)	(0.55)
MAPP, L1	-0.517	-0.401**				
	(0.36)	(0.21)				
MAPPH, L1			-0.548	-0.640**		
			(0.38)	(0.26)		
MAPPNH, L1					0.391	-0.120
					(1.72)	(0.58)
Observations	1132	1155	1132	1155	1132	1155
No. of countries	22	31	22	31	22	31
AB AR(1) Test - p value	0.00	0.00	0.00	0.00	0.09	0.00
AB AR(2) Test - p value	0.76	0.12	0.72	0.12	0.73	0.13
Sargan Test - p value	0.38	0.23	0.45	0.23	0.48	0.24
Hansen Test - p value	1.00	1.00	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively. AFE=Advanced economies, EME=Emerging economies.

Table 13: Sample Splits by Income Level: House Prices, 2000:Q1-2013:Q4

	AFE	EME	AFE	EME	AFE	EME
H. Price Growth, L1	0.246**	0.128*	0.246**	0.127*	0.253**	0.129*
	(0.10)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)
H. Price Growth, L2	0.248**	0.206***	0.249***	0.206***	0.255***	0.206***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
VIX (log)	-2.722***	-5.367***	-2.696***	-5.393***	-2.610***	-5.184***
	(0.82)	(1.66)	(0.83)	(1.67)	(0.80)	(1.61)
GDP growth, L1	0.066	0.336***	0.066	0.338***	0.071	0.344***
	(0.06)	(0.12)	(0.06)	(0.12)	(0.06)	(0.12)
GDP growth, L2	0.197*	0.010	0.197*	0.012	0.202*	0.014
	(0.11)	(0.07)	(0.11)	(0.07)	(0.11)	(0.07)
Chg. in pol. rate, L1	-2.855**	-0.510	-2.855**	-0.519	-2.956**	-0.532
	(1.17)	(0.51)	(1.18)	(0.51)	(1.20)	(0.51)
MAPP, L1	-0.445*	-0.234*				
	(0.26)	(0.14)				
MAPPH, L1			-0.441*	-0.316*		
			(0.26)	(0.17)		
MAPPNH, L1					-0.492	-0.252
					(0.90)	(0.38)
Observations	1150	1152	1150	1152	1150	1152
No. of countries	23	30	23	30	23	30
AB AR(1) Test - p value	0.02	0.00	0.02	0.00	0.00	0.00
AB AR(2) Test - p value	0.33	0.42	0.33	0.42	0.32	0.42
Sargan Test - p value	0.75	0.44	0.74	0.43	0.79	0.44
Hansen Test - p value	1.00	1.00	1.00	1.00	1.00	1.00

Note: MAPP is the overall cumulative macroprudential policy index that sums the cumulative housing-related macroprudential policy index (MAPPH) and the cumulative nonhousing-related macroprudential policy index (MAPPNH). The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively. AFE=Advanced economies, EME=Emerging economies.

Table 14: Sample Splits by Importance of Bank Finance: House Prices, 2000:Q1-2013:Q4

	Top Tertile	Bottom Tertile
H. Price Growth, L1	0.260**	0.081
	(0.10)	(0.09)
H. Price Growth, L2	0.166***	0.204***
	(0.04)	(0.04)
VIX (log)	-3.049**	-5.620*
	(1.13)	(3.03)
GDP growth, L1	0.086	0.411**
	(0.11)	(0.16)
GDP growth, L2	0.105	0.061
	(0.11)	(0.09)
Chg. in pol. rate, L1	-3.600***	0.25
	(1.11)	(0.69)
MAPPH, L1	-0.311**	-0.0476
	(0.14)	(0.65)
LTV, L1	-0.567*	-0.304
	(0.33)	(2.01)
DSTI, L1	-0.639*	-0.444
	(0.34)	(0.84)
Oth. Housing, L1	-0.588	0.100
	(0.43)	(1.31)
Observations	925	541
No. of countries	19	16
AB AR(1) Test - p value	0.01	0.02
AB AR(2) Test - p value	0.36	0.40
Sargan Test - p value	0.64	0.46
Hansen Test - p value	1.00	1.00

Note: Top (bottom) tertile column represents the estimation results for a group of countries for which bank finance is the most (least) important, as measured by bank credit relative to GDP. MAPPH is the cumulative housing-related macroprudential policy index. LTV is caps on loan-to-value ratio and DSTI is caps on debt-service-to-income ratio for mortgage loans. Other housing includes measures such as changes in regulatory risk weights for mortgage loans, quantitative limits on mortgage lending, and stricter requirements for mortgage borrower creditworthiness. The estimates are obtained using Arellano-Bond (AB) GMM method which treats all the explanatory variables but the VIX as endogenous. The evolution of VIX is assumed to be exogenous to the small open economies in our sample. Both the Sargan and Hansen tests' null hypothesis of over-identifying restrictions (i.e., the instruments as a group are exogenous) are not rejected. The Hansen tests of exogeneity of instrument subsets (not shown in the table) are not rejected either. AB test for null hypothesis of no first order autocorrelation (AR(1)) in first differences is rejected; but AB test for null hypothesis of no first order autocorrelation in levels (AR(2)) is not rejected. Robust standard errors clustered by country are in parentheses. * p<0.1, ** p<0.05, *** p<0.01. L1, L2, and L3 represent a first, second, and third order lag, respectively.

