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# Local Banks, Credit Supply, and House Prices

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**Abstract**

I study the effects of an increase in the supply of local mortgage credit on local house prices and employment by exploiting a natural experiment from Switzerland. In mid-2008, losses in U.S. security holdings triggered a migration of dissatisfied retail customers from a large, universal bank, UBS, to homogeneous local mortgage lenders. Mortgage lenders located close to UBS branches experienced larger inflows of deposits, regardless of their investment opportunities. Using variation in the geographic distance between UBS branches and local mortgage lenders as an instrument for deposit growth, I find that banks with an exogenous positive funding shock invest in strict accordance with their specialization (that is, local mortgage lending). Consequently, house price gains in neighborhoods around affected banks were more than 50 percent greater than those in neighborhoods around unaffected banks. I also find an increase in the number of employees at small firms, reliant on real estate collateral, in the former set of neighborhoods. My results show that local-mortgage-oriented banks affect house prices through the supply of credit and that bank specialization thereby plays an important role in the allocation of capital across sectors.

Key words: credit supply, liquidity shock, house prices, local banking, employment

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# 1 Introduction

The price of residential real estate exerts substantial influence over various parts of the economy. It has been shown to impact household consumption (see Mian et al. (2013)), corporate investment (see Chaney et al. (2012)), and employment (see Giroud and Mueller (2017), Adelino et al. (2015), Schmalz et al. (2017), etc.,). Despite it's key role, economists are still trying to determine exactly which factors exert an influence on price dynamics[1]. Especially the relationship between the supply of credit by mortgage lenders and the value of real estate has been a topic of some debate; consider Adelino et al. (2014) and Mian et al. (2017).

Testing whether an exogenous increase in the supply of mortgage credit actually causes an increase in house prices can prove challenging. One needs to remove the confounding influences of consumer demand and overall economic growth. After all, rising house prices and an increasing credit supply often coincide with aggregate economic expansion or changes in lending regulation.

In this paper I exploit the sudden exogenous growth in the deposits of some members of a homogeneous group of 250 local mortgage lenders (operating in exclusive neighborhoods) in Switzerland. These are cooperatives known as "Raiffeisenbanks" and their growth was the result of a depositor migration away from the UBS, a large Swiss universal bank, which occurred in 2008 (Brown et al., 2016). As a consequence, the growth of each of these mortgage lenders is largely unrelated with its local investment opportunities. Instead, it relates to the distance/travel-time to the nearest branch of the universal bank (UBS).

Using distance/travel time to a UBS branch as an instrument for deposit growth at individual Raiffeisenbanks in 2008, I am able to document two important findings. Firstly, the business model of a local bank is an important determinant of local fund allocation. While the importance of bank location is well documented, the role that bank specialization may play in fund allocation remains under-scrutinized. I show that each shocked bank directs newly arriving funds toward its core market, local real estate lending[2] (predominantly by lowering the price of new loans). In fact, a 1% increase in deposits leads to a 1.1% increase in local mortgages over the following 2 years. Secondly, the resulting expansion in the supply of local mortgage credit, exogenous to the conditions of the local labor- or real estate-markets, leads to an abnormal increase in local house

[1] See Bailey et al. (2018) on a discussion of how household price expectations can be strongly informed even by geographically distant social networks

[2] This stands in especially stark contrast to the UBS, which engaged in mortgage lending across Switzerland (without a local focus) and business lending (into which Raiffeisenbanks do not expand)

prices. Using neighborhood-level[3] transaction-based prices for all of Switzerland, I show that house prices immediately around exogenously shocked Raiffeisenbanks grow over 50% more than around unaffected ones. To the best of my knowledge, this paper is the first to document how local lending shocks, resulting from a reallocation of customer deposits between a universal and a local savings bank, impact on local house prices. Overall, the natural experiment I exploit offers one of the cleanest settings to test whether an increase in the supply of credit leads to an increase in house prices.

In an extension to the paper, I am further able to show that the increase in residential house prices correlates with a slight increase in the number of employees in very small local firms operating in affected neighborhoods (i.e., firms most likely to make use of real estate collateral or mortgage loans to grow[4]). This effect occurs after the increase in house prices can be observed, indicating that I am observing a labor-market consequence of an unanticipated house price increase.

The findings in this paper are predicated on exogenous deposit growth that is uncorrelated with local conditions, at random members of a group of similar banks. To be a suitable instrument for exogenous deposit growth at Raiffeisenbanks, the distance to a UBS branch must fulfill certain requirements. Perhaps most crucially, it must relate to depositor migration but not to future Raiffeisenbank behavior or local real estate price growth. The first link is easy to explain conceptually; customers leaving the UBS choose the closest desirable alternative so as to avoid changing established patterns or routes. Distance, after all, does not have to explain all variation in deposit growth, merely some (Angrist and Pischke, 2009). The key exclusion restriction, that distance is not correlated with bank behavior (or regional specificities like housing or labor markets), is less evident at first. It is conceivable that UBS and Raiffeisenbanks automatically cluster close to one another in dense urban areas. These areas may be fundamentally different from rural ones and necessitate a different approach to banking. Here, however, the institutional setting of this paper is useful. Raiffeisenbanks are highly similar across Switzerland and guided by the same business models. Moreover, I am able to include a variety of controls, which beside bank characteristics,

[3]Neighborhoods correspond to "bfs-regions", as defined by the Swiss Statistical office (bfs). Switzerland contains over 2000 such neighborhoods

[4]Being in an affected neighborhood is associated with a 1% increase in employment among very small firms. The effect is economically small, though significant and comparable in magnitude to the results of US studies such as Adelino et al. (2015). This effect is observable despite the fact that Raiffeisenbanks do not lend to businesses. Although Swiss households do not typically extract housing equity to consume, it is possible that the effect runs through a consumer based demand-channel. This is discussed below.

include urban density, foreigner populations, neighborhood-level household wages, past house price trends and labor market (MS-region[5]) fixed effects. These factors capture region specificities and housing demand. Finally, individual Raiffeisenbanks are unable to lend to or attract deposits from households outside of their core region of operation. I ultimately compare the lending behavior of similar banks in unique but comparable neighborhoods within a small labor market, that differ only in their distance to the nearest branch of a particular universal bank.

Given its focus on individual banks, the IV analysis allows me to link distances between branches to the inflow of deposits, bank fund allocation and, ultimately, house prices and employment. However only about 70% of Raiffeisenbanks were able to report data for this paper from 2005 onwards. Furthermore, prices in neighborhoods around Raiffeisenbanks, which have multiple branches, must be averaged as I do not have data on branch-level lending[6]. To showcase result validity, I additionally perform a difference-in-difference (DiD) analysis. I assume regions are treated (i.e., likely subject to an exogenous shock to local mortgage credit) if Raiffeisenbank- and UBS-branches are close together. Ultimately, the DiD-specification confirms that increased mortgage credit leads to increasing house prices.

This paper's findings contribute to three strands of literature. First and foremost, it contributes to the discussion on whether the prices of assets increase due to an increase in the supply of credit. This view is held most prominently by Mian and Sufi, mentioned above, who argue that a credit glut boosted house prices unnaturally in the years prior to the great recession (see for instance Mian et al. (2017) or Mian et al. (2015))[7]. Favilukis et al. (2017) show in a formal model that relaxing credit constraints can leads to an increase in house prices. Noted work by DiMaggio and Kermani (2017) and Favara and Imbs (2015) offers some of the only empirical evidence for this link. They make use of US branching deregulations and a change in federal regulation regarding sub-prime lending, respectively, as instruments for credit supply. The magnitude of the effects found in their papers is similar, though slightly smaller, to the effects discussed in my paper[8]. A contribution of my paper lies in the unique nature of its setting. I analyze a group of homogeneous

[5]The average MS-region has fewer than 500,000 inhabitants and is less than 400sq-km in size, making it smaller (in both dimensions) than all but the smallest US MSAs.

[6]The average Raiffeisenbank has 4 branches, some of which are in different neighborhoods

[7]The countervailing view is that credit followed from boom in house prices, which were driven by unreasonable expectations. This view is held most prominently by Adelino et al. (2014) and Foote et al. (2016)

[8]This may reflect a difference between the US and Switzerland. It might also be a result of the fact that the credit supply shock, discussed in my paper, applies to all sectors of the housing market. Moreover, the credit supply shock cleanly affects individual neighborhoods as opposed to larger regions or states

banks, account for a variety of labor market-, bank-/location-specific factors and can rule out any regulatory influences (which often apply to specific sub-segments of the market). By focusing on the actual lending of hundreds of individual banks I can tie deposit growth, bank behavior and local price changes together more closely than previous studies. Perhaps more importantly, I do not analyze aggregate effects; instead I show how a positive credit supply shock at a local bank influences local prices.

This paper thereby also contributes to the literature on the importance of bank branches. As Paravisini (2008) demonstrates, local bank finance is difficult to substitute[9]. Similar to Gilje (2017), Nguyen (2017), Becker (2007), and Peek and Rosengren (2000) I show that the location of bank branches matter for the dissemination of local credit. However, by tracing out the impact of a reallocation between different types of banks, I also highlight that the business model is an important determinant of how funds are allocated. So far only Paravisini et al. (2017) show the implications of some bank's specializing in export lending[10]. My paper therefore contributes by highlighting the real effects of a reallocation of deposits to specialized mortgage lenders; the type of banks, which receive funds in a local economy, will determine the supply of credit to different sectors.

Finally, this paper relates to work dealing generally with liquidity shocks in banking. Negative liquidity shocks have garnered more attention, especially following the crisis (see Cingano et al. (2016); Ippolito et al. (2016); Caccavaio et al. (2015); Ongena et al. (2015); Acemoglu et al. (2015); Schnabl (2012); Khwaja and Mian (2008))[11]. These papers showcase real negative externalities to borrowers as a consequence of a negative liquidity shock[12]. Positive liquidity shocks are harder to analyze, as these occur less frequently and, if they do, often coincide with bank or region-specific booms. Gilje et al. (2016) examine how exogenous liquidity is shared and invested within a branch network, following the discovery of shale gas. Plosser (2015) exploits the shale gas boom to study fund allocation of banks following an exogenous inflow of funds. I ultimately find that Raiffeisenbanks overwhelmingly allocate new funds to loans[13].

[9]This likely follows from an advantage in local soft information that local banks can acquire effectively; see Berger et al. (2005) or Stein (2002)

[10]Black and Strahan (2002) do document a disadvantage of smaller banks in lending to corporate borrowers

[11]For a discussion of the propagation of system-wide liquidity shocks see: Pedersen (2009); Brunnermeier (2009); and Brunnermeier and Pedersen (2008)

[12]Iyer and Puri (2012); Iyer et al. (2016); Diamond and Dybvig (1983); and Calomiris and Mason (1997) look at determinants of bank runs, in particular. These papers are discussed in greater detail below

[13]I hereby also contribute to literature that examines the propensity of firms or banks to hold cash in times of

The remainder of this paper is structured as follows. Section 2 describes Raiffeisenbanks, the data, the data collection process, as well as the Raiffeisenbank-UBS depositor migration that occurred in 2008. It thereby details why distance is a good instrument for exogenous deposit growth. Section 3 discusses the assumptions behind the IV regression and showcases the results. Section 4 presents the methodology and results of the difference in difference analysis. Section 5 offers a variety of robustness tests for both the IV and DiD specifications, to show confounding influences are captured. Section 6 extends the paper by showing and discussing the employment implications of the deposit reallocation. Finally, section 7 concludes the paper and frames the results in a broader context.

# 2 Institutional setting and description of the data

## 2.1 Raiffeisenbanks

The Raiffeisenbank group is a Swiss cooperative banking-group that specializes in mortgage-lending to households. The group holds assets worth 190 billion Swiss francs (1CHF = 1USD) and is comprised of 270 individual banks (360 in 2007)[14], which operate the densest network of bank branches in the country. The average number of branches per Raiffeisenbank is 4, with a minimum of 1 and a maximum of 10. Raiffeisenbanks treat their individual branches as indistinguishable from one another. This is because all branches of a Raiffeisenbank are located within a relatively tight radius of operation. All banks are limited to local deposit taking and local investing. Potential clients, for example, are automatically directed to the Raiffeisenbank nearest to their home address (or the place where they wish to buy a home), when requesting a loan. Should a Raiffeisenbank wish to invest outside its core market, it must allocate funds to another Raiffeisenbank via the intra-bank market. However, it cannot typically designate a specific Raiffeisenbank to receive funds. According to balance sheet data, around 99.5% of all money allocated to the intra-bank market during the key sample period left the Raiffeisenbank system again via the interbank market.

[Table 1 about here]

turmoil (see Campello et al. (2011) or Ivashina and David (2010)) and show that this too is possibly business model dependent

[14]Raiffeisenbanks experienced a wave of consolidations between 2008 and 2013, with most occurring after 2010. Banks that merged during the sample period are treated as having been merged throughout

Over 80% of the Raiffeisenbank group's assets are residential mortgage contracts; this figure varies very little over the time period of interest to this study. Table 1 presents a simplified balance sheet for the average Raiffeisenbank in 2007. Panel A focuses only on banks in the sample, panel B makes use of rougher SNB data to show the overall average Raiffeisenbank. In total 248 of the 360 (70%) Raiffeisenbanks operating in 2007 were able to provide data in sufficient detail for all the years between 2007 and 2012. It appears that some of the smaller banks may be missing from my sample. However, the differences between the two groups are small. Moreover, the structures of the banks, in terms of balance sheet composition, are identical. In 2012, the last year in this study, the Raiffeisenbank group accounted for nearly 15% of the Swiss mortgage market (substantially more in some rural areas)[15]. The group counts over 3.7 million customers in Switzerland of whom 1.8 million are members[16].

The Raiffeisen Schweiz is a coordinating umbrella organization. Based in St. Gallen, it manages the group's interbank lending activities, oversees controlling and is in charge of risk management. Together with the member banks, it also defines the groups strategy and thereby sets lending guidelines (indirectly). Importantly, the group also guarantees the claims of creditors in the event of a single bank's collapse. As such, it implicitly shares the risks of any one individual bank with all others[17]. It is largely due to this high degree of coordination and association that the Swiss financial market authority (FINMA) and the Swiss National Bank (SNB) view the Raiffeisenbank group as one bank, not hundreds of individual banks. Importantly, for the identification in this study, the uniform coordination among banks and the standard banking regulation applied throughout Switzerland implies that individual members of the group are highly comparable to one another[18].

While the overall volume of mortgages, held by banks in Switzerland, has grown by an average

[15]Given the size of its balance sheet and its importance to the Swiss mortgage and real-estate markets, the Swiss National Bank found the Raiffeisenbank group to be a systemically relevant institution in June 2014. This has implications for the size of the capital buffer the bank must hold. Moreover, it forces the bank to create a so called "living will" (Enz, 2014). These conditions are naturally tied to increased administrative and capital costs for all members of the group

[16]This number does not include customers from its wealth management and private banking arm. As in most cooperatives, members are limited to a very small ownership share and are unable to acquire, for instance, a controlling stake

[17]The banks insure each other and are insured by the deposit insurance of Switzerland. It is possible that migrating customers sought out this feature of the bank in 2008, which would be in keeping with observations by Calomiris and Jaremski (2016)

[18]With rare exceptions, Raiffeisenbanks typically offer a standard interest rate on all deposit accounts throughout Switzerland. In 2012, the first year in which group-wide interest rates are available for all banks, fewer than 5% of banks had deviated from group-wide interests paid on the standard account. However, individual banks are able to offer differing prices for credit. This is discussed below

rate of 4% p.a. since 2000, the Raiffeisenbank group has grown its business by 7% annually. Particularly in the two years following 2008, the group was able to grow over 11% p.a. (Swiss National Bank, 2013). This growth, however, was not uniform across all member banks. Instead, it seems that some banks, which enjoyed a positive liquidity shock, grew much faster than all others.

## 2.2 The Liquidity Shock

In early 2008, the public became aware of the fact that the UBS, Switzerland's largest bank, was exposed to US mortgage backed securities. Despite eventual explicit government guarantees, some depositors lost confidence in the UBS, while others sought to punish the bank for its excessive risk taking (Brown et al. 2016). As a result, the UBS experienced an outflow of about 35% of domestic retail customer deposits between 2007 and early 2010 (Brown et al., 2016)[19]. The majority of these withdrawals occurred in 2008. The Credit Suisse (CS) experienced a similar, though less pronounced, drain as 20% of retail depositors withdrew. In total, the two largest Swiss banks saw an outflow of 60 bn.CHF in domestic deposits, the vast majority coming from the UBS[20].

This drain in deposits occurred despite the fact that neither the Swiss economy or the Swiss housing market suffered a downturn. Instead, the Swiss banking industry was reshaped due to the association of some banks with U.S. sub-prime borrowers. As customers migrated away from the UBS other banks benefited. Some Raiffeisenbanks, in particular, were perceived as being unaffected by the crisis. Unlike similar German banks, the Raiffeisenbank had not invested in US mortgage backed securities. Consequently, Raiffeisenbanks received 15 bn. CHF in additional deposits by the end of 2009[21]. It seems that not all Raiffeisenbanks received an equal share of migrating deposits, however. Instead, it seems that a large determinant in a customer's choice of new bank was geographical distance between branches of the UBS and Raiffeisenbanks. This may,

[19] See also "UBS staunches client exit" Wall Street Journal; 2010

[20] Iyer and Puri (2012) and Iyer et al. (2016) document that uninsured depositors are more likely to run. However, practically all depositors who ran were covered by the deposit insurance in the case of the UBS, as it had been raised to 250.000CHF. The run is most reminiscent of a coordination failure, as discussed in Diamond and Dybvig (1983). However, the government had issued explicit guarantees so that the UBS was not facing a solvency risk, which might otherwise have been the root cause of depositor panic (see Iyer et al. (2016) or Calomiris and Mason (1997)). Drechsler et al. (2017b) document significant market power of banks in holding/pricing deposits with migration sometimes associated with increasing deposit spreads, which was not the case at the UBS in 2008. The UBS event is unique in many dimensions

[21] (SNB online bank statistics; retrieved 2016)

in part, be a function of convenience. Depositors might feel that choosing a bank, which is located close to their previous bank, allows them to keep existing routines.

