Holes in the Dike: the global savings glut, U.S. house prices and the long shadow of banking deregulation*

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Abstract

We explore empirically how capital inflows into the US and financial deregulation within the United States interacted in driving the run-up (and subsequent decline) in US housing prices over the period 1990-2010. To obtain an ex ante measure of financial liberalization, we focus on the history of interstate-banking deregulation during the 1980s, i.e. prior to the large net capital inflows into the US from China and other emerging economies. Our results suggest a long shadow of deregulation: in states that opened their banking markets to out-of-state banks earlier, house prices were more sensitive to capital inflows. We provide evidence that global imbalances were a major positive funding shock for US wide banks: different from local banks, these banks held a geographically diversified portfolio of mortgages which allowed them to tap the global demand for safe assets by issuing private-label safe assets backed by the country-wide US housing market. This, in turn, allowed them to expand mortgage lending and lower interest rates, driving up housing prices.

Keywords: HOUSE PRICES, SAVINGS GLUT, GLOBAL IMBALANCES, CREDIT CONSTRAINTS, STATE BANKING DEREGULATION

JEL *classification:* G10, G21, G28, F20, F32, F40

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1 Introduction

In this paper, we investigate empirically how the interaction between financial liberalization and capital inflows contributed to the rise (and subsequent decline) in the valuations of U.S. residential housing. Our analysis makes use of ex ante differences between US federal states in the degree of openness to international capital: During the late 1970s and 1980s, federal states lowered the barriers to access to their local banking markets (see Kroszner and Strahan (1999); Jayaratne and Strahan (1996)). We show that house prices in states that had lowered these barriers earlier—thus giving banks from outside more time to establish themselves in a state—were more sensitive to the impact of international capital flowing into the United States that started to reach the US from emerging market economies in the second half of the 1990s.

Our paper relates to several strands of the literature. Prior to the global financial crisis of 2007/2008, many analysts saw global imbalances in capital flows—the high savings rates of emerging economies and the large current account deficits of the US economy—as a major threat to global economic stability (see the review in Obstfeld and Rogoff (2009)). As early as 2005, Federal Reserve Chairman Ben Bernanke argued that a global glut of savings flowing into the US was lowering long-term interest rates and thus contributing to a run-up in asset prices. However, when the financial crisis eventually struck in 2007, it emanated from what at first appeared as the least globalized part of the US financial system—the housing market and the market for residential mortgages. In their quest to explain the crisis, many policymakers and academics at first turned to the financial liberalization and deregulation of the last two decades before 2007. Not very surprisingly, the world has seen a major trend towards the re-regulation of financial markets since. Only very recently research has again started to investigate the possibility that global imbalances in capital flows could themselves have contributed to a build-up of global imbalances in risks and to what many perceived as an excessive growth in asset prices, notably in the price of housing (Justiniano, Primiceri and Tambalotti (2013); Ferrero (2012); Favilukis et al. (2012); Aizenman and Jinjarak (2009)).

Very few papers, however, have so far attempted to disentangle the relative contributions of deregulation and capital inflows to the dynamics of housing and asset prices prior to the crisis. A notable exception is Favilukis et al. (2012) who assess the relative impact of credit supply measures and capital inflows on housing prices using only aggregate time series evidence. To the best of our knowledge, ours is the first empirical paper to acknowledge that the *interaction* between financial liberalization at the state level and aggregate capital inflows may help identify the channels through which global imbalances could have impacted housing prices. This approach allows us to focus on differences across states in the sensitivity of housing prices to aggregate capital inflows. The intuition underlying our analysis is simple: when US federal states deregulated during the 1980s, thus giving large US banks access to their local banking markets, they effectively poked holes in the dikes that shielded their local banking markets from banking flows from outside the state. After liberalization, out-of-state banks started to enter these freshly liberalized local banking markets, and states that started to lower barriers earlier therefore had a larger presence of banks operating in several states (referred to in what follows as 'integrated banks') when global imbalances started to hit the US from the mid-1990s onwards amidst a wave of financial globalization that was characterized by the appearance of major new emerging economies, primarily China, on the world economic stage (see Obstfeld and Rogoff (2009)). We argue that this savings glut was a funding shock to the banking sector that benefited in particular integrated banks. States with a stronger presence of integrated banks — i.e. states that had poked bigger holes into their dikes by liberalizing earlier during the 1980s —therefore were more exposed to the savings glut.

Our identification builds on the interaction of *ex ante* state-level characteristics with US-wide *aggregate* inflows roughly a decade later. Importantly, we do not make use of state-level capital inflows which could clearly be plagued by endogeneity (and on which good data do not exist in any case). By contrast, aggregate inflows into the US are arguably exogenous with respect to developments in house prices in the average state. Since it still may be the case that developments in some bigger states impact aggregate US inflows, we also conduct much of our analysis at the state-pair level, where it would seem even less plausible that state-pair specific developments have a big feedback on aggregate inflows. Our findings therefore, allow the interpretation that US capital inflows were causal for house price developments and that their impact was stronger in more open states.

The period of the "savings glut", starting in the late 1990s, was also a period of major changes in the regulatory environment of the US housing market. This liberalization could at least in part have been an endogenous reaction to the easy availability of capital from outside the US. Our empirical identification therefore makes use of an *ex ante* measure of financial openness in assessing the impact of capital inflows on asset valuations. As our primary measure of openness we use the number of years that had passed since a state liberalized its interstate banking regime until 1995, the year from which we date the onset of the big wave of global imbalances (Obstfeld and Rogoff (2009)). By 1995, states that had opened their markets earlier had a stronger presence of banks that operated in several states, making them also more integrated *de facto*. We believe it is plausible that the wave of cheap capital in hunt for safe assets that hit the US in the second half of the 1990s could not have been anticipated by state regulators in the 1980s, when most of the liberalization of the interstate banking regime took place. This makes our main financial openness measure clearly pre-determined and facilitates the causal interpretation of our results. By contrast, liberalization in financial markets that took place from the second half of the 1990s could well have taken place under the impression that global capital markets were easy to tap. For example, Rice and Strahan (2010) show that states with a stronger presence of integrated banks were earlier and more determined to fully liberalize their inter-state bank branching regimes from the mid-1990s onwards. To the extent that global imbalances were a positive funding shock primarily to integrated banks—as we document—one may expect the incentive for integrated banks to lobby for a quick and full liberalization of state-level banking markets to have been strengthened; weaker dikes were more easily washed away by the global savings glut.

Clearly, documenting causality from aggregate capital inflows to state-level housing prices does not yet answer the question to what extent aggregate capital inflows reflect an aggregate shock to demand for borrowing or a global supply shock in the availability of loanable funds. To get at this issue, we first show that states that opened up their banking market earlier had indeed a stronger presence of relatively big banks operating in several states when huge capital inflows started during the 1990s. We then put forward a stylized model of state-level bank lending in which integrated banks have a more interest-elastic loan supply than purely local banks that operate only in one state. The reason for this is that integrated banks hold a geographically diversified portfolio of mortgages. This has two immediate implications: first, geographic diversification means that integrated banks require a lower risk premium than local banks for a given increase in local lending since they diversify away their exposure to idiosyncratic shocks in the local property market. The geographical diversification of integrated banks' portfolios, secondly, translates into a funding advantage relative to local banks. The fact that the US-wide housing market—-in spite of some regional declines—had never declined in aggregate in the seventy years before 2007 hugely contributed to the general perception of private-label mortgage-backed securities (MBS) as safe assets. Since integrated banks' geographically diversified mortgage portfolio mainly reflects risks in the aggregate US housing market, we argue that they could tap this global demand for safe assets more easily than local banks– either by borrowing at lower rates than local banks or by issuing MBS at more favorable conditions.

In our simple model, country-wide shocks to local mortgage markets are therefore primarily transmitted through their impact on the lending decisions of integrated banks. We show that this is indeed the case empirically. Aggregate capital inflows into the US lead to increased lending at the state level and the main driver of this increase was the lending of integrated banks, not local banks. Integrated banks also decreased the rates they charged on these mortgages in response to aggregate capital inflows. This suggests that aggregate capital inflows into the US reflected an increase in the global supply of savings and not primarily an increase in the domestic demand for borrowing.

Our results also shed some light on the question whether house price increases in the US were due to a world-wide increase in the supply of savings or due to excessively lax monetary policy. Using measures of monetary policy tightness and general measures of credit availability, we find results that are in analogy to the ones we have reported for capital inflows: looser monetary policy and lower global interest rates all have a stronger bearing on house prices in states that liberalized earlier. This lends support to the risk-taking channel as a key driver of house price dynamics in the United States (see Borio and Zhu (2008) for the notion of the risk taking channel and and Jorda, Schularick and Taylor (2014) for long-run historical evidence). However, in all our specifications, capital flows drive out real interest rates and other indicators of monetary policy tightness. Our results therefore suggest that the risk taking channel—the ability of big, integrated banks to leverage up with risky assets due to cheap funding—was largely contingent on these banks' ability to tap into a global demand for private-label safe assets.

A growing literature has documented the misincentives that nationwide regulation as well as the emergence of securitization in the mortgage market may have provided to banks and other mortgage originators and our results are in principle consistent with these findings (see e.g. Mian and Sufi (2009); Loutskina and Strahan (2009)). However, our results do not suggest *a priori* that the states that liberalized their banking markets earlier also generally saw the worst excesses in lending.[1] For example, Favilukis et al. (2012) argue that the increase in housing valuations could be linked to a declining risk premium for housing: interstate banking liberalization improves household access to finance—in particular in bad times —and therefore makes income risk easier to insure. Since this also makes it less likely that households have to liquidate their house in a recession at low prices, there will be a concomitant drop in the risk premium households require for holding housing assets. Our theoretical framework captures a variant of this idea: here it is the balance sheet constraint of the local banks which have a geographically concentrated portfolio that makes them less willing to lend while better diversification of the integrated banks contributes to increased local lending supply. Our results per se, therefore, do not suggest that this lending was excessive.