Appendix A Country Groupings

Advanced Economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Emerging Economies: **Asia** (China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand); **Latin America** (Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay); **CEE** (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia, Serbia, Ukraine); **Others** (Israel, South Africa, Turkey).

Appendix B Macroprudential Dataset

Tables B1 and B2 display our coding of policy measures in the 57 countries for each quarter from the first quarter of 2000 to the last quarter of 2013 for housing and nonhousing measures, respectively. Table B1 demonstrates that housing measures have been used actively by many countries, particularly since 2007. Asian and Eastern European countries used such measures most frequently, and often adjusted LTV caps, DSTI caps, and risk weights on housing loans several times over the sample period. During the financial crisis many countries relaxed their macroprudential stance on mortgage lending. We do not observe as many nonhousing measures in table B2, but these measures were nonetheless used by nearly half the countries in our sample at some point from 2000 to 2013. Nonhousing measures were also adjusted by many countries that used them, especially during the financial crisis, and tightenings were much more common than easings across all measures. The most popular nonhousing measures were capital and loan-loss provision requirements, while consumer loan measures and credit growth limits were used more sparingly.

Appendix C Dataset for Other Variables

Finding data on credit and house prices for 57 countries with a relatively consistent definition is a difficult task, particularly for the emerging markets in our sample. For some countries, data is unavailable for the beginning of the sample period. Definitions and reporting methodologies vary across countries. This section provides a brief discussion of our selection criteria for the dependent variables used in our panel data analysis and event studies.

Our data on bank credit comes primarily from the Bank for International Settlements (BIS) dataset on credit to the private sector. The series we use is credit from domestic banks to

the non-financial private sector. We chose to study domestic credit because macroprudential policies govern domestic banks. Since this public database does not cover all countries in our sample, we supplement the BIS data with data from national sources supplied by Haver Analytics, again using domestic credit to the private sector, although the definition may vary across countries. Table C3 describes the exact definition and source for each country.

Housing credit is the most difficult to locate out of the three dependent variables. We collect the same data used in Kuttner and Shim (2013) for housing credit, using BIS databases, central bank websites, and the commercial sources Datastream and CEIC. This data should be understood as a subset of total bank credit; that is, we select the series that is closest to domestic bank credit to households for home purchase for each country. Table C4 describes the definition and source for each country.

Our house price data also comes from the BIS for most countries and is supplemented with data from national sources when necessary. Many countries have a variety of different house price indexes covering different types of homes and geographic locations. Since macroprudential regulations are generally issued on a national level and typically cover all types of residential properties, we select the broadest house price index available, ideally one covering the entire geographic area of the country and both new and existing homes. Table C5 describes the exact definition and source for each country.

The real gross domestic product data comes from national sources collected by Haver Analytics. We use the national source's seasonally adjusted series where available, and use the U.S. Census Bureau's X12-ARIMA Seasonal Adjustment program on national sources for countries that do not seasonally adjust their own GDP series.

The VIX index is an index of implied volatility of S&P500 index options. The data comes from Bloomberg.

For monetary policy, we use each country's official policy rate. To convert the data to quarterly frequency we average the policy rate at the end of each of the three months in that quarter. The data comes from Bloomberg, CEIC, and Haver.