[Figure 1 about here]

Figure 1 shows the average annual growth rates in customer deposits for Raiffeisenbanks. I split the sample by whether a UBS branch was close (within 1 km) to a Raiffeisenbank branch or not. A Raiffeisenbank is considered close as soon as it has at least 1 branch within 1 km to a UBS branch[22]. 1 km is an arbitrary, though suitable, threshold, as most extra-ordinary deposit growth accrues to Raiffeisenbanks below this threshold (this is discussed further in the robustness section below).

The aggregated data is based on all Raiffeisenbanks in my sample. In 2007, data is available for 248 banks. In earlier years, the number of banks reporting data is lower, while it rises in later years. As can be seen in Figure 2, the average growth rate of customer deposits is almost identical across both groups of banks. The only difference can be observed during 2008, when one can see a pronounced spike in annual growth rates of those banks close to a UBS branch. Given that I make use of growth rates winsorized at the 2.5%-level, these observations are unlikely to be driven by outliers.

[Figure 2 about here]

This excess liquidity at some mortgage lenders has real world consequences. Figure 2 shows the price-growth of real estate in neighborhoods that contain a Raiffeisenbank. The sample is split by whether the neighborhood houses a Raiffeisenbank that maintains a branch close (1 km) from the branch of a UBS or not. As can be seen, the development of prices diverges after 2007, with neighborhoods possibly affected by exogenous increases in liquidity showing stronger house price growth. Panel A shows this concept with indexed prices; the divergence that occurs after 2007 is substantial and persistent. Panel B, on the other hand, shows that the growth-rate of house prices is higher for only a few years. Once excess liquidity has been pushed into the market, the difference in growth-rates collapses and trends are once more identical.

[22]The average number of branches per Raiffeisenbank is 4. 115 Raiffeisenbanks maintain a branch within 1 km

## 2.3 Data and Summary Statistics

In this analysis I make use of data from several different sources; the Swiss Federal Office of Statistics (Bundesamt fuer Statistik, (bfs)), the real estate consultancy Fahrlaender & Partner Raumentwicklung (FPRE), regional tax authorities, branch location data for all banks in Switzerland as well as the balance sheets of individual Raiffeisenbanks. The bfs provides information on population densities and the movement of foreigners in Switzerland[23]. The bfs and its communal counterparts further provide me with data on each local labor market. Specifically, they detail the number of *Full Time Equivalents* (FTE) employed per neighborhood in very small (less than 10 employees), small (10 to 50 employees), medium (50 to 250 employees) and large (more than 250 employees) companies in each community. Regional tax offices provide data on the average wage per working individual, living in a given neighborhood.

FPRE provides detailed neighborhood-level house prices[24] for different categories of housing quality for all the years between 2000 and 2013 for over 2000 Swiss neighborhoods (only uninhabited mountainous areas are excluded)[25]. In most analyses discussed below, I make use of the price for an average house in a given neighborhood. FPRE further provides data on rental rates, based on new rent contracts signed in an area[26].

Information on the addresses of every branch for all banks operating in Switzerland is manually collected, overwhelmingly from bank websites, and geocoded. Geocoded locations allow me to define distances between the bank branches of Raiffeisenbanks and UBS branches (as well as branches of Credit Suisse, Kantonalbanks, and Post Finance branches for tests discussed in the robustness section below)[27]. In an extension, discussed in the robustness section below, I also

[23]This information has previously been used in an analysis by Adams and Blickle (2017) on the impacts of immigration to Switzerland

[24]For information on the hedonic pricing models used to compute individual house prices see: Fahrlaender (2006); (Fahrlaender, 2008). They make use of information on transactions as reported to them by the "large swiss banks" though they do not disclose their exact sources for the time period in question

[25]Neighborhoods are defined as bfs-administrative regions or bfs-communities of which there are over 2000. In most cases, these correspond to postal Zip codes though some neighborhoods contain up to 3 ZIP codes. In those instances where communities subsume several ZIP-codes, these are merged in my data. In this paper, the term *neighborhoods* consequently denote small regions with distinct house price dynamics. Appendix Figure 1 shows neighborhood size and placement within Switzerland as well as indicative house price growth

[26]Some rental prices before 2008/09 must be extrapolated from community-level prices for other years and MS-level rental prices, available in all years

[27]In order to convert addresses to geocoded longitude and latitude information, I make use of functions based on both "Google maps" and "Here maps". In cases where latitude and longitude estimations of each mapping program differ, I make use of the coordinates that were mapped to a higher degree of accuracy (as reported by the mapping-programs themselves). Issues of accuracy resulted primarily from names that involved Germanic or French non-standard ascii character

make use of travel time, as opposed to distance. Raiffeisenbank lending data was hand-collected from each Raiffeisenbank's physical annual reports. These were sent upon request and constituted some of the only sources of information on past Raiffeisenbank activity. Most of these reports were returned to the banks upon completion of the data collection process at the banks' requests.

Given imperfect storage of old annual reports, not all banks were able to provide reports from 2007 onwards; this paper is therefore based on 248 institutions, as discussed above. Appendix Figure 2 shows the location of bank branches for which data is available from at least 2007 onwards compared with bank branches for which the data is not available that early. Banks, for which data in some years is missing, are distributed randomly throughout Switzerland. It is therefore unlikely that the omissions will shape the results of this investigation. However, the Difference-in-Difference (DiD) specification, discussed below, does not rely on bank-specific information and therefore includes all neighborhoods that house a Raiffeisenbank branch. This approach may assuage concerns over a selection bias.

The individual annual reports of Raiffeisenbanks contain information on bank liabilities, of which the largest component is customer deposits. The annual reports further contain information on assets, such as consumer loans to households, mortgage loans to households or businesses, and information on the degree to which these loans are covered by collateral (which can be an indication of loan riskiness). The financial statements further contain information on the bank's assets at risk as well as interest income.

[Table 2 about here]

Table 2 displays summary characteristics of some of the key dependent and independent variables analyzed in the paper. Panel A depicts univariate characteristics, calculated for the whole sample. Panel B splits the sample by whether or not a Raiffeisenbank maintains at least one branch close to a UBS branch. For simplicity, only two categories are shown[28]. As I show below, distances above 1 km are too great to facilitate extraordinary deposit flows. It appears banks closer to a UBS branch show a stronger growth in their mortgage business between year-end 2007 and 2009. Similarly, these banks increase their share of interbank lending after year-end 2007. Moreover, banks close to a UBS tend to be larger (in terms of deposits and assets) but less efficient(profit relative to staff costs).

[28] "Close" is defined as less than 1 km away. Raiffeisenbanks are considered close to the UBS if it has any branch within 1 km of a UBS branch

Finally, in order to gauge local real estate impact of Raiffeisenbank lending, I combine the above-mentioned real estate data from FPRE with the location data of individual banks. The growth in real estate prices for each neighborhood in Switzerland is shown in Appendix Figure 1. Almost all Raiffeisenbanks operate in at least two neighborhoods. While some maintain multiple branches in the same neighborhood. As can be seen, house price growth between 2007 and 2009 is often centered on densely populated areas and areas with high concentrations of tourist visitors (in the south). These latter areas also host large numbers of foreign workers, who migrate to the area seasonally for employment. To test whether the expansion of deposits actually causes an increase in local mortgage lending and a subsequent increase in house prices, I perform a number of analyses.

# 3 Instrumental Variable Regression

## 3.1 Assumptions

To identify a causal relationship between deposit growth, bank lending and (ultimately) residential real estate prices, strict assumptions must be met. Succinctly put, deposit growth should be randomly distributed across similar banks in regions with similar potential mortgage growth and house price developments. While the setting of this paper approaches a natural experiment, in that some members of a homogeneous group of banks are subject to an unsolicited and sudden deposit growth, the identification still poses several challenges.

Firstly, while Raiffeisenbanks are similar across the country, they are not identical. As could be seen from the summary statistics above, significant heterogeneity exists when it comes to size, profitability, and efficiency. Some types of Raiffeisenbanks might simultaneously be in industrious cities, more attractive to depositors, and better at investing new deposits. Secondly, banks are responsible for local marketing. Certain types of Raiffeisenbanks might pursue a more aggressive advertising strategy in times of turmoil to win over new clients[29]. It is in fact possible for individual banks to deviate from group-wide interest rates paid on deposits, as discussed above. Even when controlling for observable bank differences, some issues, such as the marketing effort exerted by a bank, might remain unobservable.

[29]This might apply particularly to less profitable banks. Consider Keeley (1990)

In this paper I employ an instrumental variable approach to assuage these concerns. The distance between a UBS branch and the closest branch of a Raiffeisenbank can serve as a suitable instrument for deposit growth at Raiffeisenbanks in 2008[30]. The instrument relies on the assumption that most depositors likely reside within a certain radius around the UBS branch and would be more likely to choose a closely situated Raiffeisenbank than a bank further away. A household may wish to keep established routines when changing banks. Switching between two closely situated banks is therefore more convenient than going to a new bank in another town or village[31].

While the IV approach helps deal with unobservable differences in bank strategies, it is subject to four key assumptions that deserve to be discussed in detail. Firstly, the relationship between distance to a UBS branch and deposit growth in one Raiffeisenbank should not affect the relationship between distance and deposit growth in another UBS-branch/Raiffeisenbank pair (i.e., stable unit treatment). Secondly, deposit growth must be continually decreasing as a function of distance (i.e., monotonicity). Thirdly, distance to a UBS must be random across Raiffeisenbanks (i.e., random assignment). Finally, this distance should be independent of future bank behavior and local economic conditions/house price changes (i.e., the independence assumption).

Stable unit treatment[32] is conceptually easy to defend and, while assumptions of this kind cannot be proven conclusively, common concerns can at least be ruled out. As mentioned above, each Raiffeisenbank operates in its own area. The fact that one Raiffeisenbank is close to a UBS, does not preclude another Raiffeisenbank from also being the same distance from a UBS in another part of the country. Moreover, the depositor migration does not empty the UBS of deposits; one Raiffeisenbank receiving deposit inflows does not affect the possibility of another Raiffeisenbank receiving deposit inflows. A concern may be that Raiffeisenbanks share liquidity amongst each other. If banks distribute the newly arriving deposits via an intra-bank market, stable unit treatment is again difficult to defend. Using balance sheet data, one is able to see that some money is earmarked as intra-Raiffeisenbank lending. This money, however, flows to the central Raiffeisenbank treasury, which also coordinates interbank lending. Ultimately, over 99% of

[30]In extensions discussed in the Appendix I also make use of travel time between branches

[31]The instrumental variable approach identifies a local average treatment effect. In this case, it identifies the mortgage-lending (and house price) reactions for Raiffeisenbanks that are likely to experience larger deposit growth if they are closer to a UBS branch. Given that Raiffeisenbanks are extremely similar, this is not a limited subsample but instead holds for all banks in my sample. Moreover, distance to a UBS branch should, in expectation, only ever influence Raiffeisenbank growth positively during the sample period (i.e., there are no defiers of the instrument)

[32]Formally, I argue that If: $Z_i^a = Z_i^b$ then $D_i(Z^a) = D_i(Z^b)$,
where $Z$ is my instrument, distance and $D$ deposit growth at bank i

all money designated as intra-Raiffeisenbank lending flows out of the group to other banks via the interbank market[33]. Raiffeisenbanks allocate virtually no money to other group members during the sample period.

The monotonicity assumption argues that, as distance increases, the expected deposit inflows to a Raiffeisenbank decrease[34]. This assumption seems plausible and follows the same logic discussed above; as distance increases, the likelihood of households switching decreases, given that it becomes less convenient (i.e., the bank is no longer in their immediate neighborhood[35]).

Both the random assignment and the independence assumptions are somewhat harder to defend conceptually. Looking first at random assignment, the UBS does not maintain a branch in all the regions in which a Raiffeisenbank is also located. Regions that house a UBS may be distinctly different from regions that do not. In the extreme, the separation might be along city lines, with some densely populated cities housing a UBS and a Raiffeisenbank while suburban regions house only a Raiffeisenbank (or neither).

[Figure 3 about here]

Figure 3 shows the location of Raiffeisenbank branches throughout Switzerland. The branches are differentiated by whether a UBS branch is close (within 1 km) or not. UBS branches tend to cluster somewhat around populated areas. However, there is no clear separation of Raiffeisenbanks that are close to a UBS and Raiffeisenbanks that are not. Even within densely populated regions, some Raiffeisenbanks are further than 1 km from a UBS.

The independence assumption holds if regions, which might attract a UBS, have the same potential mortgage growth and the same potential house price growth as those that do not. Visually, this appears to be the case. Figures 1 and 2 above show similar pre-deposit-shock trends across regions in which a Raiffeisenbank is close to a UBS and regions in which this is not the case. Furthermore, one can attempt to control for regional and bank-level differences, which would allow

[33] Anecdotal evidence suggests that the only time Raiffeisenbanks lend to each other is if one of them is in danger of collapsing. This was not the case at any point in the sample

[34] Formally: $P(D_i = j|Z_i = j) > P(D_i = j|Z_i = j - 1)$
Where $Z$ is my exogenous instrument, distance, and $D$ represents deposit growth at bank i

[35] In a series of robustness tests, discussed below, I make use of category variables, reflecting brackets of distance, as opposed to continuous distance as an instrument. When viewing this specification, it is clear that deposit inflows at Raiffeisenbanks are decreasing in distance. Moreover, distances between addresses might be subject to slight geocoding errors (i.e., addresses may be geolocated to within a few meters of their actual location). Making use of category variables, instead of distance in meters, circumvents the issues that might arise from assuming strict monotonicity in the face of addresses that may be miss-specified by a few meters

the independence assumption to hold at least conditionally. My data includes size, profitability and efficiency (profits relative to staff costs) at the bank-level. It additionally includes past house price growth, population, and share of foreigners at the neighborhood-level. Changing population densities can influence deposit rates and house prices directly. The share of foreigners in a region, on the other hand, may be indicative of labor market conditions; Switzerland is home to a large workforce of foreign nationals, who are theoretically attracted to economically prosperous regions (Card, 2001)[36].

[Figure 4 about here]

Perhaps the most important neighborhood differences, from the view of this analysis, are wage and employment-related. After all, changes in income or employment, at the local level, may drive local demand for housing. Figure 4 is based on neighborhood level employment data for all neighborhoods with a Raiffeisenbank. As can be seen, the changes in the share of people employed (Panel A) as well as the changes in the wages these people earn (Panel B) are identical across neighborhoods in which a UBS is close to a Raiffeisenbank and neighborhoods in which it is not. The small level-difference that exists between the neighborhood-types persists, and can therefore not account for a sudden rise in house prices. Including wage-changes as controls in the IV-framework mitigates any effect that wages might exert on the house price dynamics of interest.

Finally, I include labor market fixed effects. Switzerland defines Mobilité-spatial (MS) regions as areas in which a single labor market theoretically exits. As there are 106 of these MS-regions in Switzerland, they are finer and more granular than US-MSA regions. The inclusion of MS-fixed effects means I am comparing similar neighborhoods within a narrow geographic region, differenced only by the distance between a UBS branch and a Raiffeisenbank branch.

In the face of bank-profitability, -efficiency, -size, local population densities, foreigner share, changes in wages, past house price trends, and labor market fixed effects, the distance between a member of the homogeneous group of Raiffeisenbanks and a UBS branch is at least conditionally independent of future Raiffeisenbank behavior or housing market trends. Formally, I argue that the exclusion restriction holds for all expressions of my confounders X:

$$E(Y^0_{i,Z_i}|X_i = x, Z_i = 0) = E(Y^0_{i,Z_i}|X_i = x, Z_i = 1)$$

[36]This holds particularly for regions that host large numbers of tourists and consequently attract a large number of seasonal EU workers

$$E(Y^1_{i,Z_i}|X_i = x, Z_i = 0) = E(Y^1_{i,Z_i}|X_i = x, Z_i = 1)$$

It is possible that, even in the face of detailed controls, unobservable neighborhood-level differences remain. To assuage concerns, I conduct a series of separate analyses that only include neighborhoods that house a UBS-branch and a Raiffeisenbank. Even within neighborhoods (or even ZIP codes, which are somewhat smaller), the distance between a UBS-branch and a Raiffeisenbank relates to deposit growth at said Raiffeisenbanks. Within a neighborhood, marginal distance between branches is likely the result of historical land availability and unrelated to the house price trends developing there after 2008. Moreover, the neighborhoods will be inherently similar given that they attracted both a Raiffeisenbank and a UBS-branch. This approach can be found as a robustness check at the end of the paper.

## 3.2 Specification

Table 3 depicts the relationship between the growth rate in customer deposits between year-end 2007 and year-end 2008 and the distance to the closest UBS branch[37]. Columns (1), (2) and (3) make use of distance as a continuous variable. In moving from column (1) to (3), I add successively more confounders, showcasing the stability of the instrument. For ease of interpretation, both distance and deposit growth are expressed in logs; the regression coefficients of interest reflect elasticities. The influence of being close to a UBS branch remains large even as bank and neighborhood controls are included in the regression. Column (4) uses category dummy-variables to denote distance. The categories represent quintiles of distance and therefore include the same numbers of observations. Being closer than 250 meters is associated with a 6% higher deposit growth in 2008. Most analyses presented in the remainder of this paper make use of the first stage specification displayed in column (3). Regressions making use of alternate specifications of distance, such as in category variables or travel time between branches, are discussed in the robustness section below and detailed in the Appendix.