Our analysis also relates closely to the recent work by Imbs and Favara (forthcoming) and by Landier, Sraer and Thesmar (2013). Imbs and Favara (forthcoming) document that state-level branching deregulation in the second half of the 1990s impacted house prices through its impact on mortgage lending of integrated banks. Their analysis emphasizes the role that better geographical diversification of banks' deposit base had on banks' mortgage lending. Our analysis is complementary to theirs in that it emphasizes the role that better diversification of the asset side of integrated banks' balance sheet played in facilitating these banks' ability to tap the global demand for safe assets that was reflected in global imbalances.

Landier, Sraer and Thesmar (2013) show that granularity in the size distribution of banks in local markets and the fact that big banks operate in several states was a major driver in

[1] For example, *a priori* it could also be the least developed banking markets, where local banks have to invest any excess funds locally, for example by ploughing them into the housing market.

increasing the comovement of housing markets in the years after the liberalization of state-level banking markets. This aspect of our results is very much in line with theirs: *de facto* measures of interstate integration correlate closely with a high market share of big banks. Our analysis, however, goes beyond Landier, Sraer and Thesmar (2013) by showing that global imbalances are a 'common factor' in house price developments and that these imbalances constituted an asymmetric funding shock to integrated banks.

Borio and Disyatat (2011) and Shin (2012) have pointed at the importance of a banking glut as a key factor in the genesis and international transmission of the crisis. European banks heavily borrowed short-term in dollars through their US subsidiaries while buying long-term US mortgage-backed securities. Adrian and Shin (2010) show that this banking glut was reflected in huge gross international banking positions and allowed US financial institutions to increase their intermediation capacity but had a relatively modest effect on net positions only. We emphasize that our findings are fully consistent with this pattern. The positive funding shock of the savings glut allowed integrated banks to increase leverage in a way that was unavailable to local banks, thus contributing to the growth in gross international banking positions.

The idea that a huge global demand for safe assets was a key driver in global imbalances was first articulated theoretically in seminal work by Caballero, Farhi and Gourinchas (2008). Alfaro, Kalemli-Ozcan and Volosovych (forthcoming) provide empirical support for the view that global imbalances are indeed driven by official flows and reserve accumulation. Caballero and Krishnamurthy (2009) discuss a model in which the global demand for safe assets drives the prices of risky assets by allowing the domestic financial sector to increase leverage. Our results lend strong empirical support to a particular variant of this mechanism: integrated banks benefited from the global demand for safe assets to leverage up on risky assets (mortgages) because their geographical diversification allowed them to engineer private label safe assets backed by the entire US housing market. Our findings, therefore, suggest that the intranational liberalization of US banking markets during the 1980s cast a long shadow: it helped lay the foundation for the ability of the US financial system to provide more safe assets when the demand of emerging economies for these assets surged roughly a decade later, triggered by the aftermath of the Asian crisis.

The remainder of the paper is structured as follows. Section two provides some historical background on state-level banking deregulation in the United States and a first descriptive look at the data. Section three presents our empirical framework and describes the preparation of the data. Section four presents our baseline results and robustness checks while section five offers a detailed discussion of the transmission mechanism between capital flows and housing prices. Section five concludes.

2 Some historical background and a first look at the data

2.1 State-level segmentation of US banking markets: a brief history

Our analysis exploits the gradual dismantling of geographical restrictions on interstate bank expansion in the United States during the 1980s and early 1990s. These restrictions dated back to the 19th century, when states acquired the right to levy bank-licensing fees and generally prohibited out-of-state banks from operating in their territories. The McFadden Act of 1927 re-affirmed the authority of states over national banks' branching within their borders. However, at the same time it opened the possibility for geographic expansion through means of a 'bank holding company' (BHC): a BHC can, in principle, operate banks in several states, as long as these banks remain separately capitalized legal entities.[2]

The Douglas Amendment to the Bank Holding Company Act of 1956 gave states even stronger authority to prohibit out-of-state banks from acquiring banks outside the state where they were headquartered. Since all states implemented this prohibition[3], interstate banking in the US was effectively barred from the mid-1950s until the late 1970s, when this regulation was gradually starting to be diluted. Beginning with Maine in 1978, state legislatures began to enact laws that allowed out-of-state BHCs to control banks in their state. Initially, such statutes authorized out-of-state acquisition only on a reciprocal basis with like-minded states or insisted that acquirers be headquartered in a neighboring state. Furthermore, federal legislators

[2]The Banking Act of 1933 brought all holding companies which owned a member bank under the Federal Reserve supervision. The reforms dealing with the bank structure were aimed at separating banks from their security affiliates but were criticized for limiting competition and thereby encouraging an inefficient banking industry.

[3]Only nineteen existing multi- state MBHCs (Savage (1993)) were grandfathered as the Douglas Amendment was enacted.

amended the Bank Holding Company Act in 1982 to allow failed banks to be acquired by any holding company, regardless of state laws. Over the following 13 years, states removed entry restrictions for bank holding companies by unilaterally opening their state borders and allowing out-of-state banks to enter, or by signing reciprocal bilateral and multilateral agreements with other states to allow interstate banking. As the last state, Hawaii passed reciprocal entry laws in 1995.

It is important to note that all of these deregulations still did not allow full bank branching but only the ownership and operation of local banks by out-of-state BHCs. Full branching was only implemented with the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994— and which became effective in 1997. Even from the Riegle-Neal Act, states could opt out—and many did. In a separate subsection below we analyze the impact of interstate bank-branching deregulation during the 1990s in the context of our analysis.

Since states deregulated in waves, or cohorts, rather than all at once the staggered timing of interstate banking deregulation provides an ideal laboratory to explore empirically how these regulatory differences in openness to a bank entry affected the real economy. In our empirical analysis, we measure a state's banking openness, generally refereed to as $open^k$, as a number of years that have passed between 1995 and the year this state allowed full interstate banking (through BHCs). The important feature of our analysis is that the era of interstate liberalization in the 1980s largely precedes the era of global imbalances which started in the 1990s and reached its peak between 1997 and 2008, when in particular Asian economies started to accumulate international reserves on a gigantic scale in the wake of the region's 1996/1997 financial crisis. Our measure of openness therefore is clearly predetermined — and plausibly even exogenous— with respect to the major wave of capital that hit the US from the mid 1990s onwards. As we will see, the liberalization history of individual states in the era before the rise of global imbalances left a long shadow on how state economies—notably real estate prices—reacted to capital inflows in the late 1990s and 2000s.

2.2 A first look at the data

We provide a detailed description of our data below. In this section, we illustrate some first stylized facts. Figure 1 presents a plot of the US current account–GDP ratio along with first principal component extracted from the time series of state-level ratios of housing prices to personal income. The first principal component explains 25 percent of the variance of the housing prices to personal income ratios. The correlation between the principal component and the US current account is 0.4. While correlations between principal components and observable time series should be interpreted with some caution, the figure and the correlation suggest that capital inflows could indeed be an important factor in the cross-section of state-level house prices.

For each state, Figure 2 plots the loadings on the first principal component in state-level housing price income ratios against the year, in which a state allowed the entry of out-of-state banks to its local banking market. The plot shows a clear positive relation: changes in post-1990 housing price income ratios load more strongly on the first principal component in states that opened their banking market earlier. As we saw in Figure 1, this principal component is highly correlated with capital inflows. Hence, housing valuations in states that had open banking markets for longer prior to the savings glut, also were more exposed to international capital inflows. We now turn to a more formal empirical analysis of this link.

3 Empirical Framework and Data

3.1 Empirical Framework

Our main specification is a panel regression in which capital inflows into the US are allowed to load differently on different states as a function of a state's *ex ante* financial openness:

$$\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}, \tag{1}$$

The dependent variable is a measure of housing valuation in state k at time t. On the right hand side of equation (1), $open^k$ is our (*ex ante*) measure of openness of the state's banking market and $CAPFLOW_t$ is a measure of aggregate capital inflows into the United States at time

t. We discuss the choice of these variables in detail below. We also include a range of control variables and time (τ_t) and state fixed effects (δ_k).

A couple of remarks are in order. First, recall that our simple principal component analysis above suggested that international capital flows are an important driving factor behind house price valuations in the US. But it also suggest a considerable degree of heterogeneity in the extent to which different states are exposed to this common factor. This heterogeneity seems to be related to the openness of a state to entry by out-of-state banks. The specification above captures this idea: aggregate capital inflows into the US load differently on different states. In particular, we would conjecture that financially more open states are also more exposed to the tide of capital in the sense that these states see a stronger impact of capital inflows on housing valuations: in states with low barriers ('dikes') to capital, the glut of capital makes a bigger impact on housing valuations than in states with higher barriers.

We note, secondly, our use of aggregate capital inflows as a driver of housing valuations. To the extent that aggregate inflows into the US are big relative to state-level inflows (for which we have no official data), they should be reasonably exogenous with respect to developments at the level of individual states. As we will argue in more detail below, our results therefore also allow us to document a causal link between aggregate capital inflows and state-level outcomes that would not be possible if we were to focus on state-level inflows (even if good data on those existed).

Third, we emphasize that our main specifications are all based on *ex ante* measures of openness. As our primary *ex ante* measure of openness we use the number of years passed between the liberalization of a state's banking market in the 1980s and 1995, one of the first years when the global savings glut started to hit the United States. We illustrate below that the use of an *ex ante* measure is important in this context: consistent with e.g. the findings in Rice and Strahan (2010), states with a stronger presence of nationwide banks were more likely to liberalize their bank branching regimes during the 1990s. The incentive to lobby for a liberalization of a state's branching regime would seem very strong for nationwide banks in particular during a period when capital from outside the state is cheaply available due to a global savings glut. This suggest that any concurrent changes in regulation could possibly be endogenous.

3.2 Data

We use a panel of variables for the 47 contiguous U.S. states excluding Delaware for the period 1991-2012. Below, we describe the main sources of data and the methodology used to construct the variables used in the analysis. Growth rates of variables are calculated as the first differences of the natural log of level values.

Housing prices, $hp_{k,t}$, are the Home Price Index provided by Land and Property Values in the U.S., Lincoln Institute of Land Policy. The data are based on the adjusted Federal funding housing agency (FHFA) indexes estimated for 50 U.S. states and the District of Columbia of the prices and quantities of residential housing and its two components, land and structures. The data are quarterly and in nominal dollars.