Table B1: Macroprudential Policies: Housing

	1. Loan-to-Value Cap	2. Debt-to-Income Cap	3. Other Housing Measures Excl. CCR and Prov.	4. Countercyclical Capital Requirements (Housing Related)	5. Loan-Loss Provisioning (Housing Related)
2000-Q1	Colombia (1), Hong Kong (2)	Colombia (1), Hong Kong (2)	Norway (1), Portugal (1), South Africa (1)	Norway (1), Portugal (1), South Africa (1)	
2000-Q2					
2000-Q3	Hong Kong (-1)		Philippines (1)		
2000-Q4					
2001-Q1					
2001-Q2				Norway (-1)	
2001-Q3	Iceland (-1)		Singapore (1)		
2001-Q4	Hong Kong (-1)				
2002-Q1					
2002-Q2					
2002-Q3	Korea (1), Philippines (-1)				
2002-Q4				Korea (1)	
2003-Q1					
2003-Q2	Denmark (1), Korea (1)		Denmark (1)	Argentina (1)	
2003-Q3					
2003-Q4	Korea (1), Thailand (1)		Denmark (-1)		
2004-Q1	Korea (-1), Romania(1)	Romania (1)	Canada (-1), Hungary (1)	Argentina (2)	
2004-Q2					
2004-Q3	China (1), Sweden (1)	China (1)			
2004-Q4	Iceland (-1), Serbia (1)	Serbia (2)	Estonia (1), Serbia (1)	Australia (1), India (1)	
2005-Q1	China (1)				
2005-Q2	Bulgaria (1)			Bulgaria (1), Malaysia (1)	
2005-Q3	Korea (1), Singapore (-1)	Korea (1), Romania (1)			
2005-Q4		Greece (1)			Greece (1)
2006-Q1			Canada (-1)	Estonia (1)	
2006-Q2	Bulgaria (1), China (1)	Korea (1)		Ireland (1)	
2006-Q3	Argentina (-1), Iceland (1)			Uruguay (1)	
2006-Q4	Croatia (1), Korea (1)	Croatia (1), Korea (1)			
2007-Q1	Iceland (-1)	Korea (1), Netherlands (1)	Netherlands (1)	France (1), Italy (1), Lithuania (1)	
2007-Q2					
2007-Q3	Canada (-1), China (1), Denmark (1), Latvia (1)	Korea (1), Latvia (1)	Brazil (1)		
2007-Q4					
2008-Q1		Latvia (1)	Philippines (-1)	Estonia (-1), Latvia (-1), Poland (1)	
2008-Q2	Iceland (-1)			Spain (1)	
2008-Q3	Serbia (1)			Serbia (1)	
2008-Q4	Canada (1), China (-1), Korea (-1), Luxembourg (-1)	Canada (1), Korea (-1)			
2009-Q1	Serbia (-1)		Switzerland (1), United Kingdom (1)	Estonia (-1), Latvia (-1)	Switzerland (1)
2009-Q2	Thailand (-1)				
2009-Q3	Chile (-1), Denmark (-1), Korea (1)	Korea (1)	Singapore (1)		
2009-Q4	Hong Kong (1), Korea (1)		Hong Kong (1), Iceland (-1)		
2010-Q1	Finland (1), Hungary (1), Netherlands (1), Norway (2), Singapore (1)	Hungary (1), Norway (2)	Australia (1), Finland (1), Malaysia (1), Singapore (1)	Bulgaria (-1)	
2010-Q2	Canada (2), China (1)	Serbia (-1)	Canada (1), China (1)		
2010-Q3	China (1), Hong Kong (1), Singapore (1)	Hong Kong (1), Korea (-1)	China (1), Hong Kong (1), Hungary (2), Singapore (1)		Israel (1)
2010-Q4	Hong Kong (1), India (1), Malaysia (1), Sweden (1), Taiwan (1)	Poland (1)	Hong Kong (1)	India (1), Israel (1), Thailand (1)	India (1)
2011-Q1	Canada (1), China (2), Poland (1), Romania (1), Singapore (1), Turkey (1)		Canada (2), China (1), Israel (1), Mexico (1), Singapore (1)	Malaysia (1), Thailand (1)	
2011-Q2	Hong Kong (3), Serbia (2)	Korea (1)	Hungary (-1), Israel (1), Serbia (1), Taiwan (1)		
2011-Q3	Netherlands (1)		Netherlands (1)		
2011-Q4	Malaysia (1), Norway (2)	Poland (1)	India (1), Singapore (1)		
2012-Q1			Malaysia (1),	Thailand (1)	
2012-Q2	Indonesia (1), Korea (-1)	Korea (-1)			
2012-Q3	Canada (1), Hong Kong (1)	Canada (1), Hong Kong (1)	Canada (2), Hong Kong (1), United Kingdom (-1)	Israel (1)	
2012-Q4	Canada (1), Israel (2), Serbia (1), Singapore (1)	Serbia (-1)	Hong Kong (1)	Peru (1), Serbia (-1)	
2013-Q1	China (1), Hong Kong (1), Netherlands (1), Poland (1), Singapore (1)	Hong Kong (1), Singapore (1)	China (1), Malaysia (1), Singapore (1)	Hong Kong (1), Israel (1), Switzerland (2)	Israel (1)
2013-Q2	India (1)	Singapore (1)		Sweden (1)	
2013-Q3	Indonesia (1)	Israel (1)	Israel (1)	Israel (1)	
2013-Q4	China (1)		New Zealand (1)		
2014-Q1	Netherlands (1)	Switzerland (1), Taiwan (1), United Kingdom (1)	Switzerland (1)		
2014-Q2					

Note: The number in parentheses indicates the number of tightenings (postive value) or loosenings (negative value) in each quarter.
Note: The "other housing" index used in the paper is the sum of columns 3-5.