[Table 3 about here]

[37] I winsorize growth in deposits to ensure outliers do not drive the effect. This places additional burden on my identification. Results are comparable and slightly larger in magnitude without winsorization

The main specification of interest is a two-staged least squares regression of the following form:

$$1.Stage: \Delta Dep_{ir}^{MS} = \alpha_0 + \alpha_1 Dist_i + \alpha_2 Char_i + \alpha_3 Reg_r + \theta^{MS} + \epsilon_{ir}^{MS} \quad (1)$$

$$2.Stage: \Delta Y_{ir}^{MS} = \beta_0 + \beta_1 \Delta \widehat{Dep}_i + \beta_2 Char_i + \beta_3 Reg_r + \theta^{MS} + u_{ir}^{MS} \quad (2)$$

*Dep* is the treatment variable, deposit growth. In this regression, treatment is continuous and defined as the deposit growth rate in a Raiffeisenbank between year end 2007 and 2008 (i.e. ln(deposits 2008) - ln(deposits 2007)). *Dist* is the excluded instrument for this deposit growth. It represents the distance between a UBS branch and the branch of Raiffeisenbank i. If a Raiffeisenbank maintains multiple branches, *Dist* reflects the minimum distance between a Raiffeisenbank branch and the nearest UBS branch. In the primary analysis, all branches of a single Raiffeisenbank are treated as one (the validity of this approach is tested and discussed in the difference in difference section, of the Robustness chapter, below).

$Y$ represents a number of different dependent variables. Of primary interest are growth rates in mortgage lending and, ultimately, growth rates in regional house prices. The latter reflects the real world consequences of deposit reallocation, while the former helps make the channel clear. In specifications focused on prices, dependent variables are changes in apartment prices, single family house prices, and rental rates. For Raiffeisenbanks that maintain branches in multiple neighborhoods, prices are averaged. Rental rates are included as a check to rule out overall economic effects. Increases in the volume of local real estate transactions, due to more readily available credit, should increase house prices but not new rental rates[38].

Other dependent variables of interest ($Y$), that reflect bank behavior after an influx of funds, are growth in business lending, growth in liquid assets, and growth in interbank lending. Finally, to determine whether banks lend more aggressively (i.e., with lower lending standards) following the shock, I further analyze various measures of credit risk. These include growth in loans covered with mortgages (i.e., loans collateralized by real estate), change in assets at risk[39], and losses. I also look at changes in interest rate and liquidity risk by analyzing the effect of deposit growth on maturity gaps and reserve ratio respectively. All dependent variables are defined as changes

[38]Swiss rental rates of existing contracts can only appreciate at a rate set for each community that reflects country-wide inflation. My rental data is based on new contracts

[39]Assets at risk (German: Gefaehrdete Forderungen; Finma Rz 413 ff.) are assets the bank sees as unlikely to be repaid in full. The liquidation value of these assets is determined on a case by case basis

between 2007 and 2009[40]. This period is chosen to capture the immediate and short term effects, directly resulting from the exogenous deposit growth. Longer time horizons may conflate different effects. After all, the one-time deposit growth in 2008 constitutes a smaller fraction of overall bank deposit growth over several years. However, alternate time horizons are analyzed in the Appendix of this paper.

*Char* is a vector of bank specific controls (i.e., characteristics for bank i). This includes log of total assets (as a proxy for size), 2007 profitability, 2007 efficiency (measured as profit over staff costs). *Reg* are regional characteristics for neighborhood r. These are a vector of neighborhood-level population, a vector of the share of the immigrant population in the same neighborhood, changes in house prices since 1992, and changes in average neighborhood wages since 2003. $\theta$ are MS fixed effects for each of Switzerland's labor market regions (MS-region), which are broader than neighborhoods [41].

Appendix 3 showcases an alternate first stage specification. It includes distance to Credit Suisse as a second excluded instrument. By using two excluded instruments, one is able to perform an over identification test. In all cases, the instrument passes the under identification and weak identification tests. The over identification test indicates that the excluded instruments were correctly excluded from the second stage regressions.

## 3.3 Results

### 3.3.1 Bank Lending

Table 4 shows how the deposit growth-rate correlates with a number of changes in bank behavior. I make use of a two-stage least squares estimation, employing the first stage specification detailed in column (3) of table 3 above. Given that both deposit growth and all dependent variables are expressed as log growth rates, the regressions measure elasticities. A 1% exogenous increase in deposits is associated with a 1.1% increase in mortgage lending over two years. This implies that a 1 million CHF increase in deposits would lead to 990.000 CHF in additional mortgage lending. Although interbank lending constitutes a much smaller component of the balance sheet, the response is even larger. A 1% increase in exogenous deposit growth increases interbank lending

[40] These are winsorized at 2.5 % to ensure that results are not driven by outliers

[41] MS-region fixed effects subsume a language boarder fixed effect; cultural differences along the language border can influence saving behavior see: Brown et al. (2018)

by 2.2%. It should be noted that the volume of interbank lending fell steadily between 2009 and 2011, ultimately returning to its pre-shock level. This may reflect the fact that interbank lending is an efficient way to store exogenous liquidity in the short term, until it can be invested locally. Finally, unlike evidence found for banks in the US, banks in my sample do not appear to hold more cash following the shock in liquidity. Perhaps more importantly, it is evident that banks do not appear to branch out and invest more in business or consumer loans.

[Table 4 about here]

Appendix 4 replicates table 4 using ordinary OLS regressions (i.e., no instrumentation of deposit growth). Ultimately, the results are comparable with those in table 4; additional deposits are invested overwhelmingly in the mortgage market. However, the relative importance of mortgage credit (compared with other investment opportunities) falls a little. Particularly the importance of liquid assets seems to increase as the coefficient becomes significant. This finding is in line with previous studies that have documented a propensity of banks to hold liquid assets in uncertain times. It cannot be ruled out that some banks solicited funds during the turmoil of 2008 to hold cash or invest in specific local projects (some of which may also necessitate storing cash in the short term). This is most clearly exemplified by the rising importance (from a relative coefficient size standpoint) of commercial lending.

The appendices 5 and 6 attempt to capture risks taken by banks following the deposit shocks. Given the limited availability of relevant data, these analyses can be seen as offering indicative evidence. The variables displayed in Appendix 5 are associated with credit risk and shine a light on whether the banks in question took greater risk with the loans they disseminated. All new mortgage lending appears fully collateralized. The value of loans, which stand to be written off (i.e., assets at risk) do not increase with exogenous deposit growth. The same holds true for losses. This holds even if I extend the time-horizon to 2012 (results not reported for brevity). In Appendix 6, I analyze the effect of deposit growth on liquidity risk and interest rate risks by looking at the reserve ratio and the repricing gaps for different maturities, respectively. The reserve ratio of banks increases over a two year period, in response to exogenous deposit growth. This indicates that new lending does not come at the expense of the required reserves held by the banks (i.e., liquidity risk does not increase). Repricing gaps indicate how quickly liabilities and assets can be brought back into sync, as interest rates change, and often determine a bank's survival. Small mortgage

banks, especially, tend to be subject to interest rate risk, given the extremely long-term nature of their lending[42]. Given significant heterogeneity among banks, an increase in interest rate risk is not discernible[43].

The bank lending channel suggests that, as funds become more abundant, the price paid for deposits as well as the price demanded for loans should drop (see for instance Kashyap et al. (1994) or Kashyap and Stein (2000)). Though it is difficult for an individual competitive bank to drop deposit rates, there is indicative evidence that banks in my sample dropped the prices of new loans. In Appendix 7 I show that new loans are disseminated at a lower price. Overall net interest income per CHF of total assets seems to fall in the two years following an increase in deposits. In fact, for a 1% increase in deposits, net interest to assets falls by almost 0.75% between 2007 and 2009. This may coincide with the overall decrease in the cost of mortgages that occurred between 2007 and 2009. After all, interest rates for average Swiss mortgages dropped from 3.75% to 3.5% during this time. However, this drop in aggregate rates is, when applied to all Raiffeisenbank growth, far too small to explain the reduction in Raiffeisenbank profitability. These results, therefore, are anecdotal evidence of Raiffeisenbanks lowering the costs of loans after a surge in funding.

The above tables show that corporate lending does not increase, while mortgages to households and interbank lending (in the short term) do. Corporate clients do not factor in to a Raiffeisenbank's business model. However, as funds moved out of the UBS (and the Credit Suisse), their Swiss corporate lending dropped[44]. Shifting funds from the UBS to Raiffeisenbanks means shifting from firm- to mortgage credit on aggregate.

### 3.3.2 House Prices

Evidence for this credit-shift can be found in the reaction of house prices around affected Raiffeisenbanks. Table 5 examines changes in house prices as dependent variables. Given that the unit of observation in this specification is the individual Raiffeisenbank, I average house prices across all neighborhoods in which a Raiffeisenbank maintains a branch and calculate average house price

[42]Regulators are typically weary of the interest rate risks (IRR) to which particularly small banks are exposed. See Bednar and Elamin (2014) and Feldman and Schmidt (2000) for a basic mortgage-related IRR discussion

[43]The fact that I do not find an increase in interest rate risk is consistent with Drechsler et al. (2017a). Banks price their deposits in a way that is generally uncorrelated with the aggregate interest environment. The authors show that banks insulate themselves from much of the interest rate risk that they were previously assumed to carry

[44]Corporate lending at the UBS and CS, combined, dropped more than 20% between 2007 and 2009. While it cannot be argued here that this drop is causally related to deposit withdrawal, UBS and CS annual reports do name the withdrawals as a primary factor for this decrease

changes[45].

[Table 5 about here]

Columns (1) to (3) make use of distance as an instrument for deposit growth. This regression uses the same first stage specification as the tables above. One can observe a reaction in the purchase prices of apartments. A 1% exogenous increase in deposits leads to a 0.68% increase in the prices of local apartments. A 1 standard deviation (ca. 8%) change in exogenous deposit growth at a local Raiffeisenbank would raise prices by about 5%. This reflects almost three quarters of total apartment price growth. House prices react slightly less strongly, perhaps because there are on average far fewer transactions. A 1 standard deviation increase in deposits would lead to a 3.2% increase in house prices (about 50% of price growth). Ultimately, my results are of a similar order of magnitude as DiMaggio and Kermani (2017) who find that an 11% increase in credit leads to a 3.3% increase in house prices in the US, following a regulation change[46]. The difference may in part be due to the fact that my paper looks at the price response of all houses-types, following a positive liquidity shocks to dedicated local mortgage lenders.

One can observe no response in rental rates. Swiss rental rates are locked in at the time of contract signing, so my data tracks rates for new rental contracts. A change in new rental rates may imply a boom in an area or neighborhood, which is the result of economic changes that attract new residents or induces resident turnover. A change that is only apparent in prices, however, may be the result of an increase in the number of house purchases in a neighborhood, that do not result from an economic boom, but from an increase in the supply of credit.

Finally, columns (4) to (6) do not make use of instrumented deposit growth and there is no evidence of an abnormal house price reaction. These findings are consistent with results depicted above, which show that mortgage credit receive a relatively smaller share of new bank funds if these are not exogenous to the bank/region. Raiffeisenbanks that specifically solicit deposits may have alternative investment opportunities. However, when looking at a slightly longer time horizon, one can still observe positive effects in house price or apartment price reactions, even if deposits are not instrumented.

[45] As discussed above, the average Raiffeisenbank maintains 4 branches, though some operate in the same neighborhood

[46] Overall, any price effect found in this paper is likely to be a lower bound effect. Although the UBS was contracting corporate- and not mortgage lending (which remained steady at the UBS and CS), the reduction in available credit is still likely to affect the area around UBS branches negatively

# 4 Difference-in-Difference Specification

While it allows for a clean identification of the credit supply channel, by looking at both the lending behavior of banks as well as local house price reactions, the above IV estimation arguably suffers from a weakness. Specifically, it makes use of only a subset of the available data. It focuses only on those Raiffeisenbanks that provide annual report information. Moreover, given that the unit of observation in the IV analysis is the Raiffeisenbank, and not the neighborhood, I am forced to average house prices across all the neighborhoods in which an individual Raiffeisenbank operates.

It is possible to estimate an average treatment effect on the treated (ATET) at the level of the individual neighborhood using a difference-in-difference specification (DiD). Hereby neighborhoods are considered exposed to a possible shock in the supply of mortgage credit ("treated"), if they house a branch of a Raiffeisenbank that also maintains a branch close (within 1 km) to a UBS. Similar to Nguyen (2017), I do not make use of actual deposit shocks to local banks but rather the likelihood that a shock occurs. As in the IV regression above, I hereby circumvent the issue that some banks may attempt to solicit funds.

The identification of ATET in a DiD-setting is subject to three strict assumptions that differ from those of the IV regressions. Firstly, one must be able to observe common trends in the dependent variable of interest prior to 2008 across treated and untreated groups. Secondly, one must have common support such that the probability of being a treated region, conditional on observables, is comparable across treated and non-treated regions[47]. Finally, the stable unit treatment assumption argues that treated regions must be clearly distinct from untreated regions.

Common trends can be confirmed visually. Both the growth rates of house prices as well as the development of actual house prices are similar in treated and untreated regions prior to 2008 (see Figure 2 and Appendix Figure 3). This implies that the common trend assumption is not functional form dependent (i.e. it holds in both changes and levels). Given that the analysis is focused only on neighborhoods in which Raiffeisenbanks operate, the common trend seems plausible. All regions in the sample enjoy the presence of at least some banks (i.e. at least a Raiffeisenbank) and will typically be at least somewhat urbanized/connected to public transport. Unobservable neighborhood differences do not appear to be common trend confounding. However, to ensure that neighborhood-level differences do not drive results, I include neighborhood-level

[47] $P(TAR = 1|X = x, (T, AR) \in \{(t, ar), (1, 1)\}) < 1$ Where T is time and AR is affected region

fixed effects in the estimation.

The assumption of common support is similarly defensible. Raiffeisenbanks across Switzerland have a chance of being close to a UBS. This is because Raiffeisenbanks operate a dense branch network. There is no mechanical reason for banks in one area of the country to stand a higher chance of being treated[48]. This is confirmed visually by figure 3 (discussed above). Treated and untreated regions are therefore comparable and treatment can be considered random, especially in the face of neighborhood-level fixed effects.

The assumption of stable unit treatment stipulates that the treatment of one region cannot influence the treatment of other regions. As was discussed above, Raiffeisenbanks are forbidden from competing with one another. They cannot use the growth in deposits to disseminate mortgages outside of their neighborhoods of operation. Moreover, they do not lend to one another outside of crises. This implies that the treatment of a region affects only that region.

The regression makes use of data for the years 2007 and 2009 and takes the following form:

$$LogHP_r^t = \beta_0 + \beta_1 AR_r + \beta_2 past08^t + \beta_3 AR_r * past08^t + \theta_r \tag{3}$$

$\theta$ are neighborhood-level fixed effects that may capture any local factors that drive prices. $AR$ is a dummy affected region; denoting whether a neighborhood is considered treated to a likely exogenous growth in liquidity. It takes the value of 1 in all neighborhoods that house a branch of a Raiffeisenbank, which also maintains a branch close (within 1 km) to a UBS. The dummy *past08* is defined as 1 if the year is after the 2007/08 shock (i.e., 2009) and zero otherwise. $\beta_3$ is the coefficient of interest. The explicit assumption is that distance (i.e., being close to a UBS branch) increases the likelihood of a "shock" to the deposit growth of a local Raiffeisenbank and therefore the supply of credit to mortgages. The link between deposit growth and mortgage credit is shown in detail in the section above, while the link between distance to a UBS branch and deposit growth is discussed in section 2. The dependent variable in all these specifications are log house prices at the neighborhood level.

[Table 6 about here]

Table 6 documents a reaction in the price of apartments and single family homes. Prices of apartments in affected areas increase 1.7% between 2007 and 2009 while house prices rise just

[48]This might be the case if the UBS focused exclusively on German-speaking regions

over 1%. Being within 1 km of a UBS branch is associated with an almost 1 standard deviation increase in deposit growth. Scaling the results somewhat, we see that a mean increase in deposits in 2007/08 leads to an over 2% increase in apartment prices and a 1.5% increase in house prices. This confirms the visible difference in growth rates, between the neighborhoods in which a UBS and Raiffeisenbank are close together and ones in which they are not, discussed above. The results are slightly smaller in magnitude but ultimately comparable to the results discussed in the IV section above. The DiD confirms that an exogenous inflow of funds to a local mortgage lender will significantly increase local real estate prices.

# 5 Robustness and Alternate Specifications

## 5.1 Instrument Validity

I can test the validity distance as an instrument for exogenous deposit growth by performing a series of placebo tests. Specifically, I can analyze the growth in Raiffeisenbank deposits as a function of the proximity of other banks in 2008 and as a function of the proximity of a UBS branch in 2012. Appendix 8 details these regressions. The Post Finance is the banking arm of the Swiss post. It maintains a large number of branches throughout the country. Kantonalbanks are a series of state banks that operate in each Kanton and also maintain a large number of branches. Neither experienced an outflow of deposits in 2008. When controlling for bank and region characteristics, distance to the Post Finance and the Kantonalbanks has no impact on the deposit growth at a Raiffeisenbank in 2008[49]. In the same vein, we see that deposit growth in 2012 is not related to distance from a UBS branch. My instrument is therefore useful in capturing the exogenous component of a onetime deposit flow from a UBS branch to a Raiffeisenbank.

A concern may arise from the fact that the instrumental variable regression makes use of only 248 observations. Two staged least squares estimates are often more stable in larger samples. In order to prove that results are not driven by individual observations in a small sample, I perform a series of bootstrapped IV regressions. The distribution of the coefficients of instrumented deposit growth on the change in mortgage lending and the change in apartment prices can be found in Appendix Figure 4. While some outliers exist, the overwhelming majority of coefficients suggest

[49]One can observe a small effect if controls are omitted. However, this could be an "urban" effect that consequently disappears when controlling for population densities

that the results discussed above hold in each of the bootstrapped samples.