State personal income, $spi_{k,t}$, is quarterly personal income by state provided by the Bureau of Economic Analysis (BEA).

Rental income, $ri_{k,t}$, is a component of state-level personal income that is also taken from the BEA. Rental income of persons is the net income of persons from the rental of property. It consists of the net income from the rental of tenant-occupied housing by persons, the imputed net income from the housing services of owner-occupied housing, and the royalty income of persons from patents, copyrights, and rights to natural resources. It does not include the net income from rental of tenant-occupied housing by corporations (which is included in corporate profits) or by partnerships and sole proprietors (which is included in proprietors' income). Like other measures of income in the national income and product accounts (NIPAs), rental income of persons measures income from current production and excludes capital gains or losses resulting from changes in the prices of existing assets. Both measures of income are nominal in per capita terms, we generally omit the term "per capita" for the sake of brevity.

Financial integration Our measure $Open_k$ indicates how many years have passed since interstate banking deregulation took place. It is constructed as $1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Deregulation dates are from Kroszner and Strahan (1999).

Interstate Branching, $IB_{k,t}$. The index is constructed using information provided in the Table 1 of Rice and Strahan (2010) on the effective date of interstate branching regulation changes, and each of the following four provisions: the minimum age of the institution for acquisition, allowance of de novo interstate branching, allowance of interstate branching by acquisition of a single branch or portions of an institution, and statewide deposit cap on branch acquisitions. The index is set to zero for states that impose all four restrictions to out-of state-entry. Abolishment of each of the restriction adds one quarter to the index. The index ranges from 0 (no integration) to 1 (full integration).

Capital Inflows: We consider several measures of the capital inflows, $CAPFLOW_t$.

Our first and principal measure is the (negative) US current account deficit over nominal GDP at current market prices ($-\frac{CA}{GDP}_t$). The current account balance is from the BEA, U.S. International Transactions Accounts Data, quarterly and seasonally adjusted. As we wish to focus on capital inflows, we use negative balance of the current account (current account deficit). GDP data is from the BEA, National Economic Accounts, quarterly and seasonally adjusted at annual rates.

The second measure is net foreign holdings of total assets ($NFHTA_t$). The data is foreign-owned assets in the United States minus U.S.-owned assets abroad.

The third measure, net foreign holdings of total securities ($NFHTS_t$) is defined as foreign-owned U.S. government securities plus U.S. Treasury securities plus U.S. securities other than Treasury securities minus U.S.-owned foreign securities. The last two measures of capital inflows are quarterly and provided by the BEA, U.S. International Transactions Accounts Data. They are also expressed relative to nominal GDP at current prices.

As an additional measure of cyclical external imbalances we use the nxa_t-residual constructed by Gourinchas and Rey (2007) that essentially denotes a ratio of net exports over net foreign assets, thus taking account of the impact of valuation changes on the US external balance. The nxa_t data is available only till the 4th quarter of 2003 and is kindly provided by Pierre-Olivier Gourinchas on his personal web page.

Indicators of monetary policy and credit availability.

The short-term real interest rate, RIR_t, is constructed as US (effective) Federal Funds minus US-wide inflation. Data on Federal Funds are from the Board of Governors of the Federal Reserve System, Historical Data. The data is monthly and to compute quarterly data we average it over 3 months. US inflation is computed using quarterly data on Personal Consumption

Expenditures from the BEA .

Monetary policy looseness, MPL_t, is the deviation of the monetary policy rate from the interest rate implied by a Taylor rule where the monetary policy rate is the US (effective) Federal Funds rate from the Board of Governors of the Federal Reserve System. The Taylor rule we use is: $0.02 + 1.5\,(\pi - 0.02) + 0.5\times$output gap, where π is US-wide inflation and the output gap is measured by detrending an index for real GDP (constructed using the cumulation of official quarterly real GDP growth rates) with the HP-filter.

Real long-term interest rates, $RCTM_t$, is the 10-year constant maturity Treasury bond rate minus expectations of the average annual rate of CPI inflation over the next 10 years from the Survey of Professional Forecasters (only available from 1992), in percent per annum.

General bank credit supply conditions , CS_t, is a measure of credit standards from the Senior Loan Officer Opinion Survey on Bank Lending Practices that gives the net percentage of banks that reported tighter credit conditions. A positive value for this variable therefore indicates a tightening of credit conditions.

Financial Distress, FD_t, is measured as Corporate Bond Yield Spread between AAA- and BAA-rated corporate bonds.

Mortgage Lending

Bank lending and interest rate on mortgage lending are computed using data from the Call Reports. The data are available for the period 1986-1999 on the quarterly basis. For each commercial bank the data provides us with information on identification number (rssd 9001), total loans secured by real estate (rcfd1410), state of location (rssd9200), the BHC with which it is affiliated – if one exists– (rssd9348), and interest and fee income on loans secured by real estate. Banks are divided into two groups depending if they are owned by a BHC that operates in several states –interstate or integrated banks– or belong to a in-state local bank –local banks. Real estate loans and interest and fee income for these two groups are then aggregated, each quarter, at the state level.

4 Results

4.1 Baseline results

Table 1 presents our baseline results which are based on our primary measure of state-level financial openness — the years passed since deregulation—-and on the (negative) US current account to GDP-ratio as the plausibly most straightforward measure of capital inflows. Consistent with our conjecture and with our preliminary factor analysis in Figures 1 and 2, we find that housing valuations in more open states are significantly more exposed to aggregate capital inflows into the US. This is true for both measures of housing valuation that we consider throughout the paper: the house price to income ratio (in panel A) as well as for the house price to rent ratio (panel B).

In each panel, column I presents the results in a regression without controls (except time and state effects). Columns II-III show that our results are robust to the inclusion of both lagged changes in the valuation ratio as well as to past levels. To control for the possibility that capital just flowed into those states with the housing markets that already had the highest valuations at the outset, we also include, in column IV, an interaction between capital flows and the initial housing valuation.

None of this affects our basic results: though including past valuations reduces the estimate of our coefficient of interest by around a half, α stays highly significant and, with a value of around 0.07, also economically important. To appreciate the magnitude of this effect, note that the first state liberalized roughly 18 years before the last state. This implies that housing prices valuations in the early state would react to a 1 percentage point increase in capital inflows (relative to GDP) with a $18 \times 0.07 = 1.26$ percentage point higher increase in valuation ratios than a state that only liberalized in 1995.

Alternative measures of capital inflows Table 2 presents results for alternative measures of capital inflows. The current account could misrepresent actual inflows into the US money and capital markets for various reasons. First, it neglects valuation changes on foreign asset holdings. Clearly, such valuation changes could impact demand and supply for credit in the mortgage market by affecting private household wealth and the balances sheets of financial intermediaries. Following Favilukis et al. (2012), we therefore look at the change in the net holding of US securities owned by foreigners as a first alternative measure of capital inflows. Different from the current account, this variable takes on board potential valuation effects and also excludes foreign direct investment inflows which we would not expect to have a direct impact on the supply of dollar liquidity and the mortgage market.

It has been widely documented that US capital inflows over the late 1990s and early 2000s were to a large extent motivated by global demand for US safe assets. As a second alternative measure of capital inflows, we therefore focus on the change in foreigners' net holdings of *safe* US securities, defined here as changes in the holdings of US government bonds and mortgage-backed securities issued by government sponsored enterprises such as Freddie Mac and Fannie Mae.

A third measure of availability of inflows we use the *nxa* measure by Gourinchas and Rey (2007). This is essentially a cointegrating residual between the US trade balance and US foreign assets that again allows to control for the impact of valuation changes on the US net external asset position.

As can be seen from Table 2, the interaction of all three alternative measures of capital inflows with our openness measure remains highly significant in all our specifications, suggesting that the particular choice of capital inflow measure does not strongly affect our results.

Net versus gross flows and the banking glut Borio and Disyatat (2011)and Shin (2012) have argued that to understand the vulnerabilities that had built up in the financial sector in the years before the financial crisis, it is important to consider gross investment positions of foreign banks in the US. Before 2008, US affiliates (subsidiaries and branches) of foreign banks borrowed heavily in the US money market. At the same time, the foreign parents of these affiliates built considerable long-term positions in the US mortgage market. Shin calls this feature of global imbalances the banking glut (as opposed to the savings glut) and argue that it played a major role in the excessive risk taking in the US financial sector by effectively enhancing the intermediation capacity of the US financial system. When short-term dollar financing dried up in 2008, the balance sheets of international banks operating in the US were therefore extremely vulnerable and became a major factor in the international transmission of the crisis. This transmission was so forceful because it got amplified through high leverage (big gross positions) even though the net position of foreign banks vis-à-vis the US was actually quite small.

In Table 3, we therefore also examine the possibility that the build-up in international banking sector positions contributed to house prices increases and that they did so more strongly in states that were financially more open. We focus in three alternative measures of the banking glut: the sum of all claims of foreign banks on US assets as well as the banks' net and the gross positions vis-à-vis the US. In our empirical specifications, we consider all three measures in both levels and in changes. All measures are normalized with US GDP.

Of all specifications, only the change in the gross position of foreign banks is strongly significant individually. However, as for the other banking glut measures, changes in the gross positions of international banks are insignificant once we also control for the interaction of our baseline measure of capital inflows (the negative current account relative to GDP) with state-level openness. By contrast, the size of the coefficient on our baseline measure and its significance remain unchanged relative to our earlier specifications. We draw two conclusions from this result: first, global banking sector imbalances cannot account for our finding that house prices in more open states reacted more strongly to international capital flows. Secondly, the results suggest that inflows, rather than the development of gross positions, seem to have been the key-driver of house price developments in the US.

Capital inflows or lax monetary policy? A leading competitor to the view that capital inflows into the US were the driver of US housing valuations is the hypothesis that monetary policy after the 2001 recession kept interest rates too low for too long, thus encouraging risk taking and fueling excessive valuations in asset markets, including housing (see Taylor (2007)). In the same way as we have shown it to be the case for capital flows, one could therefore conjecture that favorable lax monetary policy—and generally favorable credit supply conditions—had a stronger bearing on housing valuations in states that were more open financially.