Table B2: Macroprudential Policies: Non-Housing

	1. Countercyclical Capital Requirements	2. Loan-Loss Provisioning	3. Consumer Loan Measures	4. Credit Growth Limits
2000-Q1				Greece (1)
2000-Q2		Philippines (1)		Greece (-1)
2000-Q3		Peru (1), Spain (1)		
2000-Q4				
2001-Q1	Mexico (1)			
2001-Q2				
2001-Q3		Uruguay (1)		
2001-Q4		Philippines (-1)		
2002-Q1				
2002-Q2				
2002-Q3				
2002-Q4		Korea (1)		
2003-Q1				Croatia (2)
2003-Q2	Argentina (1)			
2003-Q3				
2003-Q4				Croatia (-1)
2004-Q1		Croatia (1), Spain (1)	Romania (1)	
2004-Q2	Argentina (-1)		Thailand (1)	
2004-Q3				
2004-Q4	Argentina (1)			
2005-Q1		Greece (-1)	Thailand (1)	
2005-Q2				Bulgaria (1)
2005-Q3	India (1)	Romania (1)		Romania (1)
2005-Q4		Bulgaria (1), China (1), Greece (1), India (1)		
2006-Q1	Serbia (1)			Bulgaria (1)
2006-Q2	Bulgaria (1), Croatia (1), India (1)	Croatia (1), India (1)		
2006-Q3	Serbia (1)	Peru (1), Uruguay (1)		Serbia (1)
2006-Q4		Korea (1)		
2007-Q1	Latvia (-1)	India (1), Ukraine (1)		Croatia (1), Romania (-1), Serbia (1)
2007-Q2	Turkey (1)	Colombia (1)	Thailand (1)	
2007-Q3	Brazil (1)			
2007-Q4	Argentina (-1), Slovenia (1)			
2008-Q1	Croatia (2), Latvia (-1), Romania (1), Turkey (2)	Romania (1)		
2008-Q2		Colombia (1)		
2008-Q3		Serbia (1)		
2008-Q4	Colombia (1), India (-1)	India (-1), Peru (1), Spain (-1)		Serbia (-1)
2009-Q1		Bulgaria (-1), Croatia (-1), Switzerland (1)		Serbia (-1)
2009-Q2				Serbia (-1)
2009-Q3	Romania (-1)	Mexico (1), Russia (-1)		
2009-Q4				Croatia (-1)
2010-Q1	Bulgaria (-1), Russia (1)		Hungary (1)	
2010-Q2			Turkey (1)	Turkey (1)
2010-Q3	China (1)	China (1), Israel (1)		
2010-Q4	Brazil (2)	India (1), Spain (1)	Brazil (1)	
2011-Q1	Malaysia (1)	Mexico (1)		
2011-Q2	Turkey (1)	Turkey (1)	Turkey (1)	Turkey (1)
2011-Q3	Peru (1)			
2011-Q4	Brazil (1), Russia (1)			
2012-Q1	Russia (2)	Romania (1)		
2012-Q2	Poland (1)		Indonesia (1)	
2012-Q3				
2012-Q4				
2013-Q1		Israel (1), Russia (1)	Singapore (1)	
2013-Q2				
2013-Q3	Russia (1)			
2013-Q4		Turkey (1)	Turkey (1)	
2014-Q1	New Zealand (1), Switzerland (1)			
2014-Q2				

Note: The number in parentheses indicates the number of tightenings (positive value) or loosenings (negative value) in each quarter.