## 5.2 Alternative Specifications of the Instrumental Variable Regression

Greater circle distance may be an inaccurate measure of the "real" distance between bank branches. It does not take into account any rivers, fields, or even street regulations (such as one way roads) that might make a location significantly less attractive to a potential depositor, who is in the process of migrating funds from a UBS branch. I make use of travel time between a Raiffeisenbank and the "closest" UBS branch as an instrument to analyze change in mortgage lending and changes in local real estate prices in Appendix 9. Travel time is calculated by "Google Maps" and reflects the time, in seconds, an average individual would take to walk from one location to the next. Importantly, it makes use of actual street maps. The results are largely the same as those discussed above. The price reaction of apartments is slightly, though not significantly, larger.

An important robustness test makes use of only those ZIP codes in which both a Raiffeisenbank and a UBS operate. Estimating an effect within an individual ZIP code removes all potential issues stemming from differences across regions. ZIP codes are the very smallest division possible. Each neighborhood in my sample is comprised of between 1 and 3 ZIP codes. Even within ZIP codes, there exists some variation in the distances between a UBS and a Raiffeisenbank branch that can be exploited by the instrumentation approach. Table 4 is again replicated in Appendix 10, whereby the analysis is limited to only those Raiffeisenbanks that are in a ZIP code with a UBS branch. Results should be interpreted with caution, given the fact that they rely on fewer than 90 observations. However, the effect magnitudes (and significances) presented above are confirmed, a 1% increase in exogenous deposits leads to an almost 1% increase in real estate lending[50]. This robustness test lends strong support to the approach in this paper. The results discussed above are not based on fundamental differences between the regions that hold a UBS and ones that do not.

Table 4 is replicated once more in Appendix 12. This table makes use of a stepwise instrument (as detailed in column (4) of table 3). Strict monotonicity is easier to defend in this specification than in the specification that makes use of distance in meters as a continuous variable. It is possible, after all, that some addresses may be misspecified by a few meters due to small faults in

[50]Coefficients for regressions relating deposit growth to house prices can be found in Appendix 11. Though slightly less significant, the results discussed above are still clearly confirmed

the geocoding procedure. Again, all the results discussed above are confirmed.

## 5.3 Additional IV Robustness tests

Winsorizing the data has little effect on the results. Some coefficients grow marginally larger without winsorizing. The differences in coefficient magnitude, however, are insubstantial in all cases. Table 4 is reproduced in Appendix 13, the difference being that variables are not winsorized.

Most Raiffeisenbanks do not operate at or very close to the legal limit of reserve requirements. The lending behavior of individual Raiffeisenbanks is therefore not a function of the reserves each bank holds. Each seems to have sufficient buffer to engage in the lending it chooses. Results that split Raiffeisenbanks according to reserve holdings are not reported for brevity.

There is no evidence to suggest that the rate of construction increases in affected areas (results not reported for brevity). However, information on the number of dwellings at the community level are available only for the years 2000 and 2010, meaning any analysis in the sample period of this paper will make use of interpolated information on dwelling construction. Moreover, dwelling construction could be significantly slower to react than prices, as permitting and construction can take several years.

In Appendix 14, I make use of different price categories of homes per community. These are estimates of prices for high- and low- quality houses provided by FPRE (there is no data on rental rates for homes of different quality). Both low-priced and high-priced homes show roughly the same price reaction to an expansion in the supply of credit as the average home. It appears that neither (comparatively) low- or high-quality homes benefit disproportionately from an expansion in the supply of credit. I readily acknowledge, however, that there may be insufficient transactions to accurately identify an effect.

Finally, Table 4 is again replicated in Appendix 15, where the time horizon of dependent variables reflects changes between year-end 2007 and year-end 2012. This captures a longer-term horizon that allows banks to fully adjust to the deposits received in 2008. It is of course important to note that the amount of funds received during the shock are a much smaller percentage of total growth over 5 years. Banks that receive a liquidity shock seem to grow their mortgage business disproportionately over the course of 5 years. A 1% increase in deposits in 2008 leads to a 2% increase in mortgage volume between the end of 2007 and the end of 2012.

### 5.4 Alternative Specifications of Difference-in-Difference-Approach

In extensions to the baseline DiD specification, I can further test whether the observed house price effect originates only in the neighborhood in which both the Raiffeisenbank and UBS operate a branch or in all neighborhoods serviced by the "shocked" Raiffeisenbank. I do this by separating out branches of Raiffeisenbanks that are close to (and in the same neighborhood as) a UBS branch from branches of the same Raiffeisenbank that are not close to a UBS. I thereby look at differences in the development of prices between the communities that house both a UBS- and Raiffeisenbank-branch and the communities that house a branch of a shocked Raiffeisenbank but no UBS branch. The mean distance between branches of a "shocked" Raiffeisenbank and a UBS bank is 6 km, with significant heterogeneity. This implies that even banks with some branches close to a UBS maintain some branches much further away. The mechanics of this analysis are illustrated in Appendix Figure 5.

The results of this analysis are reported in Appendix 16 and show only a small difference in the price of apartments, between the two regions. No difference in house prices is discernible. Importantly, this showcases that the observed price dynamics are not unique to areas that house a UBS[51]. Furthermore, this analysis lends credence to the notion that Raiffeisenbanks share liquidity well within their small individual branch network, as described in section 2 and asserted by Raiffeisenbank annual reports.

Finally, the results of the DiD specification are not sensitive to different definitions of distance to denote treatment. The analysis provides similar results for thresholds between 0.75 km and 1.2 km to denote a close UBS branch (results not reported for brevity).

## 6 Extension: Local Employment Effects

In an additional set of analyses, I can show that the number of employees, working for very small firms, increases in regions which experience credit supply-induced growth in house prices. This relates to work conducted in the US and Europe (see Adelino et al. (2015); Bahaj et al. (2016); Giroud and Mueller (2017); Mian et al. (2014); Pinter (2015); Schmalz et al. (2017); Banerjee and Blickle (2018); and Mettler (2017)). All these studies showcase the importance of house prices

[51]It is possible that the effect is slightly stronger in those regions that house the RB head office, for a variety of reasons

in driving employment. I contribute to this literature by analyzing economic effects of depositor migration and thereby tie together specialized mortgage lenders, house prices and labor market effects.

In Switzerland, the owners of small businesses often extract rising equity values in the form of second mortgages, or by re-mortgaging during periods of rising prices. This was observed by Mettler (2017) using loan level data. As Mian et al. (2013) observe, it is possible that consumer demand influences employment growth. To a certain extent, perceived increases in a household's wealth may lead the household to consume more. Small firms tend to have a strong regional focus, making them most susceptible to regional demand. There is no direct way to show which channel (collateral or demand) dominates in this setting. The analysis in this paper is therefore agnostic about the means by which house prices influence firm growth. The results presented here can be viewed as indicative evidence that an increase in the supply of mortgage credit will ultimately have an effect on local small firm employment.

[Figure 5 about here]

Figure 5, Panel A shows the indexed number of employees working for small (<10 employees) firms in regions in which a UBS is close to a Raiffeisenbank (<1 km) and in regions in which this is not the case. Unfortunately, the data collection methodology was changed somewhat between 2008 and 2010, leading to an apparent jump in the number of people employed in small firms. This change, however, applied throughout Switzerland and was not related to the events of 2008 or to any particular region. There is an additional up-tick in small firm employment in regions in which a UBS and a Raiffeisenbank are close together. Panel B indexes the number of employees per neighborhood in firms of all other sizes. There is no apparent difference between neighborhoods in which a UBS and Raiffeisenbank are close together and neighborhoods in which this is not the case after the deposit growth shock.

The visual observation can be confirmed with a difference in difference specification. Here, I compare the growth in the number of small firm employees across neighborhoods that are treated to a likely increase in mortgage credit (i.e. Raiffeisenbanks and UBS are close together) and neighborhoods that are not. The dependent variables are the logged number of employees in firms of 10 employees or less and the log of employees in firms of all other sizes. The specification includes neighborhood level fixed effects and follows the structure described in section 4 above.

Consequently, the same arguments, made in defense of the DiD-approach above, can be made in this case, as parallel trends in the key dependent variable are clearly apparent before 2008.

[Table 7 about here]

Table 7 shows that regions likely treated to an exogenous growth in mortgage supply also see small firm employment rise. The effect is statistically significant, if small, at 1%[52]. Given that employment reacts more slowly than prices, we can use 2010 as a final year and find that the effect is slightly larger at 2%. There is no observable effect on employment in larger firms or in the year 2008[53]. This holds when these are viewed as a group, as in table 7, or when truncated into firms of various size (not reported). Finally, given that I observe wages only on aggregate, as averages for an entire neighborhood, there appears to be no increase in the average worker's wage. This implies that I am not picking up an aggregate economic effect. Overall, I can conclude that the increase in available mortgage credit ultimately leads to a very slight increase in employment amongst those firms whose activity is most susceptible to house price changes.

# 7 Conclusion

A bank with sudden exogenous deposit growth is confronted with the choice of how best to invest the newly acquired funds. It may aggressively lend to new clients in the sector in which it is active, lend to new clients in a different sector, lend on the interbank market, or hold cash. Each decision entails consequences for the bank and the financial system as a whole. Importantly, the decision may well depend on (or at least be influenced by) bank specific characteristics.

It has been well documented that a bank's location is an important determinant of the projects in which it invests. However, the fact that a bank's business model will also matter, is relatively novel. This study fills a gap in the existing literature by analyzing the consequences of the sudden and exogenous growth in the deposits at some members of a group of homogeneous mortgage lenders (i.e., Swiss Raiffeisenbanks in 2008). I show that Raiffeisenbanks invest new funds in accordance with their business model, local real estate lending. They do not replace the diminished

[52]Estimating an IV, as above, leads to large coefficients that are significant in most, though not all, specifications. This is possibly reflective of the large heterogeneity in employment across Switzerland. These results are not reported for brevity

[53]Overall the effects are of a similar magnitude to those found for the US or the UK, though in this paper they are concentrated on smaller firms

UBS (and CS) corporate lending. Nor do they lend outside of their core market, by sharing liquidity with other Raiffeisenbanks.

This increase in the supply of local mortgage credit, exogenous to any labor or economic conditions, ultimately changes local house prices. In fact, growth rates of apartment prices increase by more than 50% around Raiffeisenbanks shocked with exogenous excess liquidity. This means that a 1 standard deviation increase in deposits for the entire Raiffeisenbank group would lead to 5 billion more in available mortgage funding. This paper represents one of very few studies able to document that an exogenous increase in the supply of credit may lead to an increase in house prices.

Ultimately, the choices of depositors to invest their money with one bank over another affects the allocation of funds in an economy. As shown, shifting from a universal lender to a local mortgage bank increases the amount of credit locally available for house purchases, while possibly decreasing the available corporate credit. It is potentially possible for policymakers to influence the allocation of funds to the productive sector by encouraging deposits at certain institutions more than others. It certainly behooves policymakers to reflect on the fact that the prevalence of certain bank types will strongly influence who, in a society, gains access to credit.

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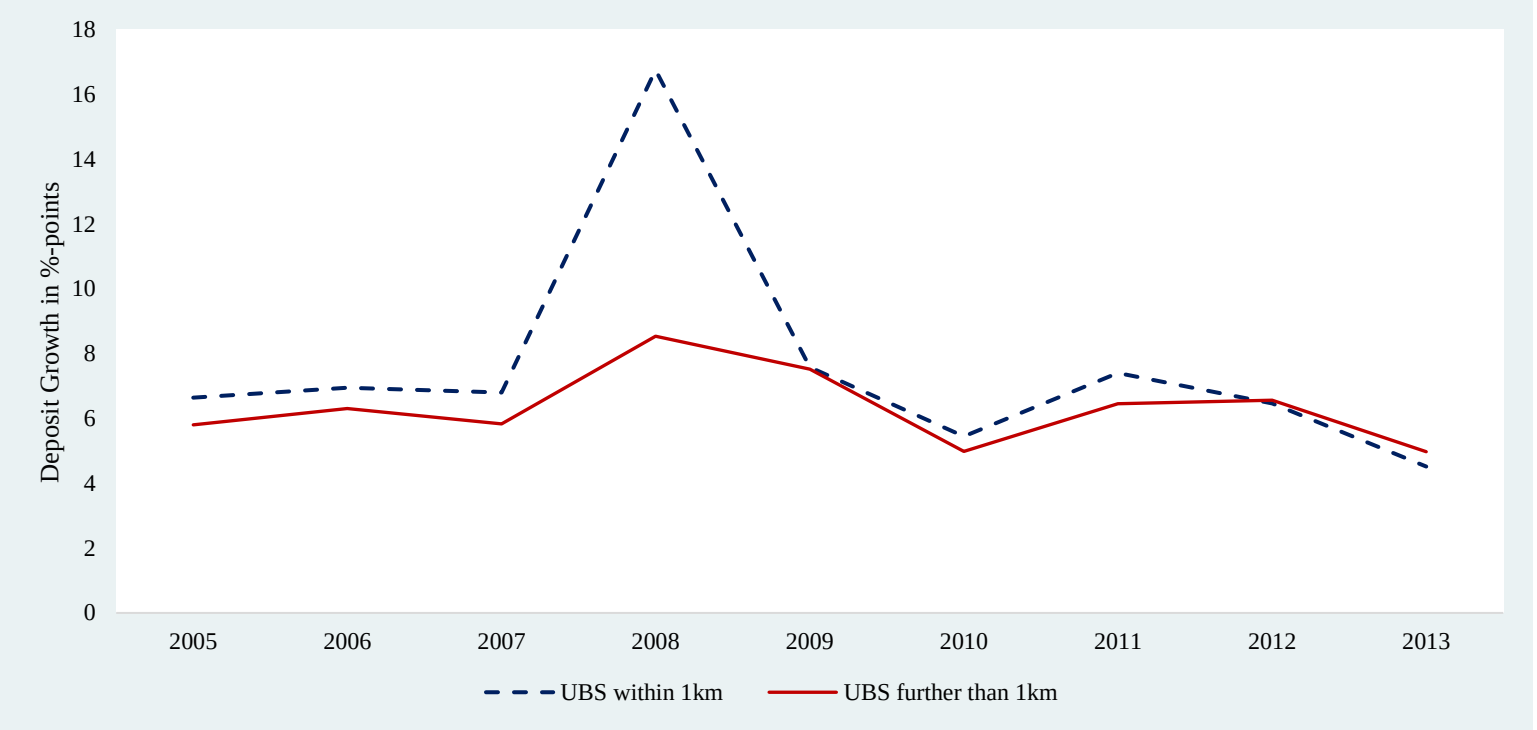
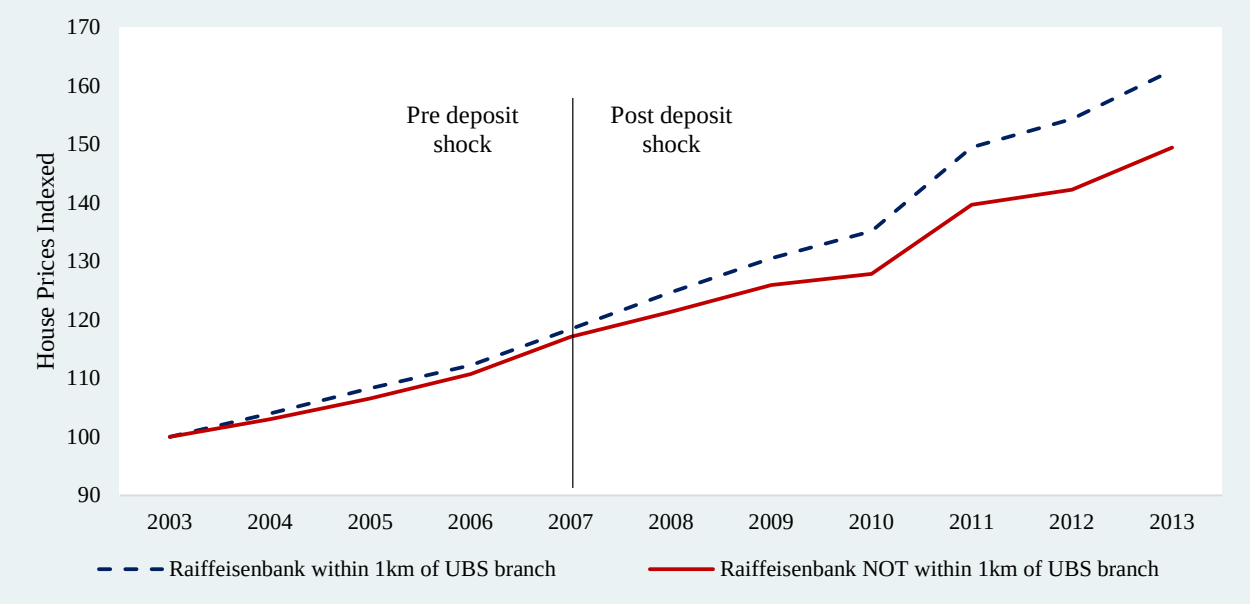
Figure 1: Average annual deposit growth at Raiffeisenbanks



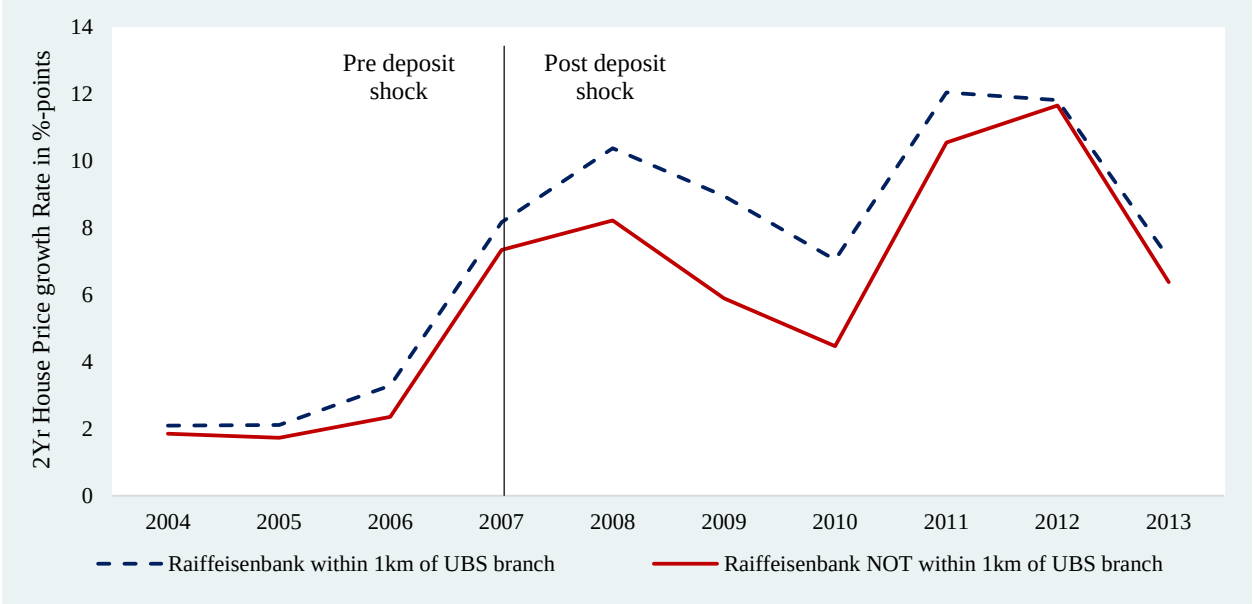

Notes: This figure depicts year on year deposit growth for Raiffeisenbanks in my sample. Raiffeisenbanks are split by whether they maintain a branch close (within 1 km) to a UBS branch or not. 115 Raiffeisenbanks in my data maintain a branch within 1 km of a UBS branch in 2007 while 133 do not. The deposit growth shock occurs during the fiscal year 2008 and is visible here in 2008 year-end balance sheet data.