This would suggest to run regressions analogue to our baseline specification but with measures of US monetary policy looseness, MP_t as the common factor driving valuations:

$$\Delta housevaluation_t^k = \alpha_{MP} \times open^k \times MP_t + Controls + \tau_t + \delta_k + \epsilon_{k,t},$$

The first two columns of Table 4 present such regressions for two measures of monetary policy tightness: the (negative) deviation of the federal funds rate from its optimal value as implied by a Taylor rule and the long-term corporate bond rate. Following Favilukis et al. (2012), in columns III and IV, we also investigate whether broader measures of credit supply (here measured as the responses from the senior loan officers survey) and the default spread could affect housing valuations differently in states of different degrees of financial liberalization.

The regressions clearly show that all of these measures of monetary policy looseness and of credit availability more generally are individually significant in their interaction with financial openness. Table 5 repeats this exercise, but now we also control for capital inflows in the regressions, i.e. we run the horse-race

$$\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + \alpha_{MP} \times open^k \times MP_t + Controls + \tau_t + \delta_k + \epsilon_{k,t},$$

Columns I-V show the regressions for a pairwise horse race between capital inflows and each of the monetary policy and credit availability measures. Column VI shows the comparison between capital inflows and all of these measures taken together. The coefficient on the capital inflows measure remains stable and significant whereas the credit-supply measures generally are not.

These findings suggest that capital inflows into the US seem to be more strongly linked to house price valuations than broader measures of domestic credit availability or monetary policy. We note, however, that monetary policy could still have played a role in the run-up in housing prices – but our results suggests that it did so primarily through its impact on capital flows.

4.2 Capital inflows and housing prices: the role of ex ante financial openness

Our *ex ante* measure of financial openness used in our results above exploited the state-level variation in the time elapsed since a state's liberalization and the onset of the savings glut in the second half of the 1990s. It is important to realize that this interstate liberalization during the 1980s allowed bank holding companies from other states to acquire local banks, but that these acquired banks had to remain separate legal entities. However, concurrent with the huge capital inflows hitting the US from the second half of the 1990s onwards, the US banking sector saw a second major wave of state-level financial liberalization: the gradual dismantling of remaining interstate bank-banching restrictions. [4]

It would seem plausible that this wave of interstate branching deregulation would have had a similar impact on state-level housing valuations or could indeed be the ultimate driver of our findings so far. Imbs and Favara (forthcoming) show that the liberalization of the branching regime had a big impact on the growth rate of mortgage loans and, on housing prices. We therefore also examine to which extent branching liberalization affected the susceptibility of housing valuations to US aggregate capital inflows.

As our indicator of interstate branching liberalization, we use the index proposed by Rice and Strahan (2010). This index, that we abbreviate with IB_t^k, indicates how liberal a state's branching regime is at a given point in time. For each state, we normalize it to vary between zero (no branching at all) and one (no restrictions to interstate branching) . Our results, are presented in Table 6, with the right panel showing results for the house price–income ratio and the right panel for the price-rent ratio.

In both the left and right panels, the first column shows a regression of housing valuations on the IB indicator alone. This replicates the flavor of the results by Imbs and Favara (forthcoming): there is a significantly positive effect on house price valuations. In the second column, we add the interaction between aggregate capital inflows and the branching liberalization indicator, IB_t^k. The estimated coefficient is insignificant and so is the coefficient on the stand-alone IB-term. In the third column of each panel, we then add capital inflows interacted with our *ex ante* measure of openness. The coefficient remains significant and in the order or magnitude of our previous estimates, while the terms associated with interstate branching drop further and appear even less significant than before.

The findings suggest that bank branching liberalization did not exert a strong independent effect on the sensitivity of state-level house price valuations to US aggregate capital inflows. Rather, it would seem that much of this effect was pre-determined by interstate branching

[4]While the Reill-Neagle Act already stipulated that interstate branching restrictions had to be dismantled by 1995, states could opt out from this legislation and most did so, thus maintaining barriers that were only gradually dismantled over the following decade.

deregulation during the 1980s and that the liberalization of the 1980s affected the exposure of house price valuations through other channels as well. This picture is consistent with a political economy perspective on the liberalization of interstate branching legislation as put forward by Rice and Strahan (2010): they argue that states with a strong presence of big, nationwide banks also saw the most forceful political lobbying for liberalization and eventual and earlier and more complete relaxation of restrictions. As we have argued before, early liberalization during the 1980s gave big, nationwide banks a longer time to establish themselves in a state. Branching liberalization in the 1990s could therefore have been foreshadowed by interstate banking deregulation during the 1980s. This point is illustrated by a regression—reported at the bottom of the table as a memorandum item—of the post-1995 state-level average value of IB_t^k (denoted by $\overline{IB}^k = \frac{\sum_{t>1995} IB_t^k}{T_{>1995}}$) on our pre-1995 measure of financial openness. The coefficient is significant with a t-statistics of 4.12 and an R^2 of around 74 percent. In addition, our finding that *ex ante* openness has a much stronger bearing on the exposure of housing valuations to capital inflows also suggests that the liberalization of the 1980s is likely to have affected the link between capital inflows and housing prices through other channels than just the liberalization of the branching regime alone.

4.3 De facto measures of financial openness

We show next that our *ex ante* measure of openness is also highly correlated with de facto measures of financial integration. To this end, we obtain data from the call reports published by the Federal Reserve Bank of Chicago over the period 1976 to 1995. For each bank, we then identify whether it is affiliated with a bank holding company that owns banks also in other states. If it is, we call it an integrated bank. Following Morgan, Rime and Strahan (2004), for each state, we then calculate the the interstate mortgage ratio as the share of mortgages issued by integrated banks. Figure 3 plots the pre-1995 average of the interstate mortgage ratio ($ISLendRatio^k$) against our 'years-since liberalization' openness measure. There is a clear positive relation between the two variables. The cross-sectional regression reveals a coefficient of 0.03 with a t-statistics of 3.09. Table 7 (in the appendix) shows the result for a baseline regression based on the interstate mortgage ratio. Again, results are very similar to those obtained from our previous specifications. In our empirical exploration of the transmission mechanism in section 5 below, will provide more evidence on how interstate liberalization has impacted the lending by integrated banks.

4.4 State-pair regressions

In this section, we demonstrate that all our key results also hold up in regressions in which state-pairs (instead of individual states) are the unit of observation. Specifically, we run regressions of the form

$$\Delta valuation^{i}_{t+1} - \Delta valuation^{j}_{t+1} = \alpha(Open^{i}_{t} - Open^{j}_{t}) \times CA_t + \mu_{ij} + \tau_t + \varepsilon^{ij}_{t+1}$$

The literature on state-level banking deregulations has recently started to use state-pair regressions more widely (see e.g. Goetz and Gozzi (2014), Michalski and Ors (2012)) since they allow to increase the power of the statistical analysis by expanding the space of cross-sectional dimension of the data set (in our case to to $47 \times 46/2 = 1081$ state-pairs) and by enabling us to control for state-pair specific factors. In the context of our analysis they seem especially attractive since the assumption that aggregate capital inflows into the US are exogenous appears even more plausible at the level of individual state-pairs than at that of entire states.

Table 8 presents results for the state-pair version of our baseline regression. Panel A of Table 9 presents the horse-race with alternative capital flow measures and Panel B with alternative measures of monetary policy. Our results remain virtually unchanged. We note two things: first, the regression coefficients are in most cased very similar to the corresponding regressions based on individual states instead of state-pairs. Secondly, the larger state-pair sample brings out our previous findings even more strongly: coefficients that were previously significant generally appear even more so in the state-pair specification. Previously insignificant coefficients, however, largely remain insignificant also in the state-pair specification.

5 Transmission mechanism

We have established that global imbalances have a stronger bearing on real estate prices in states with more integrated banking markets. In this section, we examine the transmission mechanism between capital flows and house prices in more detail. We capture the main intuition behind our analysis using a stylized model in which we interpret the savings glut as a positive refinancing shock that mainly affected integrated banks. We provide evidence for the theoretical mechanism highlighted in this model.

The key feature distinguishing integrated and local banks in our model is that by operating in several states, integrated banks hold a geographically diversified portfolio of mortgages whereas local banks have geographically concentrated portfolios. Therefore, integrated banks can issue mortgage-backed securities that largely reflected the returns on the aggregate US housing market—which until the crisis had not declined in more than 70 years—and which were therefore assumed to be a safe investment. Hence, by issuing private-label safe assets in the form of MBS, integrated banks could respond to the international demand for these safe assets in a way that local banks could not. Since, as we have seen, states that opened earlier had a stronger presence of integrated banks, they saw a bigger expansion in lending, lower interest rates and higher house price valuations.

Our simple model of local credit markets captures the impact of the savings glut as a decline in the refinancing rate that mainly affects big banks, because they can tap the international demand for safe assets, while local banks cannot (at least not to the same extent). The model assumes that integrated banks have a higher elasticity of loan supply with respect to movements in interest rates. For a given increase in lending, local banks will require a higher risk premium over their refinancing costs since the marginal loan further increases their exposure to shocks to the local property market. By contrast, integrated banks can at least partly diversify this local property market risk, making them willing tho lend at lower rates.

The upper panel of Figure 4 captures this intuition. The graph on the right shows the shock to the loan supply of the integrated bank. The drop in refinancing cost (marked as the reduction in the vertical intercept of the loan supply function by Δr) shifts the loan supply function rightwards, leading to higher lending and lower interest rates. The graph on the left shows the case of the local bank. For the same drop in refinancing cost, Δr, the net effect on the lending supplied and the interest rate charged by the local bank is very small in comparison to the integrated bank, reflecting local banks' reluctance to leverage up (because of their non-diversified exposure to the local property market).[5] The take-away from the model is twofold. First, if the savings glut was indeed an asymmetric supply shock to integrated banks, we should see higher loan growth in more integrated states and this higher loan growth should be driven by integrated banks. Also, for the integrated banks we should see a pronounced decline in lending rates whereas local banks' lending rates should remain largely unchanged.[6] The lower panel of Figure 4 contrasts these predictions with the case of a demand shock. As was the case with the supply shock, the positive demand shock should predominantly be associated with an increase in lending by integrated banks. However, interest rates should increase and on impact they should increase more for the local banks (due to their lower supply elasticity), as indicated by the shift from the thick, solid original demand curve to the thin, dashed demand curve. As customers start to move away from local banks due to their higher interest rate, we will see a small and gradual increase in the interest rate charged by the integrated banks and a decline in the interest rate charged by the local bank.