Table C3: Data Sources: Bank Credit

	Country name	Data Source	Time span	Explanation	Units
NOMINAL CREDIT DATA	Argentina	BIS	2003Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA.	Bil. Argentine Pesos
	Australia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Australian Dollars
	Austria	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Belgium	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector.Seasonally adjusted with X12-ARIMA	Billions of Euros
	Brazil	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Brazil Reais
	Bulgaria	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA.	Thousands Bulgarian Lev
	Canada	Haver	2000Q1-2013Q4	Canada: Business and Household Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Canadian Dollars
	Chile	Haver	2000Q1-2013Q4	Bal. Sheet of Banking Sect.:Domestic Credit: Pvt Sec (NSA). Seasonally adjusted with X12-ARIMA.	Billions Chilean Pesos
	China	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Renminbi Yuan
	Colombia	Haver	2000Q1-2013Q4	Fin Sect: Gross Domestic Credit to Private Sector (NSA). Seasonally adjusted with X12-ARIMA	Billions Colombian Pesos
	Croatia	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). I take the end month value to convert to quarterly and Seasonally adjusted with X12-ARIMA.	Millions Croatian Kuna
	Czech Republic	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Czeh Koruna
	Denmark	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Danish Krone
	Estonia	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). I take the end month value to convert to quarterly and Seasonally adjusted with X12-ARIMA.	Millions of Euros
	Finland	BIS	2001Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	France	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Germany	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Greece	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Hong Kong	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions HK Dollars
	Hungary	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Hungarian Forint
	Iceland	None			
	India	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Indian Rupees
	Indonesia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Indonesia Rupiah
	Ireland	BIS	2005Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Israel	Haver	2004Q1-2013Q4	Domestic Credit in Domestic Currency. I take the end month value to convert to quarterly and seasonally adjust using X12.	Millions New Israeli Shekels
	Italy	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Japan	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Japanese Yen
	Korea	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Korean Won
	Latvia	Haver	2004Q3-2013Q4	Sum of two series: "Loans: Private Nonfinancial Corps" plus "Loans: Households". Sum is seasonally adjusted with X12-ARIMA.	Millions of Euros
	Lithuania	Haver	2000Q1-2013Q4	Private Sector Credit. Seasonally adjusted with X12-ARIMA	Millions LTL
	Luxembourg	BIS	2004Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Malaysia	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Malaysian Ringgit
	Malta	Haver	2009Q1-2013Q4	Credit to Domestic Private Sector (NSA). Seasonally adjusted with X12-ARIMA	Millions of Euros
	Mexico	BIS	2001Q4-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Mexican Pesos
	Netherlands	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	New Zealand	Haver	2000Q1-2013Q4	Credit Aggregates: Private Sector Credit. Seasonally adjusted with X12-ARIMA	Millions NZ Dollars
	Norway	BIS	2009Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Norwegian Krone
	Peru	Haver	2000Q1-2013Q4	Adj Credit of Fin Sys to Pvt Sector: Domestic Currency (NSA). Seasonally adjusted with X12-ARIMA	Millions New Peruvian Soles
	Philippines	Haver	2000Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Philippines Pesos
	Poland	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions New Polish Zloty
	Portugal	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Romania	Haver	2006Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Romanian Leu
	Russia	Haver	2002Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Russian Rubles
	Serbia	Haver	2005Q1-2013Q4	Private Sector Credit (NSA). Seasonally adjusted with X12-ARIMA	Millions Serbian Dinars
	Singapore	BIS	2000Q1-2008Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Singapore Dollars
	Slovakia	Haver	2004Q1-2013Q4	Harmonized Money Supply: M3: Credit to Other Residents. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Slovenia	Haver	2008Q1-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions of Euros
	South Africa	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions South African Rand
	Spain	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions of Euros
	Sweden	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Swedish Krona
	Switzerland	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Swiss Francs
	Taiwan	Haver	2000Q1-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions NT$
	Thailand	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Thai Baht
	Turkey	BIS	2002Q3-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions New Turkish Lira
	UK	BIS	2000Q1-2013Q4	Lending from domestic banks to private nonfinancial sector. Seasonally adjusted with X12-ARIMA	Billions Pounds
	Ukraine	Haver	2003Q4-2013Q4	Private Sector Credit (EOP, NSA). Seasonally adjusted with X12-ARIMA	Millions UAH
	Uruguay	IFS	Excluded	IFS line 22d: "Claims on Private Sector" plus IFS line 42d: "Claims on Private Sector". Seasonally adjusted with X12-ARIMA	Uruguayan Pesos