Figure 2: Average house price growth

Panel A: House prices - indexed

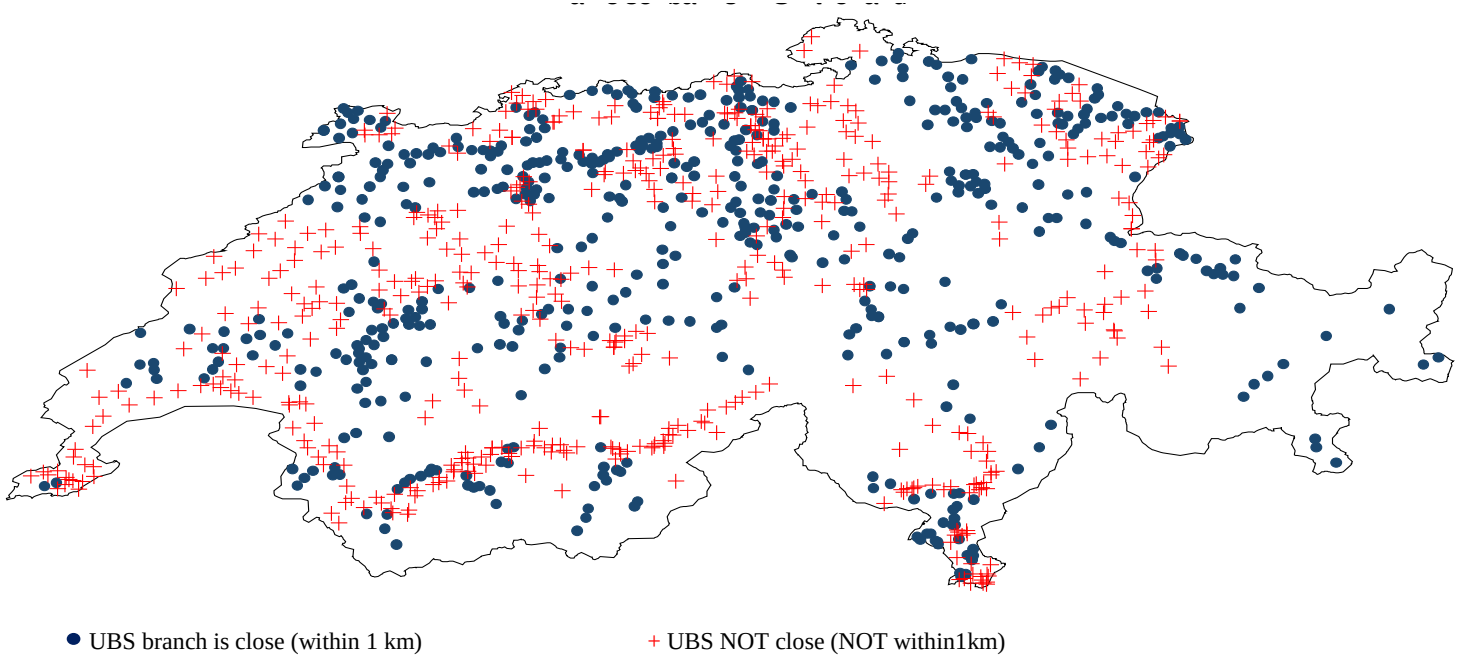



Panel B: House price growth rate (two year average)




Notes: Panel A depicts indexed house prices in neighborhoods with a Raiffeisenbank. The sample is indexed to 2003 and split by whether the local Raiffeisenbank maintains a branch close (within 1km) to a UBS or not. Panel B depicts the 2 year house price growth in any given year for neighborhoods with a Raiffeisenbank (averaged across neighborhoods). The data is again split by whether the local Raiffeisenbank maintains a branch within 1km of a UBS branch. Using 2-year growth rates smooths inter-annual fluctuations and makes the graph more comparable to the tables below (i.e. house price growth in 2009 is the house price change between 2007 and 2009). I proxy "house prices" as the price for a single family house. 115 Raiffeisenbanks operate 310 branches in distinct neighborhoods within 1 km of a UBS branch in 2007 while 133 Raiffeisenbanks with branches in 360 distinct neighborhoods do not. The deposit growth shock occurs during the fiscal year 2008. The data is split into pre- (2007 and before) and post-shock periods.

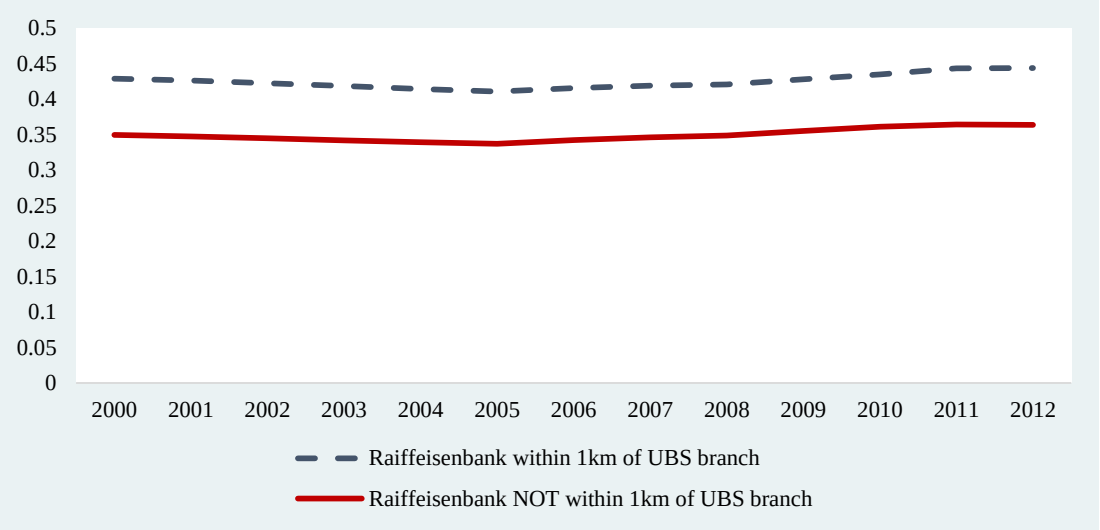
Figure 3: Location of Raiffeisenbank branches in Switzerland



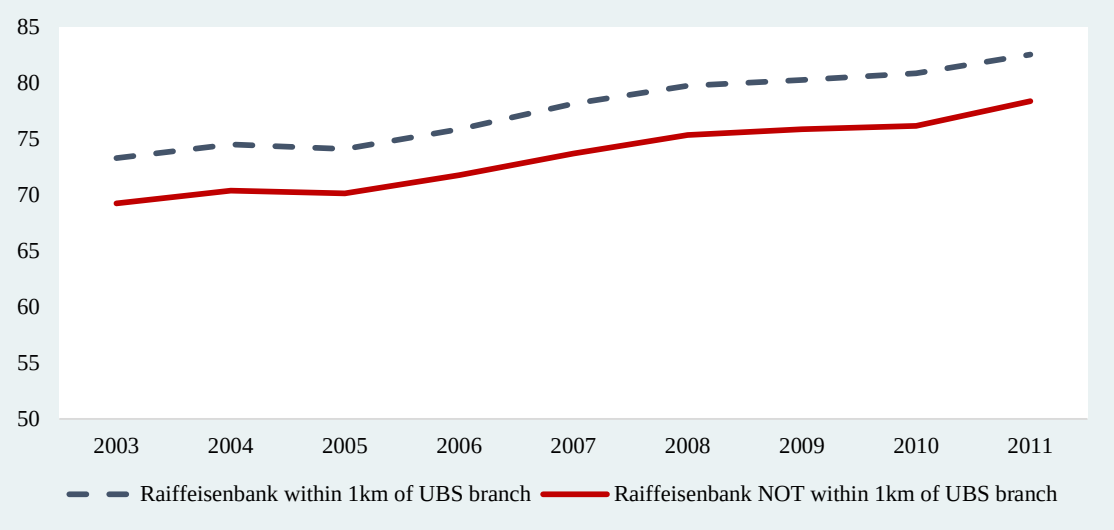

Notes: This figure depicts a map of Switzerland on which are placed the location of all Raiffeisenbank branches. Branches which are further than 1km from a UBS are denoted as red crosses. Branches of Raiffeisenbanks within 1km of a UBS are denoted as dark blue circles. Some branches are placed on top of each other in this representation, given placement at the zip-code level.

Figure 4: Employment in Switzerland pre 2007/08

Panel A: Share of population with full-time employment



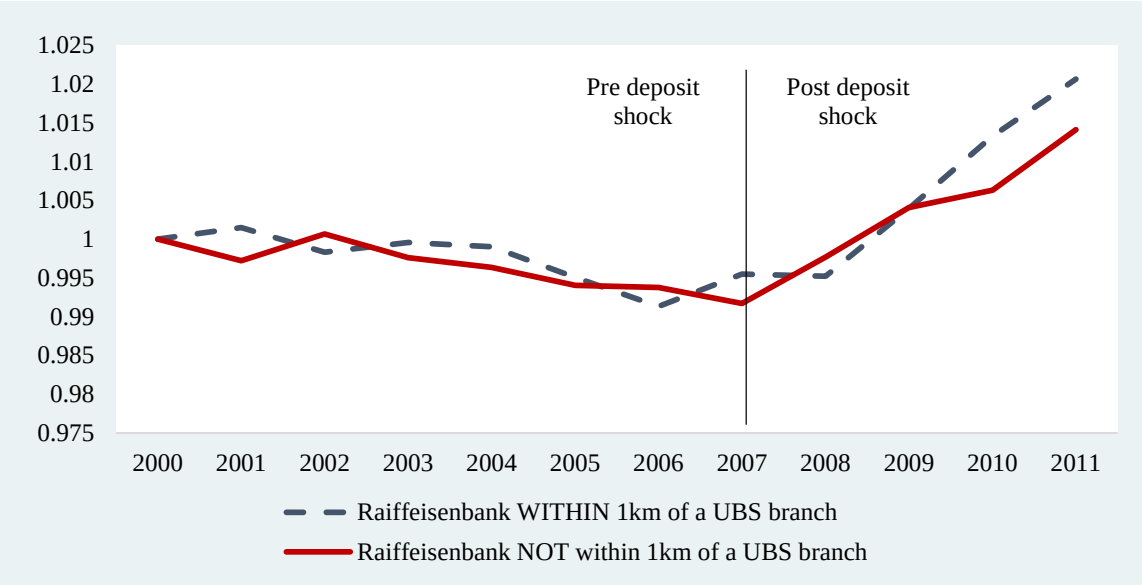

Panel B: Average income per person (non-retired only)



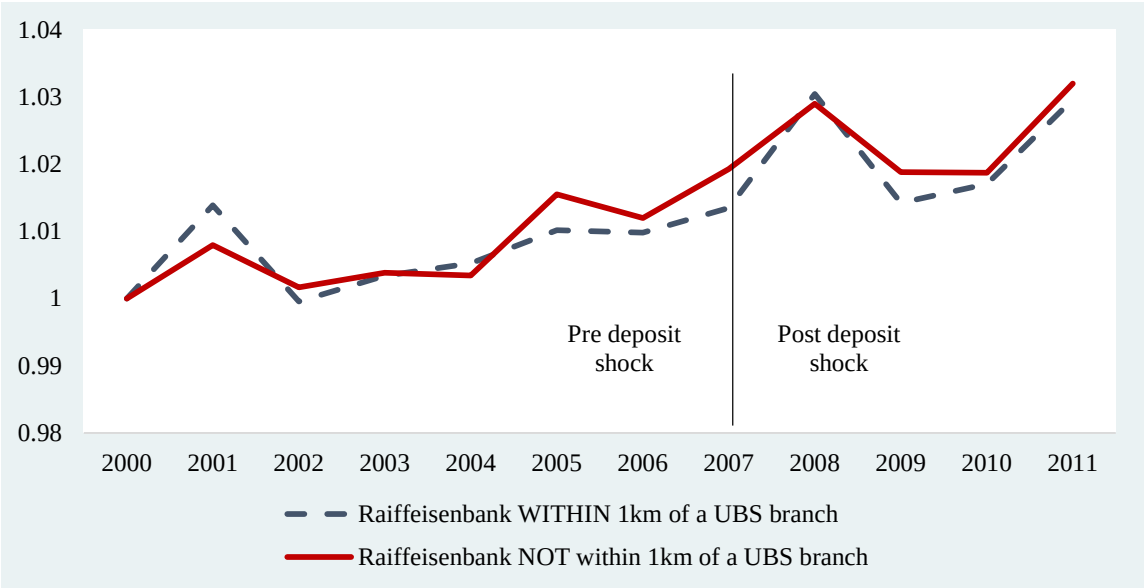

Notes: Panel A shows the share of the total population employed (=FTE per neighborhood / Total neighborhood population) averaged across all the neighborhoods with a Raiffeisenbank. The data is split according to whether a Raiffeisenbank has a branch close (within 1km) to a UBS or not. Panel B tracks the average wage per neighborhood of non-retired employed persons, averaged accross all neighborhoods with a Raiffeisenbank. The data is again split according to whether a Raiffeisenbank is close (within 1 km) to a UBS branch or not. 115 Raiffeisenbanks operate 310 branches in distinct neighborhoods within 1 km of a UBS branch in 2007 while 133 Raiffeisenbanks with branches in 360 distinct neighborhoods do not.

Figure 5: Employees in very small firms vs all other firms

Panel A: Employees in very small firms (indexed)




Panel B: Employees in firms of all other sizes (indexed)




Notes: Panel A of this figure shows the number of employees working in very small firms (less than 10 employees), averaged across all neighborhoods with a Raiffeisenbank and indexed to 2000. The data is split by whether the local Raiffeisenbank is close (within 1 km) to a UBS or not. Panel B makes use of information on the number of people working in firms of any other size (more than 10 employees), again split by whether the local Raiffeisenbank is close (within 1 km) to a UBS or not. Employment data by firm size is available for 630 neighborhoods that house a Raiffeisenbank.The deposit growth shock occurs during the fiscal year 2008. The data is split into pre- (2007 and before) and post-shock periods.

Table 1: Simplified balance sheet for the average Raiffeisenbank

| | Panel A: Banks in sample | | Panel B: All Raiffeisenbanks | |
|---|---|---|---|---|
| Balance sheet item | In million CHF | Share of total assets | In million CHF | Share of total assets |
| Deposits (including deposits by other banks) | 265 | 78% | 245 | 76% |
| Other liabilities (including covered bonds) | 65 | 19% | 64 | 20% |
| Equity | 10 | 3% | 13 | 4% |
| Total Liabilities | 341 | 100% | 324 | 100% |
| | | | | |
| Total mortgage lending | 283 | 83% | 267 | 82% |
| *of which fully residential mortgages* | *251* | *74%* | - | |
| *of which industrial and office mortgages* | *12* | *4%* | - | |
| Loans to other banks | 30 | 9% | 32 | 10% |
| Other commercial lending | 18 | 5% | 15 | 5% |
| Other assets (including liquid assets) | 9 | 3% | 9 | 3% |
| Total Assets | 341 | 100% | 324 | 100% |

Notes: Panel A shows a simplified balance sheet for the average (mean) Raiffeisenbank in my sample in 2007. It is therefore based on 248 banks. Panel B makes use of aggregate data from the SNB in 2007 to show an average Raiffeisenbank, independent of the sample in this paper. Panel B is based on aggregate data averaged accross all 360 banks operating in 2007.