The simple model therefore allows us to test whether the savings glut reflects demand or supply factors: if loan demand was responsible for our findings, we should see interest rates increases predominantly by local banks and lending increases predominantly by integrated banks. If supply factors dominate, we should see an increase in lending of integrated banks accompanied with a strong decline in interest rates charged by these banks. As we will see, it is the latter pattern that we observe in the data.

To test these hypotheses empirically, we compile aggregates of state-level mortgage lending

[5]Note that the differential effect on local and integrated banks would be reinforced, if, in addition, we assume that the reduction in refinancing cost is bigger for the integrated banks, which we believe is plausible. As discussed local banks, though they can sell mortgages to government sponsored enterprises such as Fannie Mae and Freddie Mac or other institutions, will however not be able to 'produce' a country-wide diversified portfolio of mortgages by themselves. For example, most likely this would imply that they face haircuts in selling these loans that the integrated banks do not have to accept.

[6]Clearly, if borrowers can switch between banks within the state, over time interest rates should start to decline also for the local banks. This is sketched in the graph by the inward shift of the demand function faced by the local bank and the concomitant outwards shift of the demand curve faced by the integrated bank (marked with a dashed line respectively).

from the quarterly Call Reports for the period 1976-1999.[7] To distinguish between lending by integrated and local banks within a state, we identify banks as integrated if they are owned by a bank holding company that operates in several states. We also construct state-level measures of mortgage interest rates for both types of banks using the variable "interest and fee income from mortgages" and dividing it through the stock of outstanding mortgage loans. Since the interest rate series at the state-level is very noisy, we take a four-quarter moving average and divide it through the moving average of lending over the same period.

Table 10 provides empirical evidence on the theoretical mechanism. It first provides results for our baseline regression, but now with the growth rate of total state-level mortgage lending as the dependent variable. The results clearly suggest that capital inflows led to higher lending growth primarily in open states. The following regressions distinguish between the lending by local and integrated banks. They show that capital inflows in more open states mainly increase the lending of integrated banks, whereas the effect on local banks' mortgage lending is insignificant. The same pattern is apparent from regressions of interest rates on the interaction between capital inflows and financial openness. Importantly, the lending rates of integrated banks decline with capital inflows, suggesting that capital inflows into the US are indeed mainly a supply phenomenon, consistent with the 'savings glut' interpretation. Again, there is no significant response in the interest rates charged by local banks, in line with the supply shock scenario in the model. We also corroborate these results based on state-pair regressions.

In Figure 5 we examine the dynamics of interest rates and lending in more detail. Here, for each bank type, we run forecasting regressions of the form

$$x_{t+k}^{ij} = \alpha_k(Open_t^i - Open_t^j) \times CA_t + \mu_{ij} + \tau_t + \varepsilon_{t+1}^{ij}$$

on state pairs where x_{t+k}^{ij} is the k-period ahead interest rate difference between states i and j or the cumulated lending growth difference between these states between period t and $t+k$. By collecting the coefficients α_k obtained from these regressions for different forecasting horizons

[7] After around 1999, the data no longer allow a clean distinction between local and integrated banks since changes in regulation allowed banks to report consolidated data at the holding company level. See the discussion in Landier, Sraer and Thesmar (2013).

k, we can obtain a dynamic responses of interest rates and lending.

Our findings confirm the intuition from our model and our earlier conclusion that capital inflows largely impacted house prices through their impact on the lending policies of integrated banks: an increase in aggregate capital inflows leads to a stark increase in mortgage lending of integrated banks and to an immediate decline in interest rates. By contrast, there is virtually no impact on the lending of local banks and only a very muted response of the interest rate charged by these banks.

6 Conclusion

In this paper, we studied the interaction between global imbalances in capital flows and interstate banking deregulation in the United States. We have argued that huge capital inflows that started to hit the United States from the middle of the 1990s onwards had a bigger impact on house prices in states that opened up their banking markets earlier during the 1980s and that therefore had a stronger presence of integrated banks, operating in several states, by the mid-1990s. Since aggregate inflows are reasonably exogenous with respect to state-level outcomes and since we use *ex ante* measures of financial integration — the number of years elapsed until 1995 since a state liberalized its local banking market to access from other states — this result allows us to establish a causal link between aggregate capital inflows and state-level housing prices. Our results are robust to controlling for other common factors that could have affected house prices differentially in different states such as low monetary interest rates, gross banking flows or other indicators of credit availability.

To explain our findings, we turn to the literature that has interpreted global imbalances as a the reflection of a global demand for safe assets — as a savings glut. We argue that this global demand for US safe assets constituted a funding shock that benefited in particular integrated banks. As opposed to purely local banks that operate only in one state, integrated banks held a geographically diversified portfolio of mortgages. Since the aggregate US housing market was considered safe at the time, this portfolio allowed them to tap the global demand for safe assets by refinancing themselves at low rates and by providing the international capital market with private-label safe assets in the form of mortgage-backed securities while increasing leverage at the same time. Consistent with this interpretation, we find that aggregate capital inflows into the US lead integrated banks to increase their lending and to lower interest rates whereas there is virtually no impact on local banks.

Our results provide an empirical perspective on the recent literature that has argued that a global demand for safe assets can actually lead to an increase in the prices of risky assets. Our finding suggests that the run-up in US housing valuations occurred because regionally diversified financial intermediaries were perceived as much safer than local banks. This allowed them to increase leverage and to invest into local mortgages, thus driving up housing markets. Our findings suggest that *intra*-national banking liberalization within the United States had a long shadow in that it effectively increased the ability of the US financial system to produce assets that were perceived as safe by global investor when a huge demand for such assets arose more than a decade later, after the Asian financial crisis and the emergence of China on the world economic stage.

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Table 1: Financial Openness and Capital Inflows — baseline results

Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$

	I	II	III	IV	V
$open^k \times CAPFLOW_t$	0.12	0.12	0.07	0.07	0.07
	(3.63)	(3.58)	(2.84)	(3.07)	(3.06)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$			0.38	0.38	0.38
			(5.75)	(5.74)	(5.75)
$hp_{t,k} - spi_{t,k}$				-0.01	
				(-2.25)	
$(hp_{0,k} - spi_{0,k}) \times CAPFLOW_t$					0.08
					(0.19)
$\Delta pop_{t,k}$		0.96	0.94	0.94	0.94
		(11.80)	(12.69)	(12.78)	(12.65)
R^2	0.53	0.57	0.64	0.64	0.64

Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$

	I	II	III	IV	V
$open^k \times CAPFLOW_t$	0.26	0.26	0.25	0.17	0.25
	(2.62)	(2.60)	(2.52)	(1.97)	(2.25)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$			0.03	0.01	0.03
			(1.27)	(0.15)	(1.27)
$hp_{t,k} - ri_{t,k}$				0.05	
				(1.05)	
$(hp_{0,k} - ri_{0,k}) \times CAPFLOW_t$					-0.05
					(-0.08)
$\Delta pop_{t,k}$		0.26	0.25	0.34	0.25
		(1.06)	(1.03)	(1.54)	(1.04)
R^2	0.82	0.82	0.82	0.83	0.82

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}, open^k = Years^{sinceInterD} = 1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Capital inflows $CAPFLOW_t$ are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP_t}\right)$. Data are quaterly. Data on house valuations is logged. Separate time- and state fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 2: Financial Openness and Capital Inflows — alternative measures

	Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$								
	I NFH of US assets			II NFH of US safe assets			III NXA		
$open^k \times CAPFLOW_t$	0.02	0.01	0.01	0.03	0.02	0.02	-0.01	-0.00	-0.00
	(2.35)	(2.66)	(2.75	(1.60)	(1.90)	(2.25)	(-3.51)	(-2.80)	(-2.63)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$		0.39	0.39		0.39	0.39		0.31	0.30
		(5.81)	(5.81)		(5.82)	(5.82)		(3.92)	ma.90)
$(hp_{0,k} - spi_{0,k}) \times CAPFLOW_t$			0.02			0.12			0.04
			(0.24)			(0.44)			(1.75)
R^2	0.52	0.60	0.60	0.52	0.60	0.60	0.52	0.56	0.57
	Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$								
	I			II			III		
$open^k \times CAPFLOW_t$	0.07	0.06	0.07	0.15	0.14	0.16	-0.01	-0.01	-0.01
	(2.21)	(2.16)	(1.97)	(1.98)	(1.94)	(1.75)	(-2.17)	(-2.11)	(-2.23)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$		0.03	0.02		0.03	0.03		0.08	0.08
		(1.10)	(1.04)		(1.25)	(1.20)		(2.18)	(2.18)
$(hp_{0,k} - ri_{0,k}) \times CAPFLOW_t$			-0.11			-0.53			0.03
			(-0.52)			(-0.82)			(1.29)
R^2	0.82	0.82	0.82	0.82	0.82	0.82	0.92	0.92	0.92

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}$. $open^k = Years^{sinceInterD} = 1995 - Year\, of\, Interstate\, Banking\, Deregulation$. $CAPFLOW_t$ is represented by alternative measures of capital inflows, which vary from column I to III. In columns I $CAPFLOW_t$ is defined as net foreign holdings of total assets $(NFHTA_t)$, in columns II as net foreign holdings of total securities $(NFHTS_t)$, in columns III as cyclical external imbalances (nxa_t) constructed by Gourinchas and Rey. nxa_t data is available only till the 4th quarter of 2003. Data are quaterly. Data on house valuations is logged. Separate time- and state- fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 3: Financial Openness and Banking Glut