Table C4: Data Sources: Housing Credit

	Country name	Data Source	Time span	Explanation	Units
NOMINAL HOUSING CREDIT DATA	Argentina	BIS dbsonline	2003Q1-2013Q4	CREDIT INSTITUTIONS, CREDIT (=LOANS)TO HHOLDS,HOUSE PURCHASE,M-END NSA. Seasonally adjusted with X12-ARIMA	Thousands Argentine Pesos
	Australia	BIS dbsonline	2000Q1-2013Q4	FIN. INST., CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, M-END SA	Millions Australian Dollars
	Austria	Central bank	2003Q1-2013Q4	Domestic Debt Secured by Mortgages and Housing Loans. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Belgium	Datastream	2000Q1-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Brazil	BIS dbsonline	2000Q1-2013Q4	FIN.SYST,CREDIT (=LOANS)TO HHOLDS,HSE PURC, MKT&NON-MKT COND,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Brazilian Reais
	Bulgaria	BIS dbsonline	2001Q1-2013Q4	BANKS (MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Thousands Bulgarian Lev
	Canada	BIS dbsonline	2000Q1-2013Q4	HOUSEHOLDS LIABILITIES, RESID. MORTGAGE CREDIT, TOTAL NSA. Seasonally adjusted with X12-ARIMA	Millions Canadian Dollars
	Chile	BIS dbsonline	2002Q1-2013Q4	CREDIT INSTITUTIONS, CREDIT(=LOANS) TO HHOLDS,HOUSE PURCHASE,M-END NSA. Seasonally adjusted with X12-ARIMA	Billions Chilean Pesos
	China	CEIC	2006Q1-2013Q4	CN: Loan: Real Estate Housing Mortgage. Seasonally adjusted with X12-ARIMA	Billions Renminbi
	Colombia	Datastream	2000Q1-2013Q4	CREDIT INSTITUTIONS - MORTGAGE LOAN CURN. Seasonally adjusted with X12-ARIMA	Billions Colombian Pesos
	Croatia	Datastream	2005Q1-2013Q4	LOANS - HOUSEHOLDS & NPISH - HOUSING - IN KUNA CURN. Seasonally adjusted with X12-ARIMA	Thousands Croatian Kuna
	Czech Republic	BIS dbsonline	2002Q1-2013Q4	BANKS, MORTGAGE LOANS TO HOUSEHOLDS, HOUSING LOANS, TOTAL NSA. Seasonally adjusted with X12-ARIMA	Millions Czech Koruna
	Denmark	Datastream	2003Q1-2013Q4	Sum of "LENDING-HOUSEHOLD HOUSING PURPOSES,0-1 YEAR; 1-5 YEAR;5+ YEARS". Seasonally adjusted with X12-ARIMA	Millions Danish Krone
	Estonia	Datastream	2002Q1-2013Q4	CDT INSTS STK OF LNS GRANTED - HOUSING LOANS, TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Finland	BIS dbsonline	2000Q1-2013Q4	CREDIT INST., LOANS (IN EUR/FIM) TO HOUSEHOLDS, HOUSING LOANS, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	France	BIS dbsonline	2000Q1-2013Q4	CREDIT INST., CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Germany	Datastream	2000Q1-2013Q4	LEND TO DOM ENTP&HH,HSG LOAN TO EMPL&OTH IND,TOTAL,ALL BNKS. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Greece	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTI.& CENTRAL BANK, CREDIT TO HOUSEHOLDS, HOUSE PURCHASE, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Hong Kong	CEIC	2009Q1-2013Q4	Total Residential Property Loans. Seasonally adjusted with X12-ARIMA	Millions Hong Kong Dollars
	Hungary	BIS dbsonline	2003Q1-2013Q4	BANKS(MFI),MORTGAGE LOANS TO HOUSEHOLDS,TOTAL, M-END NSA. Seasonally adjusted with X12-ARIMA	Billions Hungarian Forint
	Iceland	None			
	India	None			
	Indonesia	BIS dbsonline	2004Q1-2013Q4	BANKS, CREDIT (= LOANS) TO HOUSEHOLDS, MORTGAGES, Q-END NSA. Seasonally adjusted with X12-ARIMA	Billions Indonesian Rupiah
	Ireland	Datastream	2000Q1-2013Q4	CREDIT ADVANCED TO IRISH PRIV SCT: HSLDS-LOANS FOR HOUSE PURC. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Israel	Datastream	2004Q1-2013Q4	Sum of "LOANS GRANTED: PUBLIC - HOUSING(DISC.) CURN" and "HOUSING LOANS: BANKS FUND(DISC.) CURN". Seasonally adjusted with X12-ARIMA	Millions Israeli New Shekels
	Italy	BIS dbsonline	2000Q1-2013Q4	MFIs EX. CENTRAL BANK, CR(=LOANS) TO HHOLDS, HOUSE PURCHASE, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Japan	CEIC	2000Q1-2013Q4	Sum of "Lia: Stock: Households: Loans: By Private FI: Housing Loans" and "Lia: Stock: Households: Loans: By Public FI: Housing Loans". Seasonally adjusted with X12-ARIMA	Billions Japanese Yen
	Korea	CEIC	2000Q1-2013Q4	Loans of CSB: CH: Household: Mortgage Based. Seasonally adjusted with X12-ARIMA	Billions Korean Won