Table 2: Summary statistics

| | Panel A: full sample | | | Panel B: UBS branch within 1km | | | |
|---|---|---|---|---|---|---|---|
| Variable | N | mean | sd | Yes | No | Δ | |
| Key Independent Variables | | | | | | | |
| Instrument: Distance to UBS (km) | 248 | 2.68 | 2.90 | | | | |
| Growth in deposits in 2008 | 248 | 0.11 | 0.07 | 0.16 | 0.08 | 0.08 | *** |
| Key Dependent Variables (Δ between 2007 and 2009) | | | | | | | |
| Mortgage loans | 248 | 0.17 | 0.09 | 0.20 | 0.14 | 0.06 | *** |
| Local house prices | 248 | 0.07 | 0.06 | 0.08 | 0.06 | 0.02 | *** |
| Dependent Variables - Lending (Δ between 2007 and 2009) | | | | | | | |
| Interbank loans | 248 | 0.23 | 0.36 | 0.35 | 0.14 | 0.21 | *** |
| Industrial or office Mortgages | 248 | 0.17 | 0.35 | 0.18 | 0.17 | 0.00 | |
| Other commercial lending | 248 | 0.18 | 0.40 | 0.19 | 0.18 | 0.00 | |
| Total liquid assets (cash) | 248 | 0.03 | 0.24 | 0.04 | 0.02 | 0.02 | |
| Dependent Variables - Credit and Liquidity Risk (Δ between 2007 and 2009) | | | | | | | |
| Loans covered w/mortgages | 248 | 0.16 | 0.09 | 0.20 | 0.14 | 0.06 | *** |
| Loans not covered by any collateral | 248 | -0.04 | 0.44 | -0.03 | -0.05 | 0.02 | |
| Assets at risk | 248 | -0.19 | 0.66 | -0.09 | -0.27 | 0.18 | ** |
| Losses | 248 | -0.16 | 0.56 | -0.16 | -0.16 | 0.00 | |
| Reserve ratio | 248 | 0.15 | 0.08 | 0.16 | 0.14 | 0.02 | ** |
| Bank and neighborhood characteristics | | | | | | | |
| Log total assets 2007 | 248 | 19.52 | 0.53 | 19.74 | 19.36 | 0.39 | *** |
| Log profit 2007 | 248 | 12.90 | 0.82 | 12.99 | 12.84 | 0.15 | |
| Efficiency in 2007 | 248 | 0.29 | 0.18 | 0.24 | 0.33 | -0.10 | *** |
| Inhabitants in neighborhood in 2008 | 248 | 7433 | 13297 | 9985 | 5561 | 4423 | *** |
| Share of foreign workers in 2008 | 248 | 0.18 | 0.09 | 0.20 | 0.16 | 0.05 | *** |
| Δ house prices 1992 to 2007 | 248 | 0.09 | 0.14 | 0.12 | 0.06 | 0.07 | *** |
| Δ wages 2003 to 2007 | 248 | 0.03 | 0.03 | 0.03 | 0.03 | 0.01 | |

Notes: This table shows summary statistics for key independent and dependent variables. Dependent variables are represented as growth rates between year end 2007 and 2009. Panel A shows overall sample characteristics. In Panel B, the data is split by whether a UBS branch is within 1 km or not of a Raiffeisenbank branch. Variable definitions can be found in the Appendix. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Table 3: Deposit growth in 2008

| | Ln(Deposit 2008) - Ln(Deposit 2007) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Log (Distance to UBS branch) | -0.0172*** | -0.0147*** | -0.0124*** | |
| | [0.002] | [0.003] | [0.003] | |
| UBS <250m | | | | 0.0624*** |
| | | | | [0.013] |
| UBS between 250 and 750 m | | | | 0.0403*** |
| | | | | [0.013] |
| UBS between 750m and 2.5 km | | | | 0.0155 |
| | | | | [0.012] |
| UBS between 2.5 and 5km | | | | -0.00304 |
| | | | | [0.012] |
| Bank Controls | No | Yes | Yes | Yes |
| neighborhood controls | No | No | Yes | Yes |
| N | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.111 | 0.55 | 0.190 | 0.566 |
| Estimation technique | OLS | OLS | OLS | OLS |
| rk LM statistic | 31.35 | 10.98 | 14.22 | 30.77 |
| F-statistic | 39.78 | 17.89 | 15.13 | 7.62 |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and distance to the nearest UBS-branch. Average deposit growth in 2008 is 11%. Column (1) uses distance as the only explanatory variable. Column (2) includes bank controls while column (3) includes bank and neighborhood controls. Column (4) makes use of distance expressed in categories and includes bank and neighborghood controls. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. I winsorize deposit growth at 2.5% to ensure my results are not driven by outliers. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Table 4: Deposit growth and the growth rate of key balance sheet items (2007 to 2009)

| | Δ Mortgages | Δ Interbank loans | Δ Industrial or office Mortgages | Δ Other commercial lending | Δ Liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Deposit growth in 2008 | 1.094*** | 2.182* | 1.362 | 1.242 | 1.105 |
| | [0.344] | [1.306] | [1.505] | [1.514] | [0.935] |
| Log of total assets 2007 | -0.0383* | 0.0935 | 0.0244 | -0.0473 | -0.0479 |
| | [0.021] | [0.082] | [0.099] | [0.116] | [0.069] |
| Log of profit 2007 | 0.0260 | -0.0599 | -0.0815 | 0.0311 | -0.0580 |
| | [0.017] | [0.073] | [0.090] | [0.104] | [0.060] |
| Efficiency 2007 | -0.0447 | -0.0454 | 0.205 | -0.157 | 0.0912 |
| | [0.058] | [0.259] | [0.277] | [0.331] | [0.220] |
| Constant | 0.475* | -0.790 | 0.548 | 0.577 | 1.361* |
| | [0.248] | [0.945] | [1.136] | [1.261] | [0.797] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.360 | 0.318 | -0.104 | -0.116 | -0.010 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between the growth rate of deposits at a Raiffeisenbank and the growth rate of key balance sheet variables that reflect lending behaviour (the table measures elasticities). I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch (column (3) from table 3). neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. All change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Table 5: Deposit growth and the growth rate of local residential house prices (2007 to 2009)

| Instrument: | Distance to UBS | | | No Instrument | | |
|---|---|---|---|---|---|---|
| Dependent variable: | Δ Apartment prices | Δ S.F. home prices | Placebo: Δ Rents | Δ Apartment prices | Δ S.F. home prices | Placebo: Δ Rents |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Deposit growth in 2008 | 0.675*** | 0.399* | 0.229 | 0.0663 | 0.0106 | 0.0539 |
| | [0.254] | [0.220] | [0.170] | [0.081] | [0.065] | [0.064] |
| Log of total assets 2007 | -0.000204 | -0.00148 | 0.00503 | 0.00146 | 0.000410 | 0.00607 |
| | [0.020] | [0.015] | [0.013] | [0.016] | [0.015] | [0.014] |
| Log of profit 2007 | -0.00973 | -0.00521 | -0.000243 | -0.00358 | -0.00250 | 0.00257 |
| | [0.017] | [0.012] | [0.011] | [0.013] | [0.013] | [0.013] |
| Efficiency 2007 | 0.0593 | 0.0498 | -0.0260 | -0.00516 | 0.0144 | -0.0493 |
| | [0.056] | [0.036] | [0.044] | [0.046] | [0.040] | [0.047] |
| Constant | 0.140 | 0.163 | -0.127 | 0.113 | 0.142 | -0.156 |
| | [0.227] | [0.166] | [0.144] | [0.212] | [0.180] | [0.163] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | -0.141 | 0.208 | 0.712 | 0.244 | 0.169 | 0.752 |
| Estimation technique | 2SLS | 2SLS | 2SLS | OLS | OLS | OLS |

Notes: This table shows the relationship between the growth rate of deposits at a Raiffeisenbank and the growth rate in house prices(the table measures elasticities). Columns (1) to (3) make use of distance to a UBS as an instrument, (4) to (6) make use of no instrument. Columns (1) & (4) focus on apartment prices. Columns (2) & (5) on single family homes and columns (3) & (6) on new rental rates. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Table 6: House prices around Raiffeisenbanks - DiD specification

| Dependent variable: | Log Price Apartments (1) | Log Price S.F. homes (2) | Placebo: Log Rents (3) |
|---|---|---|---|
| Affected neighborhood * After Shock (year = 2009) | 0.017*** | 0.011** | 0.004 |
| | [0.005] | [0.005] | [0.005] |
| After Shock (year = 2009) | 0.052*** | 0.051*** | 0.042*** |
| | [0.004] | [0.003] | [0.003] |
| Constant | 13.13*** | 13.45*** | 9.817*** |
| | [0.002] | [0.002] | [0.002] |
| neighborhood fixed effects | Yes | Yes | Yes |
| N | 2146 | 2146 | 2164 |
| R-Sq | 0.318 | 0.332 | 0.241 |
| Estimation technique | OLS | OLS | OLS |

Notes: This table shows a difference in difference analysis for changes in neighborhood-level house prices, based on whether a neighborhood is likely to suffer an increase in mortgage credit. The analysis focuses only on those neighborhoods with a Raiffeisenbank branch. I define "affected areas" as those in which a Raiffeisenbank, which has at least one branch close to a UBS, operates a branch. The "affected neighborhood" dummy is subsumed by the neighborhood fixed effect. There are 310 affected and 360 unaffected neighborhoods. The after shock dummy takes a value of 1 for the year 2009. Column (1) focuses on apartment prices (2) on the prices of single family homes (3) on new rental rates. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **;
$p<0.01$ ***

Table 7: Employment around Raiffeisenbanks - DiD specification

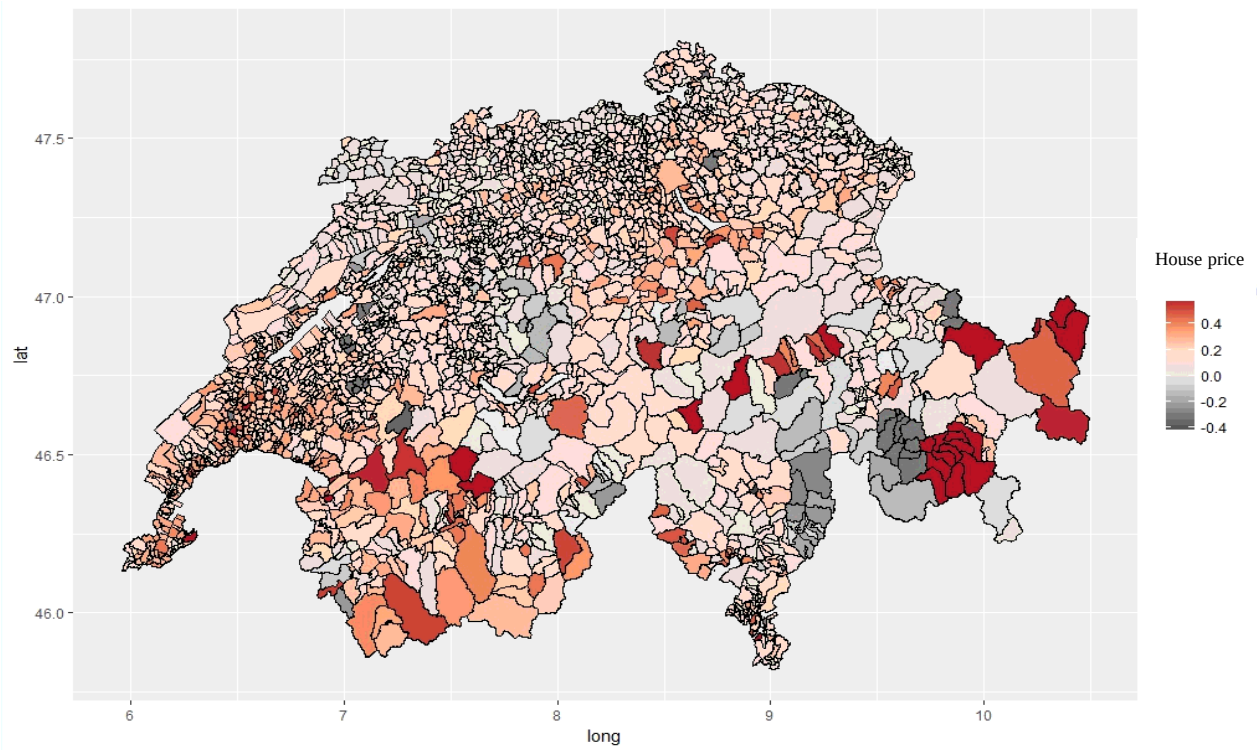
| Dependent variable: | Log employees small firms | Log employees all other firms | Log employees small firms | Log employees all other firms |
|---|---|---|---|---|
| | 2007 to 2009 | | 2007 to 2010 | |
| | (1) | (2) | (3) | (4) |
| Affected neighborhood * After Shock | 0.0104*** | 0.0112 | 0.0202*** | 0.0296 |
| | [0.00365] | [0.00998] | [0.00619] | [0.0274] |
| After Shock | 0.0371*** | 0.0328*** | 0.0692*** | 0.0213* |
| | [0.00249] | [0.00679] | [0.00421] | [0.0119] |
| Constant | 5.782*** | 5.976*** | 5.782*** | 5.982*** |
| | [0.00129] | [0.00352] | [0.00218] | [0.00615] |
| neighborhood fixed effects | Yes | Yes | Yes | Yes |
| N | 1260 | 1250 | 1260 | 1250 |
| Adj. R-Sq | -0.308 | -0.906 | -0.212 | -0.985 |
| Estimation technique | OLS | OLS | OLS | OLS |

Notes: This table shows a difference in difference analysis on changes in neighborhood-level employment. The analysis focuses only on those neighborhoods with a Raiffeisenbank branch. I define affected areas as those in which a Raiffeisenbank, which has at least one branch close to a UBS, operates a branch. The affected area dummy is subsumed by the neighborhood fixed effect. Columns (1) and (2) focus on the years 2007 and 2009, while columns (3) and (4) on 2007 and 2010. In columns (1) and (3) the dependent variable is employees in small firms (<10 employees). In columns (2) and (4) the dependent variable is employees in firms of all other sizes. Not all neighborhoods house employees in larger firms or report employee statistics, leading to a reduction in the number of observations. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Online Appendix for

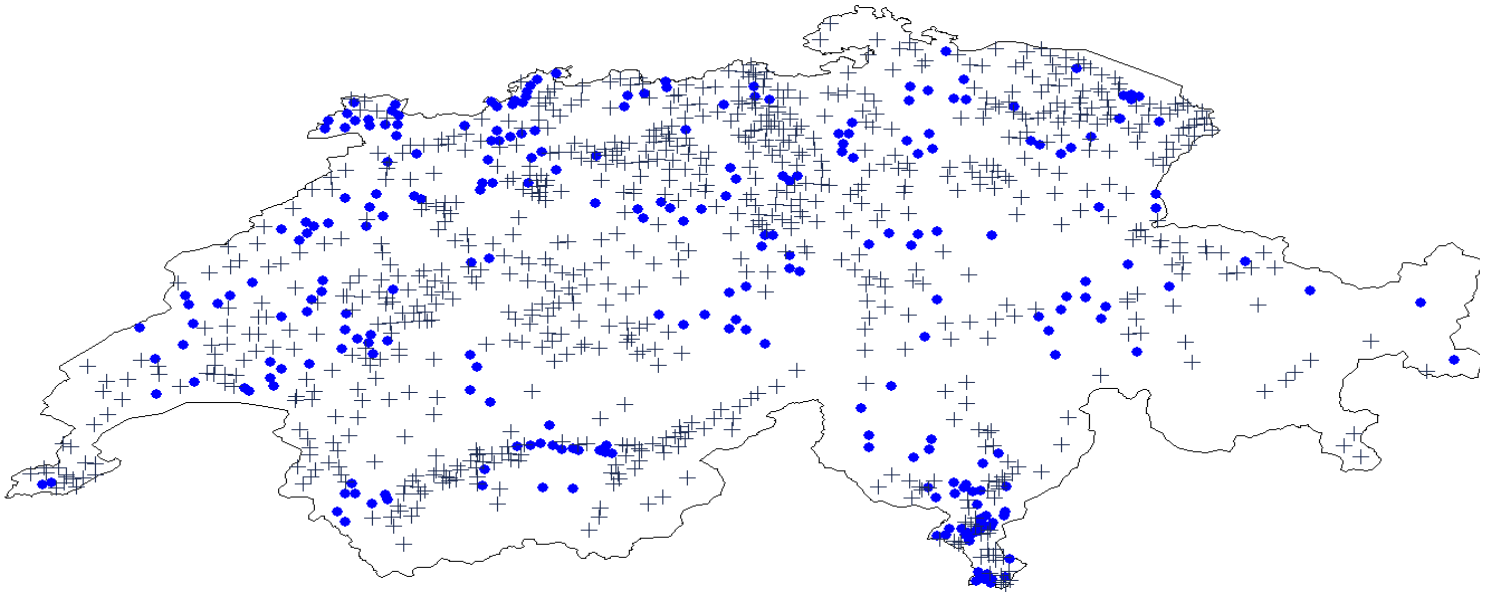
# Local Banks, Credit Supply and House Prices

Appendix Figure 1: House price growth in Switzerland



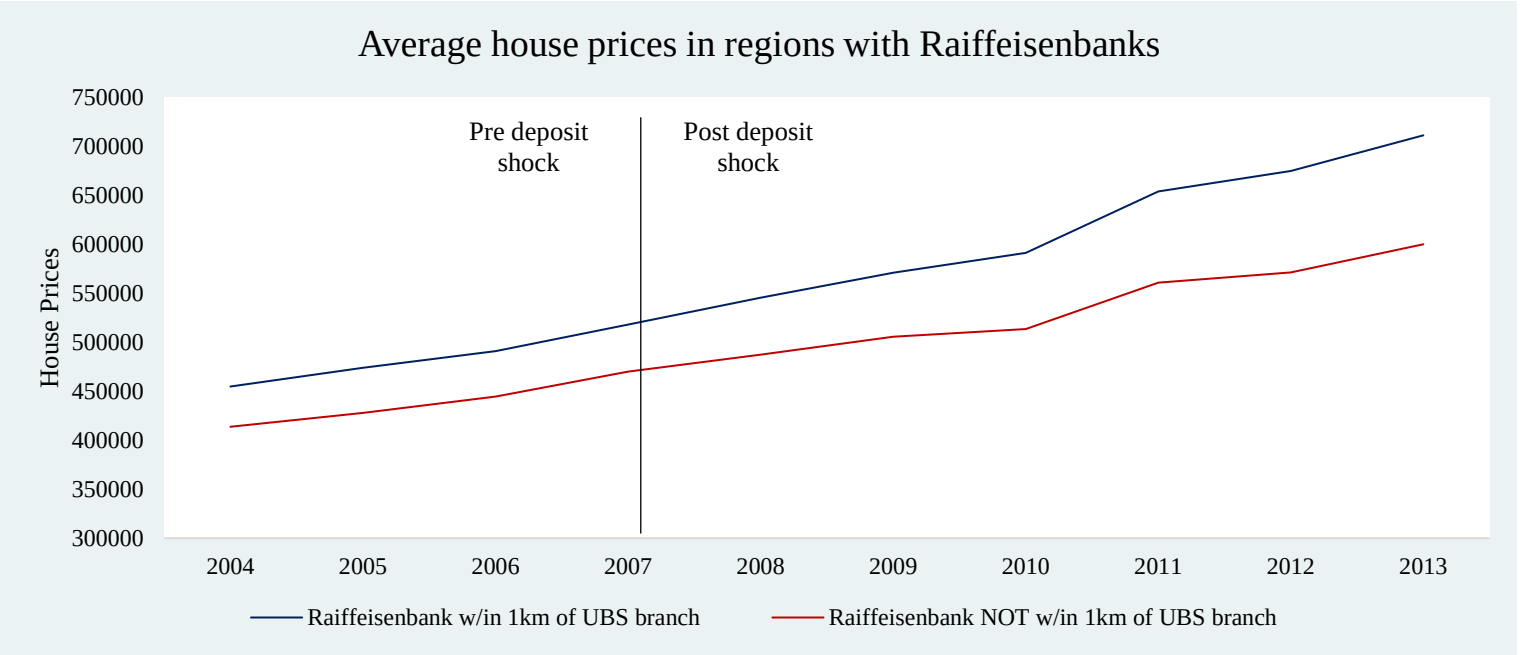

Notes: This figure depicts the average house price growth per neighborhood in Switzerland between 2007 and 2009. I cap maximum house price growth at 60%. Red areas represent municipalities with extreme price growth.