	$\Delta hp_{t,k} - \Delta spi_{t,k}$										
	I	II		III		IV		V		VI	
	CL	NBH		GBH		ΔCL		ΔNBH		ΔGBH	
$open^k \times CAPFLOW_t$			0.07		0.10		0.06		0.07		0.06
			(2.89)		(2.90)		(2.52)		(2.89)		(2.34)
$open^k \times BG_t$	0.06	0.33	-0.05	0.03	-0.09	1.18	0.71	0.03	-0.05	0.75	0.47
	(0.96)	(1.66)	(-0.05)	(0.80)	(-1.55)	(1.81)	(0.97)	(0.03)	(-0.05)	(2.45)	(1.37)
R^2	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + \alpha_{BG} \times open^k \times BG_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}, open^k = Years^{sinceInterD} = 1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Capital inflows $CAPFLOW_t$ are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP_t}\right)$. Various measures of banking glut BG_t are defined for each column: columns I claims, CL, columns II net banking holdings, NBH, columns III gross banking holdings, GBH, , columns IV changes of claims, ΔCL, columns V changes of net banking holdings, ΔNBH, columns VI changes of gross banking holdings, ΔGBH. $Controls$ are $\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$ and $\Delta pop_{t,k}$. Coefficient α_{BG} is multiplied by 100. Data are quaterly. Data on house valuations is logged. Separate time- and state fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 4: Housing valuations and general credit conditions

	I		II		III		IV		V	
Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$										
	interest rate		Taylor residual		long rate		SLOS		Corporate Spread	
$open^k \times MP_t$	-0.01	-0.01	-0.01	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(-1.97)	(-1.46)	(-2.13)	(-1.40)	(-2.11)	(-1.97)	(-1.29)	(-1.39)	(-1.36)	(-1.50)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$		0.39		0.39		0.39		0.39		0.39
		(5.82)		(5.80)		(5.66)		(5.85)		(5.85)
R^2	0.52	0.60	0.52	0.60	0.52	0.60	0.52	0.60	0.52	0.60
Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$										
	I		II		III		IV		V	
$open^k \times MP_t$	-0.03	-0.02	-0.03	-0.03	0.00	0.00	-0.00	-0.03	-0.00	-0.00
	(-1.56)	(-1.52)	(-2.00)	(-1.94)	(0.12)	(0.13)	(-1.92)	(-1.86)	(-1.97)	(-1.91)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$		0.03		0.03		0.03		0.03		0.03
		(1.41)		(1.38)		(1.39)		(1.34)		(1.32)
R^2	0.82	0.82	0.82	0.82	0.81	0.81	0.82	0.82	0.82	0.82

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha_{MP} \times open^k \times MP_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}$. $open^k = Years^{sinceInterD} = 1995 - Year\, of\, Interstate\, Banking\, Deregulation$. Alternative measures of monetary policy are represented as follows: in columns I as real interest rate (RIR_t), in columns II as monetary policy looseness (MPL_t), incolumns III as real annual interest rate on the 10-year Treasury bond $((RCTM_t)$, here the data is only available from 1992 to 2012, in columns IV as credit supply due to the Senior Loan Officer Opinion Survey on Bank Lending Practices (CS_t) and in columns V as financial risk measured as Corporate Bond Yield Spread $(CBYS_t)$. Data on house valuations is logged. Separate time- and state- fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 5: Financial Openness and credit supply conditions — horse race

Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$

	I		II		III		IV		V		VI	
$open^k \times CAPFLOW_t$	0.12	0.07	0.11	0.07	0.13	0.06	0.13	0.07	0.13	0.08	0.12	0.06
	(3.25)	(2.67)	(3.04)	(2.52)	(2.91)	(2.21)	(3.56)	(2.99)	(3.76)	(3.15)	(2.69)	(2.02)
$open^k \times MP_t^I$	-0.00	-0.00									-0.02	-0.00
	(-0.56)	(-0.18)									(-0.71)	(-0.29)
$open^k \times MP_t^{II}$			-0.00	-0.00							0.02	0.01
			(-0.68)	(-0.29)							(1.20)	(0.95)
$open^k \times MP_t^{III}$					-0.00	-0.00					-0.00	-0.00
					(-0.25)	(-0.73)					(-2.14)	(-2.59)
$open^k \times MP_t^{IV}$							-0.00	-0.00			-0.00	-0.00
							(-1.59)	(-1.64)			(-1.80)	(-1.48)
$open^k \times MP_t^{V}$									-0.00	-0.00	-0.00	-0.00
									(-2.08)	(-2.04)	(-3.26)	(-3.16)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$		0.39		0.39		0.39		0.38		0.38		0.38
		(5.60)		(5.60)		(5.49)		(5.58)		(5.57)		(5.42)
R^2	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60	0.53	0.60

Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$

	I		II		III		IV		V		VI	
$open^k \times CAPFLOW_t$	0.24	0.24	0.22	0.21	0.36	0.35	0.28	0.28	0.31	0.30	0.35	0.34
	(2.07)	(2.01)	(2.00)	(1.94)	(2.53)	(2.45)	(2.69)	(2.61)	(2.82)	(2.74)	(2.78)	(2.71)
$open^k \times short\ rate$	-0.01	-0.01									-0.01	-0.01
	(-0.42)	(-0.41)									(-0.18)	(-0.18)
$open^k \times Taylorresidual$			-0.01	-0.01							0.01	0.01
			(-1.06)	(-1.03)							(0.21)	(0.21)
$open^k \times long\ rate$					0.00	0.00					-0.00	-0.00
					(1.53)	(1.50)					(-0.63)	(-0.63)
$open^k \times loan\ of ficer\ survey$							-0.00	-0.00			0.00	0.00
							(-2.10)	(-2.05)			(0.18)	(0.20)
$open^k \times de fault\ spread$									-0.00	-0.00	-0.00	-0.00
									(-2.33)	(-2.26)	(-2.23)	(-2.19)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$		0.03		0.03		0.03		0.02		0.02		0.02
		(1.27)		(1.26)		(1.21)		(1.14)		(1.08)		(1.04)
R^2	0.82	0.82	0.82	0.82	0.81	0.81	0.82	0.82	0.82	0.82	0.81	0.81

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha \times open^k \times CAPFLOW_t + \alpha_{MP} \times open^k \times MP_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}$. $open^k = Years^{sinceInterD} = 1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Capital inflows are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP}_t\right)$. Alternative measures of monetary policy are represented as follows: in columns I as real interest rate (RIR_t), in columns II as monetary policy looseness (MPL_t), incolumns III as real annual interest rate on the 10-year Treasury bond $((RCTM_t)$, here the data is only available from 1992 to 2012, in columns IV as credit supply due to the Senior Loan Officer Opinion Survey on Bank Lending Practices (CS_t) and in columns V as financial risk measured as Corporate Bond Yield Spread $(CBYS_t)$. Data are quarterly. Data on house valuations is logged. Separate time- and state- fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 6: Financial Openness, Capital Inflows and Intrastate Branching

	House valuation is based on					
	house price to income ratio			house price to rent ratio		
	$\Delta hp_{t,k} - \Delta spi_{t,k}$			$\Delta hp_{t,k} - \Delta ri_{t,k}$		
$IB_{k,t}$	0.01	0.00	0.00	0.01	-0.00	-0.00
	(2.66)	(0.19)	(0.51)	(2.05)	(-0.43)	(-0.14)
$IB_{k,t} \times CAPFLOW_t$		0.58	0.25		1.56	0.86
		(1.27)	(0.54)		(1.33)	(0.76)
$open^k \times CAPFLOW_t$			0.09			0.20
			(2.92)			(2.38)
R^2	0.52	0.53	0.53	0.82	0.82	0.82

Memorandum:
In the regression $\overline{IB_k} = \alpha_0 + \alpha_1 open^k + \epsilon_k$ $\alpha_1 = 0.06$ (4.12), $R^2 = 0.74$

$open^k = Years^{sinceInterD} = 1995 - Year\,of\ Interstate\,Banking\ Deregulation$. Capital inflows $CAPFLOW_t$ are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP\,t}\right)$. The index of interstate baranching deregulation ($IB_{k,t}$) ranges from 0 (no integration) to 1 (full integration). Data are quaterly.mathnormalouse valuations is logged. Separate time- and state fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 7: De Facto Financial Openness and Capital Inflows

Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$

	I	II	III	IV
$ISLendRatio^k \times CAPFLOW_t$	0.95	1.15	0.70	0.37
	(1.25)	(1.72)	(1.69)	(0.83)
$open^k \times CAPFLOW_t$				0.06
				(2.25)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$			0.39	0.38
			(5.95)	(5.75)
$\Delta pop_{t,k}$		0.97	0.95	0.95
		(12.10)	(13.00)	(13.02)
R^2	0.52	0.57	0.64	0.64

Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$

	I	II	III	IV
$ISLendRatio^k \times CAPFLOW_t$	3.08	3.14	3.05	1.87
	(1.65)	(1.70)	(1.64)	(1.02)
$open^k \times CAPFLOW_t$				0.20
				(2.29)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$			0.03	0.03
			(1.24)	(1.19)
$\Delta pop_{t,k}$		0.29	0.28	0.27
		(1.19)	(1.15)	(1.10)
R^2	0.82	0.82	0.82	0.82

The Table shows the results from the panel regression $\Delta housevaluation_t^k = \alpha \times ISLendRatio^k \times CAPFLOW_t + Controls + \tau_t + \delta_k + \epsilon_{k,t}$, the $ISLendRatio^k$ is defined as the 1980-1995 average of the share of mortgages issued by integrated banks for each state. Capital inflows $CAPFLOW_t$ are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP}_t\right)$. As additional control the regression in column IV is augmented by the baseline measure of openness $open^k = Years^{sinceInterD} = 1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Data are quaterly. Data on house valuations are logged. Separate time- and state fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 8: Financial Openness and Capital Inflows — state-pair results

	Panel A: House valuation is based on house price to income ratio, $\Delta hp_{t,k} - \Delta spi_{t,k}$				
	I	II	III	IV	V
$open^k \times CAPFLOW_t$	0.12	0.12	0.07	0.07	0.07
	(4.14)	(4.21)	(2.90)	(3.21)	(3.18)
$\Delta hp_{t-1,k} - \Delta spi_{t-1,k}$			0.38	0.38	0.38
			(10.07)	(10.07)	(10.07)
$hp_{t,k} - spi_{t,k}$				-0.01	
				(-2.09)	
$(hp_{0,k} - spi_{0,k}) \times CAPFLOW_t$					0.08
					(0.23)
$\Delta pop_{t,k}$		0.95	0.94	0.93	0.94
		(11.31)	(11.86)	(11.73)	(11.84)
R^2	0.07	0.16	0.30	0.30	0.30