	Latvia	BIS dbsonline	2003Q3-2013Q4	BANKS(MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Lithuania	BIS dbsonline	2004Q1-2013Q4	BANKS(MFI), MORTGAGE LOANS TO HOUSEHOLDS, TOTAL, NSA. Seasonally adjusted with X12-ARIMA	Millions Lithuania Litas
	Luxembourg	Central bank	2001Q1-2013Q4	Credit granted by credit institutions to euro area households and NPISH by type and original maturity: Loans for house purchases - total. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Malaysia	CEIC	2000Q1-2013Q4	Loans: BS: Term Loans: Housing Loans. Seasonally adjusted with X12-ARIMA	Millions Malaysian Ringgit
	Malta	Central bank	2000Q1-2013Q4	OTHER MONETARY FINANCIAL INSTITUTIONS LOANS TO RESIDENTS OF MALTA BY ECONOMIC ACTIVITY - Households - Lending for house purchase. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Mexico	BIS dbsonline	2000Q1-2013Q4	BANKS, CREDIT (=LOANS) TO HOUSEHOLDS, HOUSE PURCHASE, Q-END NSA. Seasonally adjusted with X12-ARIMA	Millions Mexican Pesos
	Netherlands	Datastream	2000Q1-2013Q4	Sum of "MFI LOANS TO HOUSEHOLDS: HOUSE PURCHASE 0-1 YEARS;1-5 YEARS; 5+YEARS". Seasonally adjusted with X12-ARIMA	Millions of Euros
	New Zealand	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTIT.,CREDIT TO HHOLDS,HOUSE PURCHASE CREDIT,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions NZ Dollars
	Norway	BIS dbsonline	2000Q1-2013Q4	BANKS, ASSETS, CREDIT TO HOUSEHOLDS, HOUSING, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Norwegian Krone
	Peru[1/]	Datastream	2002Q1-2013Q4	CREDIT TO PRIVATE SECTOR: MORTGAGE CURN. Seasonally adjusted with X12-ARIMA	Millions New Peruvian Soles
	Philippines	CEIC	2010Q1-2013Q4	CL: PBS: Real Esate: Residential. Seasonally adjusted with X12-ARIMA	Billions Philippine Pesos
	Poland	Datastream	2000Q1-2013Q4	MFI LOANS - HOUSING LOANS CURN. Seasonally adjusted with X12-ARIMA	Millions Polish Zloty
	Portugal	BIS dbsonline	2000Q1-2013Q4	CREDIT INSTIT.,CREDIT(=LOANS)TO HHOLDS,HOUSE PURCHASE CREDIT,M-END NSA. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Romania	Datastream	2008Q1-2013Q2	CREDIT TO HOUSEHOLDS - HOUSING LOANS, LEI (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions New Romanian Leu
	Russia	BIS dbsonline	2008Q1-2013Q4	CREDIT INSTIT.,CREDIT(=LOANS) TO INDIVIDUALS, HOUSING LOANS, Q-END NSA. Seasonally adjusted with X12-ARIMA	Millions Russian Roubles
	Serbia	None			
	Singapore	CEIC	2000Q1-2013Q4	DBU: Loans & Advances: Qtr: Housing & Bridging Loans. Seasonally adjusted with X12-ARIMA	Millions Singaporean Dollars
	Slovakia	Datastream	2006Q1-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
	Slovenia	Datastream	2005Q2-2013Q4	MFI'S: LOANS TO HOUSEHOLD FOR HOUSE PURCHASE- TOTAL (EP) CURN. Seasonally adjusted with X12-ARIMA	Millions of Euros
	South Africa	Datastream	2000Q1-2013Q4	CREDIT EXTENSION: DOM.PRIVATE SECTOR - MORTGAGE ADVANCES CURN. Seasonally adjusted with X12-ARIMA	Millions South African Rand
	Spain	Datastream	2000Q1-2013Q4	CREDIT INSTITUTION LOANS TO HOUSEHOLDS - MORTGAGES CURN. Seasonally adjusted with X12-ARIMA	Thousands of Euros
	Sweden	Datastream	2002Q4-2013Q4	LENDING TO HOUSEHOLDS INCL NPISH - HOUSING - MFI CURN. Seasonally adjusted with X12-ARIMA	Millions Swedish Krona
	Switzerland	BIS dbsonline	2000Q1-2013Q4	BANKS (180 BANKS), ASSETS, MORTGAGE CREDIT, M-END NSA. Seasonally adjusted with X12-ARIMA	Millions Swiss Francs
	Taiwan	CEIC	2000Q1-2013Q4	Consumer Loans: Outstanding: DB: House Purchasing. Seasonally adjusted with X12-ARIMA	Millions New Taiwanese $
	Thailand	CEIC	2000Q1-2013Q4	Housing Loans: Qtr: Total. Seasonally adjusted with X12-ARIMA	Millions Thai Baht
	Turkey	Datastream	2007Q1-2013Q4	BANK LENDING TO PRIVATE SECTOR - HOUSING LOANS CURN. Seasonally adjusted with X12-ARIMA	Thousands New Turkish Lira
	UK	Datastream	2000Q1-2013Q4	HN: LOANS SECURED ON DWELLINGS CURN. Seasonally adjusted with X12-ARIMA	Millions Pounds
	Ukraine	Datastream	2007Q1-2013Q4	LOANS: HOUSEHOLDS - LENDING FOR HOUSE PURCHASE CURN. Seasonally adjusted with X12-ARIMA	Millions Ukranian Hryvnia
	Uruguay	None			