Appendix Figure 2: Location of Raiffeisenbanks that report vs. those that do not report data



Notes: This figure depicts a map of Switzerland on which are placed the Raiffeisenbank branches that report data in 2007 (grey crosses) vs those that existed then, but for which no data is available (blue dots). For simplicity, all address data is at the Zip-code level in this representation.

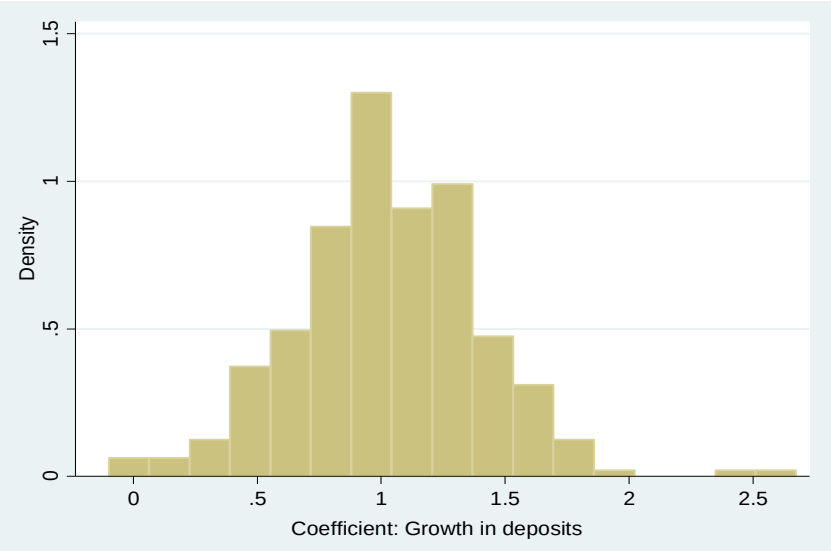
Appendix Figure 3: Average house prices in communities with Raiffeisenbanks



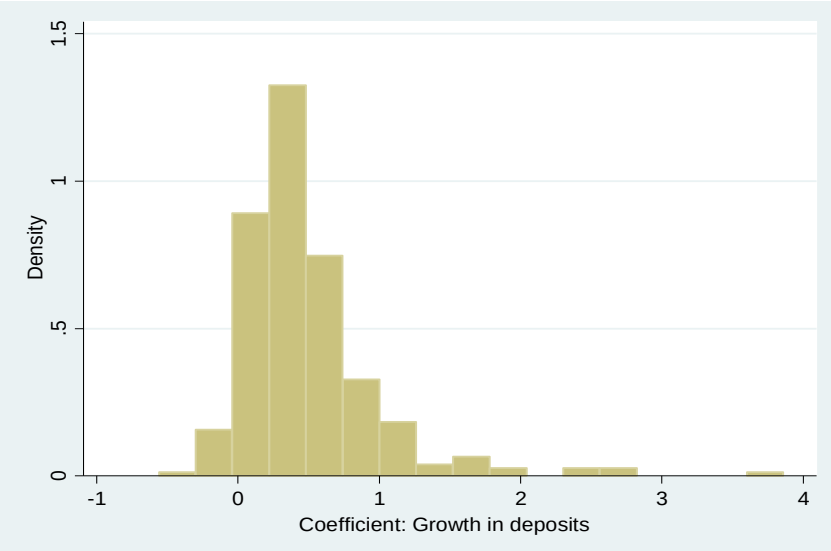

Notes: This figure depicts house prices for single family apartments in a given year for neighborhoods with a Raiffeisenbank (averaged across neighborhoods). I split the sample by whether a Raiffeisenbank in a given neighborhood maintains a branch within 1 km of a UBS branch or not. 115 Raiffeisenbanks operate 310 branches in distinct neighborhoods within 1 km of a UBS branch in 2007 while 133 Raiffeisenbanks with branches in 360 distinct neighborhoods do not.The deposit growth shock occurs during the fiscal year 2008. The data is split into pre- (2007 and before) and post-shock periods.

Appendix Figure 4: Distribution of bootstrapped coefficients

Panel A: Change in mortgage lending (07 to 09)



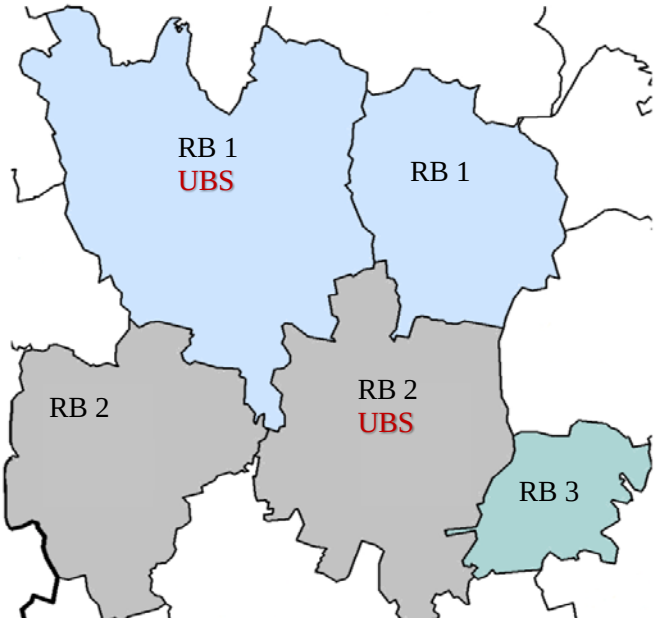

Panel B: Change in apartment prices (07 to 09)



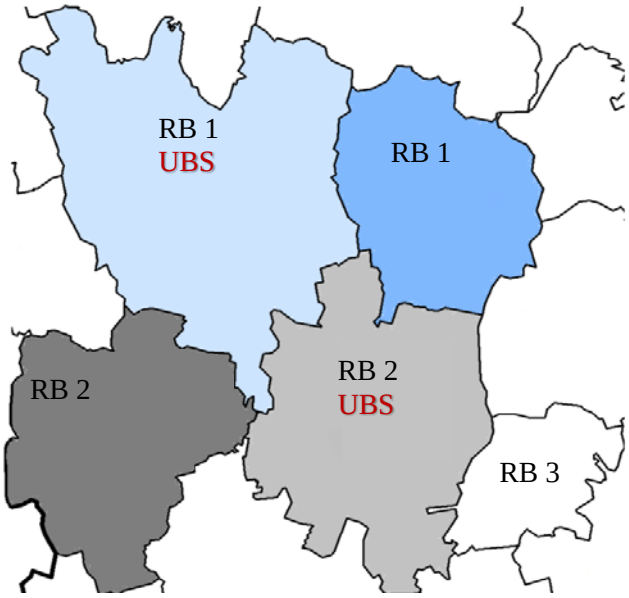

Notes: The graphs reflect the distribution of bootstrapped coefficients of the main regressions in tables 4 and 5. Both stages of the IV are bootstrapped at 250 repetitions.

Appendix Figure 5 - DiD branch level-test design

Panel A: Ordinay regression setup




Panel B: Robustness test




Notes: This image helps make the DiD branch test, described in the robustness section, clearer. Panel A shows the ordinary regression approach in the DiD setting. Regions that house a branch of a Raiffeisenbank (that is close to a UBS anywhere) are considered treated and compared with regions whose Raiffeisenbanks maintain no branches close to a UBS. Blue and grey regions are respectively averaged because they contain "affected" Raiffeisenbank branches and compared to green which contains unaffected Raiffeisenbank branches. The placebo test (Panel B) instead compares regions that house the same Raiffeisenbank. In essence comparing neighborhoods that house the "affected" branch with all other neighborhoods in which the affected Raiffeisenbanks operate (i.e., dark grey and dark blue compared to light grey and light blue).

Appendix 1: Summary statistics for Raiffeisenbanks (in millions of CHF in 2007)

| | Panel A: full sample | | | Panel B: UBS branch w/in 1 km | | | |
|---|---|---|---|---|---|---|---|
| Variable | N | mean | sd | No | Yes | Δ | |
| Key Dependent Variables | | | | | | | |
| Mortgage loans | 248 | 285.5 | 161.5 | 240.8 | 348.8 | -108.0 | *** |
| Dependent Variables (lending) | | | | | | | |
| Interbank loans | 248 | 30.5 | 21.7 | 24.0 | 39.6 | -15.6 | *** |
| Industrial or office Mortgages | 248 | 12.0 | 13.5 | 8.8 | 16.7 | -7.9 | *** |
| Other commercial lending | 248 | 6.1 | 7.9 | 4.2 | 8.9 | -4.7 | *** |
| Total liquid assets (cash) | 248 | 3.3 | 1.8 | 2.7 | 4.2 | -1.5 | *** |
| Dependent Variables (credit and liquidity risk) | | | | | | | |
| Loans covered w/mortgages | 248 | 289.3 | 161.2 | 245.4 | 352.1 | -106.8 | *** |
| Loans not covered by any collateral | 248 | 10.0 | 9.9 | 9.9 | 10.1 | -0.2 | |
| Assets at risk | 248 | 4.1 | 4.6 | 4.0 | 4.3 | -0.3 | |
| Reserves | 248 | 6.4 | 4.7 | 6.6 | 6.1 | 0.4 | |
| Bank and neighborhood characteristics | | | | | | | |
| Customer deposits in 2008 | 248 | 268.4 | 143.5 | 218.8 | 338.8 | -120.0 | |
| Total assets 2007 | 248 | 343.1 | 185.5 | 288.8 | 420.2 | -131.4 | *** |
| Log profit mio CHF 2007 | 248 | 0.5 | 0.5 | 0.5 | 0.6 | -0.1 | |
| Efficiency in 2007 | 248 | 0.3 | 0.2 | 0.3 | 0.2 | 0.1 | *** |
| Inhabitants in county in 2008 (abs) | 248 | 7568 | 13481 | 5622 | 10371 | -4749 | *** |
| Share of foreign workers in 2008 | 248 | 0.2 | 0.1 | 0.2 | 0.2 | 0.0 | *** |
| Δ house prices 1992 to 2007 | 248 | 1.1 | 0.1 | 1.1 | 1.1 | -0.1 | *** |

Notes: This table shows summary statistics for key control and dependent variables. Variables are expressed in mil. CHF unless otherwise indicated. Data is split by whether a UBS branch is within 1 km of a Raiffeisenbank branch. 115 Raiffeisenbanks operate a branch within 1km of a UBS while 133 do not. Variable definitions can be found in the Appendix. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 2: Variable definitions

| | |
|---|---|
| **Key Independent Variables** | |
| Instrument: Distance to UBS | The distance, in km, between a UBS branch and the closest branch of any given Raiffeisenbank |
| Growth in deposits in 2008 | The growth in deposits at a given Raiffeisenbank during the fiscal year 2008: ln(deposits year end 2007) - ln(deposits year end 2008) |
| **Key Dependent Variables (Δ between 2007 and 2009)** | |
| Mortgage loans | Change in all mortgage loans between 2007 and 2009 |
| Regional house prices | Change in prices of apartment based on transaction data gathered by FPRE |
| **Dependent Variables - Growth (Δ between 2007 and 2009)** | |
| Interbank loans | Change in loans to other banks (coordinated via HQ in St. Gallen) |
| Industrial or office Mortgages | Change in industrial or office mortgages (typically business lending is collateralized by industrial property) |
| Other commercial lending | Change in all loans classified as loans to business entities that are not also mortgage loans |
| Total liquid assets (cash) | Change in total liquid assets (predominantly cash and securities) |
| **Dependent Variables - Risk taking (Δ between 2007 and 2009)** | |
| Loans covered w/mortgages | Change in loans covered with mortgage collateral |
| Loans not covered by any collateral | Change in total loans not covered by collateral (most collateral is mortgage collateral; this represents LTV) |
| Assets at risk | Assets at risk denote assets whose full value has become unlikely to be realized: they are self reported by each Raiffeisenbank based on standardized metrics |
| Losses | Actual losses on assets (i.e. loans written off) |
| Reserve ratio | Change in the ratio of reserves to total assets (reserves defined by regulator in compliance with Basel II) |
| Repricing Gap | The assets repricing within a certain time horizon - liabilities repricing within that same time horizon |
| **Bank and neighborhood characteristics** | |
| Growth in deposits in 2008 | Change in deposits (total customer funds) between year end 2007 and 2008 |
| Log total assets 2007 | Natural log of total assets in 2007 |
| Log profit 2007 | Natural log of pre tax profits in 2008 |
| Efficiency in 2007 | Pre tax profits divided by total salary costs in 2007 |
| Inhabitants in county in 2008 | Total number of inhabitants registered in a county (roughly zip-code-level); provided by the bfs; averaged for all |
| Share of foreign workers in 2008 | Share of foreign workers, relative to domestic; provided by the bfs; averaged for all neighborhoods in which a |
| Δ house prices 1992 to 2007 | Long term change in the price of single family apartments (between 1991 and 2007) based on transaction data |
| Δ wages 2003 to 2007 | The change in wages over recent year to account for the fact that stronger wage growth can cause housing demand |
| MS region fixed effects | MS regions are areas that house a single unified labour market (so defined by the state). MS regions comprise several neighborhoods. Switzerland is comprised of 106 of these MSregions |

Appendix 3: Distance to UBS/CSand Deposit Growth in 2008

| | Ln(Deposit 2008) - Ln(Deposit 2007) | |
|---|---|---|
| | (1) | (2) |
| Distance to UBS branch in km | -0.00645*** | -0.00510*** |
| | [0.002] | [0.002] |
| Distance to CS branch in km | -0.00413*** | -0.00255* |
| | [0.001] | [0.001] |
| Log of total assets 2007 | | -0.0221 |
| | | [0.018] |
| Log of profit 2007 | | 0.0160 |
| | | [0.016] |
| Efficiency 2007 | | -0.100* |
| | | [0.053] |
| Δ house prices 1992 to 2007 | | 0.144*** |
| | | [0.041] |
| Constant | 0.145*** | 0.407* |
| | [0.007] | [0.225] |
| neighborhood Controls | No | Yes |
| N | 248 | 248 |
| R-Sq | 0.171 | 0.556 |
| Estimation technique | OLS | OLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and distance to the nearest UBS-branch and Credit Suisse (CS)-branch in km. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. I winsorize deposit growth at 2.5% to ensure my results are not driven by outliers. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 4: Deposit growth on growth rate of balance sheet items (2007 to 2009) - no instrumentation

| | Δ Mortgages | Δ Interbank loans | Δ Industrial or office Mortgages | Δ Other commercial lending | Δ Liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Deposit growth in 2008 | 0.735*** | 1.459*** | 0.514 | 0.620 | 0.773* |
| | [0.118] | [0.419] | [0.537] | [0.557] | [0.433] |
| Log of total assets 2007 | -0.0352 | 0.0995 | 0.0254 | -0.0467 | -0.0446 |
| | [0.026] | [0.102] | [0.123] | [0.147] | [0.088] |
| Log of profit 2007 | 0.0275 | -0.0569 | -0.0727 | 0.0363 | -0.0564 |
| | [0.019] | [0.091] | [0.111] | [0.130] | [0.074] |
| Efficiency 2007 | -0.0744 | -0.103 | 0.123 | -0.206 | 0.0600 |
| | [0.065] | [0.288] | [0.318] | [0.386] | [0.254] |
| Constant | 0.440 | -0.860 | 0.531 | 0.566 | 1.324 |
| | [0.300] | [1.166] | [1.431] | [1.600] | [1.011] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.398 | 0.327 | -0.088 | -0.111 | -0.003 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that reflect lending behaviour. I control for a variety of bank-specific characteristics. I do not instrument deposit growth. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. All change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. p<0.10 *; p<0.05 **;
p<0.01 ***