	Panel B: House valuation is based on house price to rent ratio, $\Delta hp_{t,k} - \Delta ri_{t,k}$				
	I	II	III	IV	V
$open^k \times CAPFLOW_t$	0.26	0.26	0.25	0.17	0.25
	(2.89)	(2.88)	(2.77)	(2.05)	(2.31)
$\Delta hp_{t-1,k} - \Delta ri_{t-1,k}$			0.03	0.01	0.03
			(1.39)	(0.12)	(1.39)
$hp_{t,k} - ri_{t,k}$				0.05	
				(0.85)	
$(hp_{0,k} - ri_{0,k}) \times CAPFLOW_t$					-0.05
					(-0.05)
$\Delta pop_{t,k}$		0.25	0.24	0.33	0.24
		(0.76)	(0.74)	(1.25)	(0.75)
R^2	0.02	0.02	0.02	0.04	0.02

The Table shows the results from the panel regression $\Delta housevaluation_t^k - \Delta housevaluation_t^i = \alpha \times (open^k - open^i) \times CAPFLOW_t + Controls + \tau_t + \delta_{k,i} + \epsilon_{k,i,t}$. $open^k = Years^{sinceInterD} = 1995 - Year\,of\,Interstate\,Banking\,Deregulation$. Capital inflows $CAPFLOW_t$ are measured as current account deficit over GDP $\left(CAPFLOW_t = -\frac{CA}{GDP}_t\right)$. Data are quaterly. Data on house valuations is logged. Separate time- and state-pair fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 9: Financial Openness, Capital Inflows and Monetary Policy — state-pair results

	Panel A: Capital Flows $\Delta housevaluation_t^k - \Delta housevaluation_t^i$									
	I NFH of US assets		II NFH of US safe assets		III $\frac{Chinese\ CA}{Chinese\ GDP}$		IV $\frac{Chinese\ CA}{US\ GDP}$		V GBH	
$(open^k - open^i) \times CAPFLOW_t$	0.02	0.01	0.03	0.02	-0.00	-0.00	-0.02	-0.01	0.00	0.00
	(2.79)	(2.83)	(1.81)	(1.83)	(-0.22)	(-0.26)	(-1.26)	(-0.67)	(0.49)	(0.69)
$Controls$	no	yes	no	yes	no	yes	no	yes	no	yes
R^2	0.07	0.30	0.06	0.29	0.06	0.29	0.06	0.29	0.06	0.29

	Panel B: Monetary Policy									
	I Interest rate		II Taylor rule		III LT interest rate		IV Credit supply		V Spread	
$(open^k - open^i) \times MP_t$	-0.01	-0.01	-0.01	-0.0042	-0.00016	-0.00013	-0.000013	-0.0000086	-0.00047	-0.00028
	(-2.27)	(-1.52)	(-2.58)	(-1.26)	(-1.96)	(-1.92)	(-1.63)	(-1.24)	(-1.59)	(-1.11)
$Controls$	no	yes	no	yes	no	yes	no	yes	no	yes
R^2	0.06	0.29	0.06	0.29	0.06	0.29	0.06	0.29	0.06	0.29

The Panel A of the table shows the results from the panel regression $\Delta housevaluation_t^k - \Delta housevaluation_t^i = \alpha \times (open^k - open^i) \times CAPFLOW_t + Controls + \tau_t + \delta_{k,i} + \epsilon_{k,i,t}$. $open^k = 1995 - Year\,of\ Interstate\ Banking\ Deregulation$. $CAPFLOW_t$ is represented by capital inflows, which vary from column I to IV. In columns I $CAPFLOW_t$ is defined as current account deficit over GDP $\left(-\frac{CA}{GDP}_t\right)$, in columns II as net foreign holdings of total assets $(NFHTA_t)$, in columns III as net foreign holdings of total securities $(NFHTS_t)$, in columns IV as chinese current account to gdp $\left(\frac{CA_{CHN}}{GDP_{CHN}}\right)$, in columns V as chinese current account to US gdp $\left(\frac{CA^{\$}_{CHN}}{GDP^{\$}_{US}}\right)$.

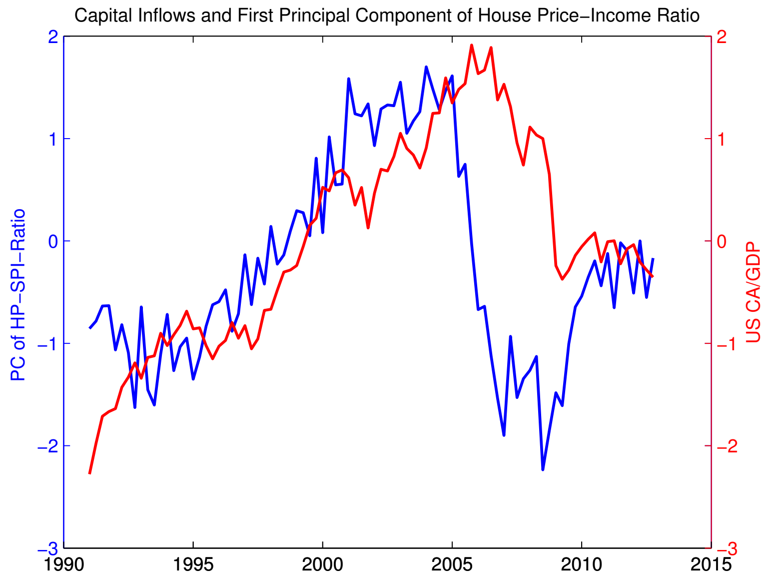
The Panel B of the table shows the results from the panel regression $\Delta housevaluation_t^k - \Delta housevaluation_t^i = \alpha \times (open^k - open^i) \times MP_t + Controls + \tau_t + \delta_{k,i} + \epsilon_{k,i,t}$. MP_t is represented by monetary policy meassures, which vary from column I to IV. In columns I MP_t is defined as interest rate, in columns II as deviation from the Taylor rule interest rate, in columns III as long term interest rate, in columns IV as credit supply tightning and in columns V as corporate spread. Data are quarterly. Data on house valuations is logged. Separate time- and state-pairs fixed effect as dummies. Sample period is 1991-2012. 47 US States (Alaska, Hawaii, Delaware and District of Columbia are left out). $Controls$ include population growth Δpop_t and a lag of left hand-side variable. OLS estimates, t-statistics in parentheses, standard errors are two-way clustered.

Table 10: Transmission Mechanism

			Panel A: Baseline Results		
	I	II	III	IV	V
Z_t^k	$dISLend_t^k$	$dLocBLend_t^k$	$dTotLend_t^k$	$ISIntRate$	$LocBIntRate$
$open^k \times CAPFLOW_t$	1.90	-0.19	0.39	-0.11	-0.03
	(2.28)	(-0.34)	(2.44)	(-1.64)	(-0.36)
R^2	0.05	0.07	0.08	0.98	0.95
			Panel B: State-pair Results		
$(open^k - open^i) \times CAPFLOW_t$	1.91	-0.20	0.38	-0.11	-0.02
	(2.74)	(-0.32)	(2.36)	(-3.44)	(-0.78)
R^2	0.02	0.05	0.04	0.55	0.85

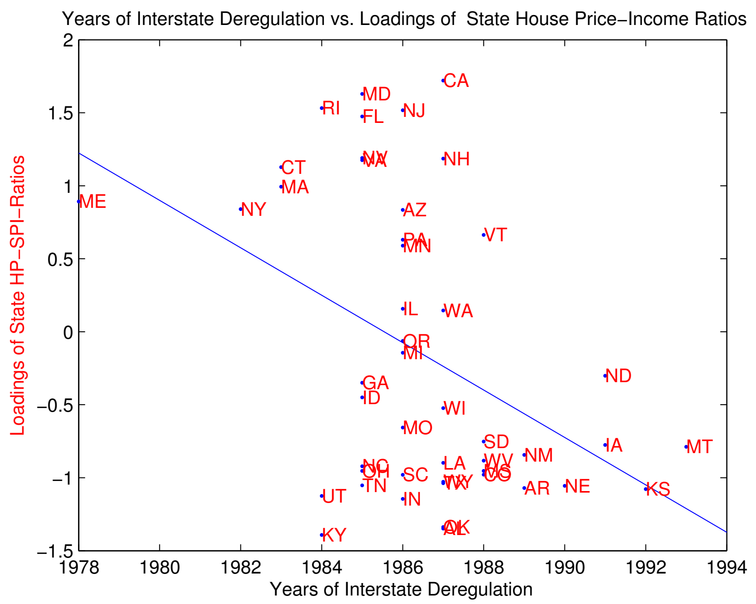
The Table shows the results from the panel regression $Z_t^k = \alpha \times open^k \times CAPFLOW_t + \tau_t + \delta_k + \epsilon_{k,t}$ in Panel A and $Z_t^k - Z_t^i = \alpha \times (open^k - open^i) \times CAPFLOW_t + \tau_t + \delta_{ik} + \epsilon_{ik,t}$ in Panel B respectively. Z_t^k is defined in each column: column I mortgage lending growth rate of integrated banks (members of MBHC) $dISLend_t^k$, column II mortgage lending growth rate of local banks $dLocBLend_t^k$, column III mortgage lending growth rate of total banks $dTotL$, column IV interest rate on real estate lending for banks which are a member of a MBHC $ISIntRate$, column V interest rate on real estate lending for local banks (that are not a member of a MBHC) $LocIntRate$. Separate time- and state-fixed effect as dummies. Sample period is 1990-1999, quarterly data. Alaska, Hawaii, Delaware and District of Columbia are generally left out. Additionally following states are left out for interest rate regressions: Alabama, Arizona, Idaho, Indiana, Kansas, Michigan, Missouri, Montana, New Jersey, New Mexico, Ohio, Rhode Island, Tennessee. All data but interest rates are logged. OLS estimates, t-statistics in parentheses, standard errors are two-way clustered .

Figure 1: Capital Inflows and First Principal Component of House Valuations, 1991-2012



NOTES: The figure plots US current account to GDP ratio (red line) against first principal component extracted from the time series of state level ratios of housing prices to personal income (blue line).