1/ For Peru we exclude 2008Q4.

Table C5: Data Sources: House Prices

NOMINAL HOUSE PRICE DATA

Country name	Data Source	Time Span	Explanation
Argentina	None		
Australia	BIS	2000Q1-2013Q4	RESID. PROPERTY PR.ALL DETACHED HOUSES (8 CITIES,PURE PRICE.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Austria	BIS	2001Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Belgium	BIS	2006Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Brazil	BIS	2002Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWEL. (METROPOL. AREA) PER DWEL.,M-ALL NSA. I take the end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Bulgaria	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR., EXIST.FLATS (BIG CITIES),PER SQ..M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Canada	Dallas Fed	2000Q1-2013Q4	Quarterly house price series for existing bungalows and two story executive dwellings located in ten main metropolitan areas of Canada . Seasonally adjusted with X12-ARIMA
Chile	Haver	2005Q1-2013Q4	Real New Housing Price Index: Gran Santiago (NSA) I take end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA. NOTE THIS IS ALREADY REAL!!!!
China	CEIC	2000Q1-2013Q4	China_propindex_new
Colombia	Haver	2000Q1-2013Q4	Existing Home Price Index, Real (NSA) . Seasonally adjusted with X12-ARIMA.
Croatia	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICES, NSA SA with 12
Czech Republic	BIS	2009Q1-2013Q4	RESID. PROPERTY PRICES,ALL OWNER OCCUP. DWELL, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Denmark	BIS	2000Q1-2013Q4	RESID. PROPERTY PRICES,ALL SINGLE-FAMILY HOUSE,PURE PRICE,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Estonia	Haver	2004Q3-2013Q4	Res Prop Prices: Whole Cntry: All Flats . Seasonally adjusted with X12-ARIMA
Finland	BIS	2006Q1-2013Q4	RES.PROPERTY PRICES, EXIST.DWELLINGS,TOTAL, PER SQ.M.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
France	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,EXISTING DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Germany	BIS	2001Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS, PURE PRICE,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Greece	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL FLATS(URBAN AREAS),PER SQ.M.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Hong Kong	BIS	2009Q1-2013Q4	RESIDENTIAL PROPERTY PR.,ALL DWELLINGS, PER SQUARE M., M-ALL NSA I take the end month to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Hungary	BIS	2008Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWELLINGS, PER SQ.M.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Iceland	BIS	2001Q1-2013Q4	RESIDENTIAL PROP.PR.,ALL DWELLINGS(GR. REYKJAVK),PER SQ.M,M-ALL NSA . Seasonally adjusted with X12-ARIMA
India	Haver	2011Q1-2013Q4	House Price Index {NHB} Residex}: Delhi . Seasonally adjusted with X12-ARIMA
Indonesia	BIS	2003Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, NEW HOUSES (BIG CITIES), PER DWELLING,NSA. . Seasonally adjusted with X12-ARIMA
Ireland	Dallas Fed	2000Q1-2013Q4	Nationwide house price series for all types of existing (second-hand) dwellings. . Seasonally adjusted with X12-ARIMA
Israel	BIS	2002Q1-2013Q4	RESIDENTIAL PROP.PR.,OWNER-OCCUPIED DWELLINGS, PER DWELLING, M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Italy	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Japan	BIS	2009Q2-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICE, M-ALL NSA . Seasonally adjusted with X12-ARIMA
Korea	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS PER DWELLING, M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
Latvia	BIS	2007Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PURE PRICE, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Lithuania	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR., ALL DWELLINGS, PER SQUARE M., Q-ALL, NSA . Seasonally adjusted with X12-ARIMA
Luxembourg	BIS	2008Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL FLATS, PURE PRICES, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Malaysia	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, UNIT, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Malta	BIS	2001Q1-2013Q4	RESID. PROPERTY PRICES,ALL DWELLINGS, PRICE PER DWELLING,Q-ALL,NSA . Seasonally adjusted with X12-ARIMA
Mexico	Haver	2006Q1-2013Q4	SHF Housing Price Index (NSA) . Seasonally adjusted with X12-ARIMA
Netherlands	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, EXISTING DWELLINGS,PER DWELLING,M-ALL NSA I use end month and . Seasonally adjusted with X12-ARIMA
New Zealand	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Norway	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-AVG,NSA . Seasonally adjusted with X12-ARIMA
Peru	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, FLATS (LIMA), PER SQ.M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA.
Philippines	BIS	2009Q1-2013Q4	RESID. AND COMMERC. PROP. PRICES, FLATS (MAKATI), PER SQ.M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Poland	Haver	2000Q1-2013Q4	Average House Price: Residential Bldgs . Seasonally adjusted with X12-ARIMA
Portugal	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE METER,M-ALL NSA . Seasonally adjusted with X12-ARIMA
Romania	BIS	2010Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER DWELLING, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Russia	BIS	2002Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,EXISTING DWELLINGS,PER SQUARE M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Serbia	None		
Singapore	BIS	2000Q1-2013Q4	RESID. PROPERTY PRICES, ALL DWELLINGS, PER SQ.M.,Q-ALL . Seasonally adjusted with X12-ARIMA
Slovakia	BIS	2006Q1-2013Q4	RESIDENTIAL PROP. PR., ALL DWELLINGS, PER SQUARE METER, Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Slovenia	BIS	2008Q1-2013Q4	RESIDENTIAL.PROPERTY PRICES, ALL DWELL., TOTAL, PER SQ. M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
South Africa	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PR.,ALL MIDDLE-SEGMENT DWELL.,PER DWELL.,M-ALL SA . Seasonally adjusted with X12-ARIMA
Spain	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE M., Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Sweden	BIS	2000Q1-2013Q4	RESIDENTIAL PROP.PR., OWNER-OCCUP. HOUSES,PER DWEL.,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Switzerland	Dallas Fed	2000Q1-2013Q4	Nationwide quarterly house price index for new and existing, single-family dwellings . Seasonally adjusted with X12-ARIMA
Taiwan	CEIC	2001Q1-2013Q4	Sinyi Residential Property Price Index: Taiwan Area . Seasonally adjusted with X12-ARIMA
Thailand	Haver	2000Q1-2013Q4	Combined two haver series by reindexing them to same year. Haver description for both: House Prices: Single-detached Houses incl Land (NSA) . Seasonally adjusted with X12-ARIMA. New series begins in 2009Q1
Turkey	BIS	2011Q1-2013Q4	RESIDENTIAL PROPERTY PRICES, ALL DWELLINGS, PER SQUARE METER,M-ALL NSA I take the end month value to convert to quarterly and . Seasonally adjusted with X12-ARIMA
UK	BIS	2000Q1-2013Q4	RESIDENTIAL PROPERTY PRICES,ALL DWELLINGS (ONS), PER DWEL.,M,Q-ALL NSA . Seasonally adjusted with X12-ARIMA
Ukraine	None		
Uruguay	None		