Appendix 5: Deposit growth on growth rate of balance sheet items reflecting credit risk (2007 to 2009)

| | Δ Loans covered w/mortgages | Δ Loans not covered by collateral | Δ Assets at risk | Δ Loans written off as losses |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Log deposit growth in 2008 | 1.101** | 1.74 | 0.907 | -1.312 |
| | [0.452] | [1.553] | [4.044] | [1.929] |
| Log of total assets 2007 | -0.0460** | 0.106 | 0.0772 | 0.00111 |
| | [0.021] | [0.113] | [0.233] | [0.120] |
| Log of profit 2007 | 0.0307* | -0.198* | -0.0653 | 0.0528 |
| | [0.018] | [0.103] | [0.203] | [0.106] |
| Efficiency 2007 | -0.0602 | 0.471 | -0.274 | -0.228 |
| | [0.065] | [0.349] | [0.783] | [0.399] |
| Constant | 0.568** | 0.3 | -0.922 | -0.69 |
| | [0.252] | [1.279] | [2.554] | [1.324] |
| neighborhood Controls | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.406 | 0.166 | -0.099 | 0.302 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that relate to credit risk. I control for a variety of bank-specific characteristics. I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch. All change variables are winsorized at the 2.5% level. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 6: Deposit growth on changes in balance sheet items reflecting interest and liquidity risk (2007 to 2009)

| | | Dependent variable: Δ repricing gap (assets - liabilities) due: | | |
|---|---|---|---|---|
| | Δ Reserve ratio | After 5 years | Between 1 and 5 years | In less than 12 months |
| | (1) | (2) | (3) | (4) |
| Log deposit growth in 2008 | 0.944** | 3.095 | -12.75 | 29.1 |
| | [0.368] | [11.06] | [14.07] | [31.22] |
| Log of total assets 2007 | -0.0671*** | 0.0718 | -0.224 | -3.549* |
| | [0.018] | [0.819] | [1.147] | [2.152] |
| Log of profit 2007 | 0.0623*** | -0.745 | -0.905 | 4.185** |
| | [0.016] | [0.742] | [1.066] | [1.643] |
| Efficiency 2007 | 0.0123 | 3.489 | -0.328 | -11.77* |
| | [0.059] | [2.774] | [3.351] | [6.555] |
| Constant | 0.532** | 6.552 | 20.39* | 19.87 |
| | [0.207] | [9.451] | [12.39] | [28.04] |
| neighborhood Controls | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.406 | 0.166 | -0.099 | 0.302 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that relate to liquidity (reserve ratio in column (1)) or interest rate risk (columns (2) to (4)). I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch. All change variables are winsorized at the 2.5% level. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 7: Deposit growth on changes in profitability 2007 to 2009

| | Gross Interest Earnings to total assets | Net Interest Earnings to total assets |
|---|---|---|
| | (1) | (2) |
| Deposit growth in 2008 | -0.339** | -0.723*** |
| | [0.137] | [0.259] |
| Log of total assets 2007 | 0.0291*** | 0.0167 |
| | [0.011] | [0.021] |
| Log of profit 2007 | -0.0167 | 0.00786 |
| | [0.010] | [0.019] |
| Efficiency 2007 | 0.0603 | 0.0181 |
| | [0.037] | [0.069] |
| Constant | -0.438*** | -0.508** |
| | [0.131] | [0.246] |
| neighborhood Controls | Yes | Yes |
| N | 248 | 248 |
| Adj. R-Sq | 0.131 | 0.043 |
| Estimation technique | 2SLS | 2SLS |
| Mean income/assets in 2007 | 3% | 2% |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in Raiffeisen profitability. Profitability is measured as gross interest income relative to total assets in column (1) or interest income net of interest expenses relative to total assets in column (2). Aggregate interest rates drop 0.25% on average for mortgages accross Switzerland during this time. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Change variables are not winsorized. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 8: Deposit growth placebo tests

| | Deposit Growth in 2008 | Deposit Growth in 2012 |
|---|---|---|
| | (1) | (2) |
| Distance to Post Finance | -0.00229 | |
| | [0.00141] | |
| Distance to Kantonalbank | -0.00567 | |
| | [0.00348] | |
| Distance to UBS | | -0.000962 |
| | | [0.000914] |
| Constant | 0.0441 | 0.124 |
| | [0.215] | [0.115] |
| neighborhood Controls | Yes | Yes |
| Bank Controls | Yes | Yes |
| N | 248 | 248 |
| Adj. R-Sq | 0.532 | 0.022 |
| Estimation technique | OLS | OLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and distance to the nearest Post Finance and Kantonalbank-branch in column (1). Column (2) relates deposit growth at a Raiffeisenbank to distance to a UBS in 2012. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and county/labour market fixed effects. I winsorize deposit growth at 2.5% to ensure my results are not driven by outliers. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 9: Deposit growth on growth rate of mortgage lending and prices 2007 to 2009

| | Lending | Prices | |
|---|---|---|---|
| | Δ Mortgages | Δ Apartment prices | Δ Single Family home prices |
| | (1) | (2) | (2) |
| Deposit growth in 2008 | 1.410*** | 1.027*** | 0.506* |
| | [0.545] | [0.367] | [0.303] |
| Log of total assets 2007 | -0.0411* | -0.00334 | -0.00243 |
| | [0.024] | [0.025] | [0.015] |
| Log of profit 2007 | 0.0246 | -0.0113 | -0.00568 |
| | [0.020] | [0.021] | [0.013] |
| Efficiency 2007 | -0.0180 | 0.0890 | 0.0589 |
| | [0.072] | [0.066] | [0.042] |
| Constant | 0.508* | 0.176 | 0.174 |
| | [0.274] | [0.280] | [0.179] |
| neighborhood Controls | Yes | Yes | Yes |
| N | 241 | 241 | 241 |
| Adj. R-Sq | 0.261 | 0.129 | 0.129 |
| Estimation technique | 2SLS | 2SLS | 2SLS |
| F statistic first stage | 10.6 | 10.6 | 10.6 |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in Raiffeisen mortgage lending as well as local house prices. Deposit growth is instrumented with the time, in seconds, required to walk from the nearest UBS branch to the Raiffeisenbank. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 10: Deposit growth on growth rate of key balance sheet items 2007 to 2009
- only Raiffeisenbanks in ZIP-code with UBS

| | Δ Mortgages | Δ Interbank loans | Δ Industrial or office Mortgages | Δ Other commercial lending | Δ Liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Log deposit growth in 2008 | 0.804* | 6.213*** | 1.115 | 0.347 | -0.695 |
| | [0.465] | [2.165] | [1.710] | [1.594] | [0.958] |
| Log of total assets 2007 | -0.0733* | 0.0981 | 0.691*** | 0.687*** | 0.126 |
| | [0.044] | [0.176] | [0.118] | [0.110] | [0.088] |
| Log of profit 2007 | 0.0568** | -0.100 | -0.707*** | -0.741*** | -0.204*** |
| | [0.026] | [0.160] | [0.103] | [0.096] | [0.073] |
| Efficiency 2007 | -0.155 | 0.529 | 2.670*** | 2.327*** | 0.424 |
| | [0.132] | [0.683] | [0.464] | [0.433] | [0.314] |
| Constant | 0.796 | -0.959 | -4.952*** | -4.493*** | 0.0186 |
| | [0.645] | [2.134] | [1.424] | [1.328] | [1.082] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes |
| N | 89 | 89 | 89 | 89 | 89 |
| Adj. R-Sq | 0.428 | -0.170 | 0.302 | 0.555 | 0.299 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables. I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch in tranches. The regression includes only Raiffeisenbanks that operate in the same ZIP code (the narrowest geographic region in Switzerland) as UBS bank branches. All change variables are winsorized at the 2.5% level. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 11: Deposit growth and the growth rate of real estate - only Raiffeisenbanks in ZIP-code with UBS

| Instrument: | Distance to UBS | | |
|---|---|---|---|
| Dependent variable: | Δ Apartment prices | Δ S.F. home prices | Placebo: Δ Rents |
| | (1) | (2) | (3) |
| Deposit growth in 2008 | 0.762 | 0.456* | 0.498 |
| | [0.711] | [0.271] | [0.336] |
| Log of total assets 2007 | 0.0195 | -0.0825*** | -0.0107 |
| | [0.0361] | [0.0231] | [0.0237] |
| Log of profit 2007 | -0.0216 | 0.0579** | 0.0300 |
| | [0.0348] | [0.0244] | [0.0184] |
| Efficiency 2007 | -0.0554 | -0.136 | -0.0892 |
| | [0.147] | [0.127] | [0.0901] |
| Constant | 0.0273 | 1.010*** | -0.0796 |
| | [0.434] | [0.269] | [0.389] |
| neighborhood Controls | Yes | Yes | Yes |
| N | 89 | 89 | 89 |
| Adj. R-Sq | -0.337 | 0.393 | 0.363 |
| Estimation technique | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between the growth rate of deposits at a Raiffeisenbank and the growth rate in house prices in the subsequent years (the table measures elasticities). I make use of distance to UBS as an instriument. Column (1) shows apartment prices, column (2) single family home prices and columns (3) new rental rates. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. p<0.10 *; p<0.05 **; p<0.01 ***

Appendix 12: Deposit growth on growth rate of key balance sheet items 2007 to 2009 - stepwise instrument

| | Δ Mortgages | Δ Interbank loans | Δ Industrial or office Mortgages | Δ Other commercial lending | Δ Liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Deposit growth in 2008 | 0.748*** | 2.336** | -1.405 | -1.501 | 0.599 |
| | [0.215] | [1.042] | [1.263] | [1.427] | [0.710] |
| Log of total assets 2007 | -0.0352* | 0.0921 | 0.0276 | -0.0441 | -0.0434 |
| | [0.020] | [0.083] | [0.104] | [0.126] | [0.070] |
| Log of profit 2007 | 0.0275* | -0.0606 | -0.0528 | 0.0596 | -0.0558 |
| | [0.016] | [0.073] | [0.092] | [0.112] | [0.060] |
| Efficiency 2007 | -0.0740 | -0.0323 | -0.0632 | -0.423 | 0.0484 |
| | [0.052] | [0.244] | [0.277] | [0.356] | [0.216] |
| Constant | 0.440* | -0.775 | 0.491 | 0.520 | 1.310 |
| | [0.238] | [0.945] | [1.230] | [1.399] | [0.805] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.398 | 0.313 | -0.169 | -0.195 | -0.004 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that relate to lending behaviour. I instrument deposit growth at Raiffeisenbanks using distance to a UBS in tranches (column (4) of table 3). neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. All change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are heteroskedasticity robust and displayed in parentheses. p<0.10 *; p<0.05 **; p<0.01 ***

Appendix 13: Deposit growth on growth rate of key balance sheet items 2007 to 2009 - no winsorizing

| | Mortgages | Interbank loans | Industrial or office Mortgages | Other commercial lending | Total liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Deposit growth in 2008 | 1.351*** | 3.215** | 1.561 | 2.679 | 0.612 |
| | [0.388] | [1.458] | [1.670] | [2.174] | [1.091] |
| Log of total assets 2007 | -0.0638** | 0.122 | 0.0226 | 0.0129 | -0.00960 |
| | [0.025] | [0.095] | [0.112] | [0.146] | [0.071] |
| Log of profit 2007 | 0.0491** | -0.0900 | -0.0723 | -0.0533 | -0.0738 |
| | [0.022] | [0.084] | [0.102] | [0.132] | [0.063] |
| Efficiency 2007 | -0.103 | 0.0471 | 0.185 | 0.124 | 0.0787 |
| | [0.084] | [0.315] | [0.380] | [0.495] | [0.235] |
| Δ house prices 1992 to 2007 | 0.0955 | 0.0295 | 0.0674 | -0.477 | -0.0203 |
| | [0.075] | [0.284] | [0.325] | [0.424] | [0.212] |
| Constant | 0.693** | -1.140 | 0.448 | 0.194 | 0.881 |
| | [0.297] | [1.118] | [1.320] | [1.718] | [0.836] |
| MS fixed effects | Yes | Yes | Yes | Yes | Yes |
| Ø county population density | Yes | Yes | Yes | Yes | Yes |
| Ø county foreigner share | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.318 | 0.287 | -0.101 | -0.100 | -0.016 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that relate to lending behaviour. I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch and replicate table 3, above. Change variables are NOT winsorized. Variable definitions can be found in the online Appendix. Standard errors are in parentheses. p<0.10 *; p<0.05 **; p<0.01 ***

Appendix 14: Instrumented deposit growth on growth rate of local residential house prices (2007 to 2009)

| Instrument: | Distance to UBS in km | | Distance to UBS in km | |
|---|---|---|---|---|
| Dependent variable: | Apartments (low) | S.F. homes (low) | Apartments (high) | S.F. homes (high) |
| | (1) | (2) | (3) | (4) |
| Log deposit growth in 2008 | 0.612** | 0.445* | 0.603** | 0.433* |
| | [0.251] | [0.238] | [0.255] | [0.236] |
| Log of total assets 2007 | 0.00183 | 0.00273 | 0.0104 | 0.00517 |
| | [0.016] | [0.015] | [0.016] | [0.015] |
| Log of profit 2007 | -0.0102 | -0.00957 | -0.0155 | -0.0103 |
| | [0.014] | [0.013] | [0.015] | [0.013] |
| Efficiency 2007 | 0.0618 | 0.0707 | 0.0651 | 0.0665 |
| | [0.053] | [0.051] | [0.056] | [0.051] |
| Constant | 0.150 | 0.120 | 0.00475 | 0.0146 |
| | [0.185] | [0.176] | [0.188] | [0.173] |
| neighborhood Controls | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 |
| Adj. R-Sq | -0.071 | 0.167 | -0.034 | 0.169 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in house prices. Columns (1) and (2) look at the low-priced segment per neighborhood. Columns (3) to (4), make use of high-priced homes per neighborhood. neighborhood controls include the share of the population that are not swiss per neighborhood, population densities per neighborhood, change in house prices since 1992, change in wages since 2003 and MS/labour market fixed effects. Standard errors are in parentheses. p<0.10 *; p<0.05 **; p<0.01 ***

Appendix 15: Instrumented deposit growth on growth rate of key balance sheet items (2007 to 2012)

| | Δ Mortgages | Δ Interbank loans | Δ Industrial or office Mortgages | Δ Other commercial lending | Δ Liquid assets |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Log deposit growth in 2008 | 2.274*** | 2.087 | -0.509 | -0.271 | 0.742 |
| | [0.459] | [1.225] | [1.709] | [2.353] | [0.994] |
| Log of total assets 2007 | -0.0527 | 0.0561 | 0.0993 | 0.00616 | -0.0384 |
| | [0.037] | [0.099] | [0.139] | [0.191] | [0.080] |
| Log of profit 2007 | 0.0234 | 0.0451 | -0.152 | -0.0781 | -0.0590 |
| | [0.033] | [0.087] | [0.122] | [0.168] | [0.070] |
| Efficiency 2007 | -0.0380 | -0.247 | 0.323 | 0.0965 | -0.122 |
| | [0.118] | [0.315] | [0.446] | [0.614] | [0.255] |
| Constant | 0.882** | -1.612 | 0.410 | 1.628 | 1.470 |
| | [0.443] | [1.180] | [1.667] | [2.295] | [0.958] |
| neighborhood Controls | Yes | Yes | Yes | Yes | Yes |
| N | 248 | 248 | 248 | 248 | 248 |
| Adj. R-Sq | 0.287 | 0.142 | 0.011 | -0.059 | 0.028 |
| Estimation technique | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |

Notes: This table shows the relationship between deposit growth at a Raiffeisenbank and changes in key balance sheet variables that reflect lending behaviour. I instrument deposit growth at Raiffeisenbanks using distance to a UBS branch. I replicate Table 3 above but make use of a longer time horizon for dependent variables. All change variables are winsorized at the 2.5% level. Variable definitions can be found in the online Appendix. Standard errors are in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***

Appendix 16: House prices around Raiffeisenbanks - DiD specification

| Dependent variable: | Log Price Apartments | Log Price S.F. homes | Placebo Log Rents |
|---|---|---|---|
| | (1) | (2) | (3) |
| Close branch * After Shock (year = 2009) | 0.0151* | 0.0108 | -0.00110 |
| | [0.00857] | [0.00736] | [0.00706] |
| After Shock (year = 2009) | 0.0634*** | 0.0582*** | 0.0459*** |
| | [0.00501] | [0.00431] | [0.00412] |
| Constant | 13.17*** | 13.50*** | 9.846*** |
| | [0.00287] | [0.00247] | [0.00237] |
| Zip-code fixed effects | Yes | Yes | Yes |
| N | 982 | 982 | 986 |
| R-Sq | 0.370 | 0.393 | 0.273 |
| Estimation technique | OLS | OLS | OLS |

Notes: This table shows a difference in difference analysis on changes in zip-code-level house prices. The analysis focuses only on those Zip-codes with a "treated/affected" Raiffeisenbank branch. I differentiate between "close" branches (within 1km of a UBS) and not close branches of the same "treated" Raiffeisenbank. The "close branch" dummy is subsumed by the Zip-code fixed effect. The after shock dummy takes a value of 1 for the year 2009. Standard errors are heteroskedasticity robust and displayed in parentheses. $p<0.10$ *; $p<0.05$ **; $p<0.01$ ***