Figure 2: Interstate Banking Deregulation and State House Valuations

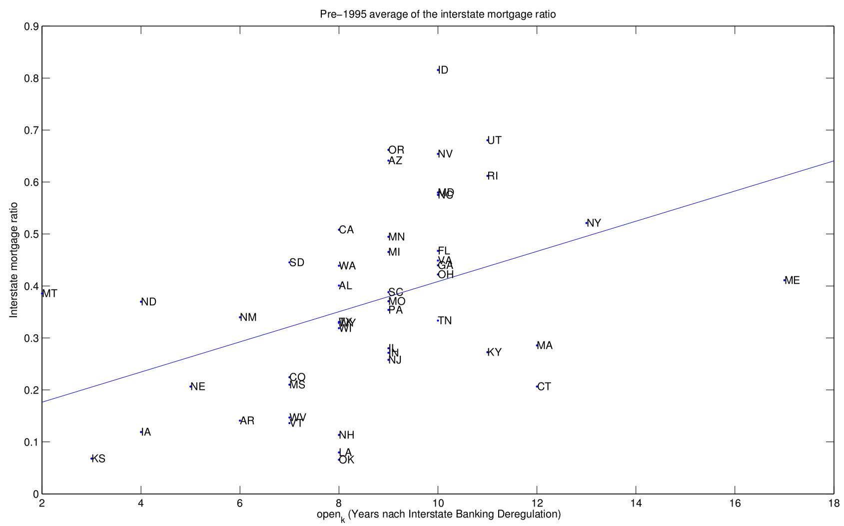


NOTES: The figure plots the years of interstate banking deregulation against loadings of the first principal components of the state level house pricing to personal income ratios. The cross-sectional regression of the form

$$DeregulationYear^k = b \times LoadPC^k + constant + \epsilon^k$$

yields a coefficient estimate of $b = -1.09$, a t-statistics of 3.11.

Figure 3: Openness and Interstate Mortgage Ratio

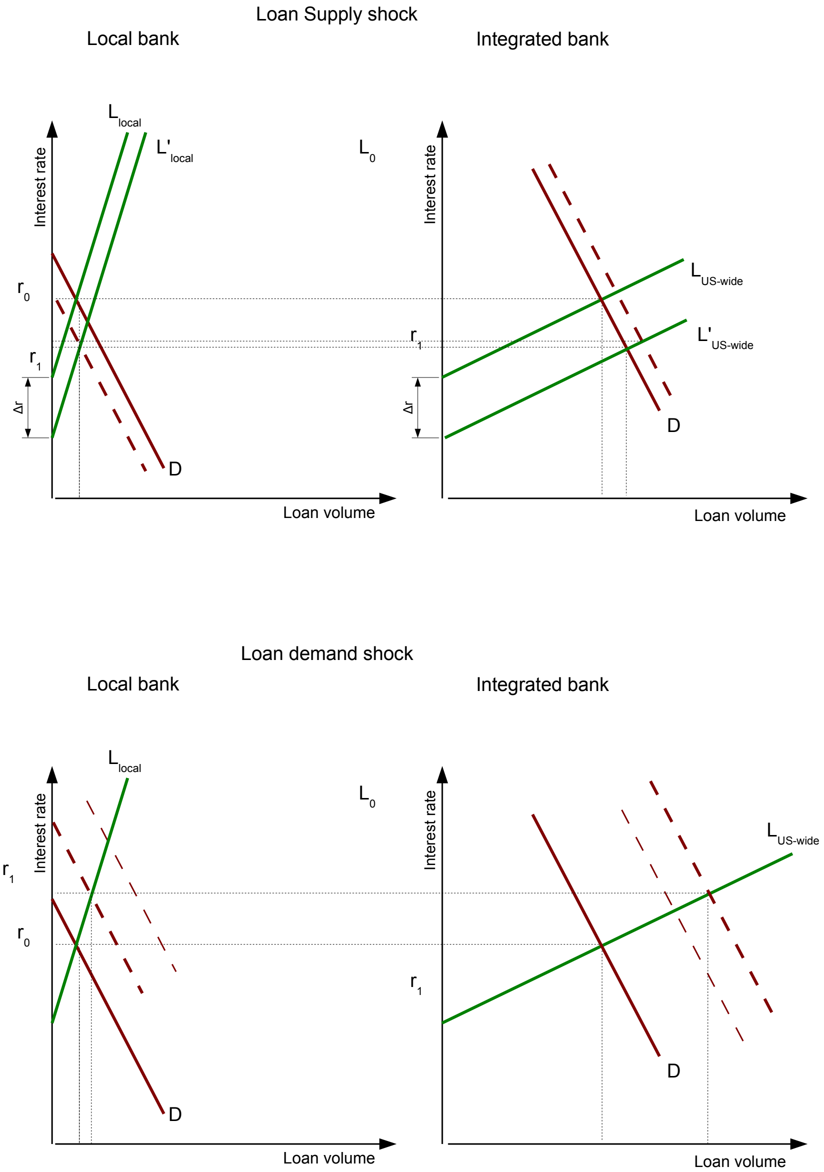


NOTES: The figure plots the openness – measured as years since interstate banking deregulation – against the 1980-1995 average of the share of mortgages issued by integrated banks for each state $ISLendRatio^k$. The cross-sectional regression of the form

$$ISLendRatio^k = open^k + constant + \epsilon^k$$

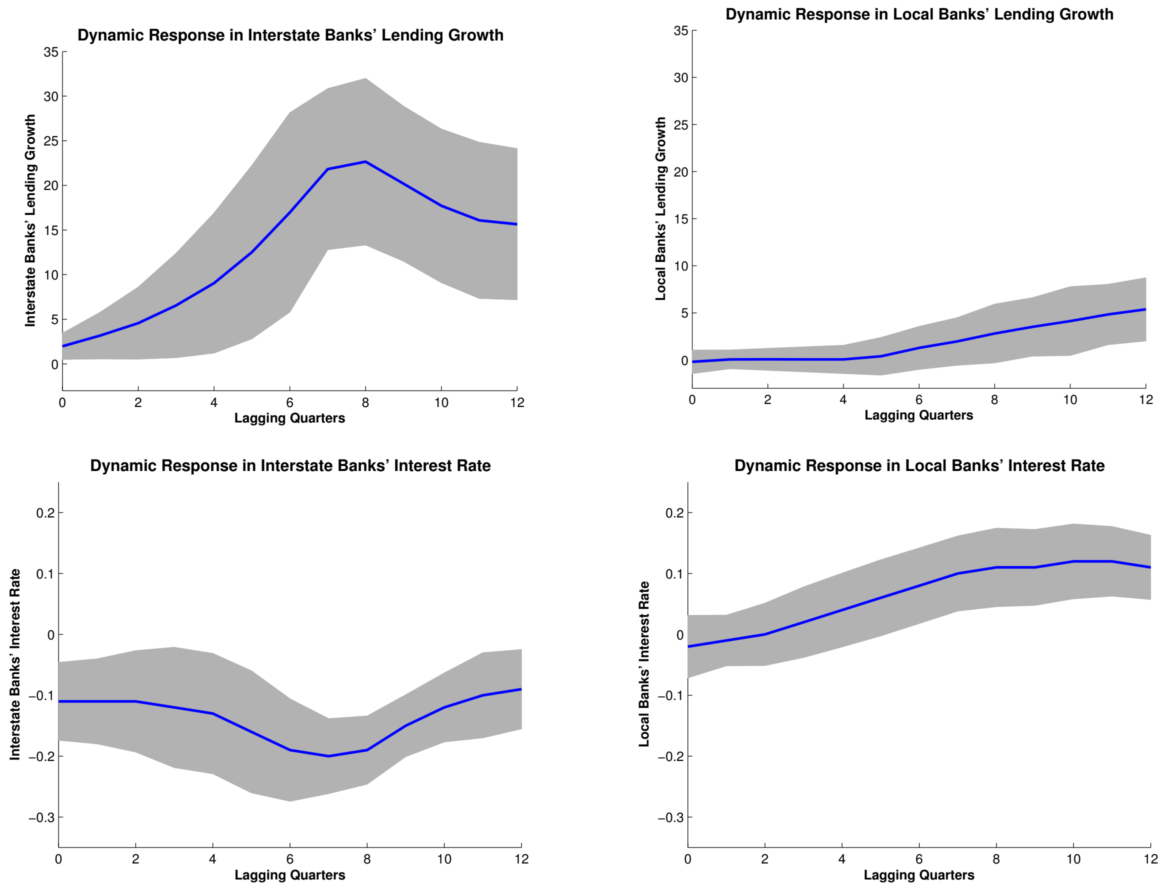
yields a coefficient estimate of $b = 0.03$, a t-statistics of 3.09, $R^2 = 0.84$.

Figure 4: A stylized model of state-level bank lending



NOTES: The figure illustrates the cases of a loan supply (upper panel) and a loan demand (lower panel) shock that hits local bank (on the left) and integrated bank (on the right). The supply curve of integrated bank is flatter than the one faced by the local bank because the integrated bank has a higher elasticity of loan supply with respect to interest rate. A loan supply shock – represented by a drop in refinancing cost Δr – increases lending and lowers interest rate of the integrated bank considerably more than it does for the local bank. By contrast, a positive loan demand shock increases lending and interest rate of both integrated and local banks (thin dashed demand curve). The ensuing interest rate increase is much higher for the local bank (due to the lower supply elasticity) than for the integrated banks.

Figure 5: Dynamic Responses in Lending Growth and Interest Rate



NOTES: The figure plots dynamic responses of lending (panel above) and interest rate (panel below) to the movements in US current account as a function of state's openness for two types of banks: integrated bank (on the left) and local bank (on the right). These dynamic responses are represented by a regression coefficient α_k of a regression of the form

$$x_{t+k}^{ij} = \alpha_k(open^i - open^j) \times CA_t + \mu_{ij} + \tau_t + \varepsilon_t^{ij}$$

on state pairs where x_{t+k}^{ij} is the k-period ahead interest rate difference between state i and j or the cumulated lending growth between these states between period t and $t+k$.