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Maciej Albinowski

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Maciej Albinowski*

Abstract

I use panel data on 20 countries to analyze the links between savings (defined as time deposits and savings accounts) and credit extended by banks. Credit growth is not related to prior changes in savings, at least not in the short run. This result indicates that the intuition behind the loanable funds theory does not work well in explaining macroeconomic dynamics. I also find that the share of savings in total deposits is positively affected by cyclical upswings in the GDP, which is consistent with the permanent income hypothesis. Most interestingly, however, the share of savings decreases during credit booms. The existence of such an effect is predicted by the Austrian theory of the business cycle. Based on the above results, I infer that an important disadvantage of fractional-reserve banking is a tendency for the market interest rate to diverge from the natural interest rate. In this paper I also propose a new method of credit boom identification that captures the timing of booms more adequately than the procedures commonly used in the literature.

JEL: E51, E32, E41

Keywords: loanable funds, deposits, credit booms, fractional-reserve banking

I. Introduction

The recent financial crisis has given rise to research on the characteristics of financial cycles. One strand of this literature analyzes the evolution of banks' liabilities during credit booms. Considerable attention is paid to the role of so-called non-core liabilities (e.g. Hahm et al. 2013, IMF 2013) and to the overall leverage of the banking sector (Damar et al. 2013, Dewally and Shao 2013). However, the issue that remains largely overlooked is the changes in the structure of core liabilities. The deposits of non-financial agents are usually perceived as homogeneous positions, irrespective of the fact that they comprise funds deposited in banks for two different economic motives: facilitating transactions and saving.

* Warsaw School of Economics, E-mail: maciej.albinowski@doktorant.sgh.waw.pl

The neglect of this issue may be explained by some practical considerations. Under the fractional-reserve banking system, supported by public deposit insurance, overnight retail deposits are almost as stable a source of funding for banks as time deposits. Moreover, in the real world, there is no clear-cut distinction between deposits that are held due to the transaction motive and those that satisfy the precautionary motive. Although agents usually have the liquidity necessary for upcoming transactions on current accounts, some of their purchases may be financed with less liquid deposits, which pay a higher interest rate, or with credit cards. Conversely, some savings may be placed on current accounts due to high liquidity preferences or low opportunity costs.

However, despite these ambiguities, an analysis of the dynamics of the deposit structure may shed light on some interesting macroeconomic issues. In particular, it may help to assess the impact of fractional-reserve banking on deviations of the market interest rate from the natural level. Instead of directly estimating an unobservable natural interest rate, it is possible to examine the relationship between savings deposited in banks and credit extended by banks. Specifically, I will answer two questions empirically.

First, is credit growth influenced by the availability of savings? On the one hand, there is a popular notion, derived from the loanable funds theory, that investment is constrained by the amount of savings or at least related to it. Therefore, incentivizing saving is often considered as a way to improve the funding availability for borrowers. On the other hand, it is recognized that technically the banking sector can expand its asset side with no prior increase in domestic or foreign savings. If the latter pattern typically occurred in the real world, the link between the natural and the market interest rates would be weak.

Second, are credit booms associated with a smaller share of genuine savings in banks' liabilities? Credit booms themselves pose many risks to the sustainability and healthiness of economic growth. Some risks, however, might be magnified if savings increase at a slower pace than credit. Low savings levels would exert upward pressure on the natural interest rate, while banks might continue to lend money on good terms. Such a scenario is certainly possible under fractional-reserve banking. The potential overheating of the economy may be illustrated by considering the impact on the aggregate domestic demand. If the structure of deposits remains constant, it may be expected that an increase in residents' spending will be proportional to an increase in the money supply (assuming no changes in the velocity of broad money). It is also possible that the effects of credit expansion on the economic activity may be mitigated if agents decide to save additional income to smooth their lifetime consumption. On the contrary, if newly created money continues to finance depositors' expenditures, the growth rate of the domestic demand may exceed the growth rate of the total deposits.

In the context of the questions formulated above, it is important to distinguish between different notions of saving and savings. In the empirical analyses, the national accounts concept of *ex-post* saving is most often used. Its main advantage is easy availability of data. However, it is not a measure of voluntary saving, nor does it correspond to the loanable funds that might be transferred to entrepreneurs to be invested. According to the national accounts definition, saving is basically an income that is not consumed during the relevant reporting period. For example, if an employee receives a wage on December 31, he will probably "save" it until the next year. Likewise, profits made by corporations are classified as saving until they are paid out as dividends. Furthermore, the distinction between households' saving and corporate saving is quite artificial, because part of the latter is included in the wealth of domestic households.

Intentions regarding deferred consumption are captured by the concept of *ex-ante* saving, introduced by Myrdal (1939). It denotes planned saving out of planned income in a given period of time. Such defined saving has an impact on the natural interest rate, because it represents households' propensity to save. It also influences the market for loanable funds, as savings are supposed to be supplied throughout a period. However, ex-ante saving is not an observable variable.

Robertson (1940) defines saving as a portion of disposable income that is not consumed. Importantly, the income comes from production on the previous "day" and is available from the beginning of the "day" under consideration. This interpretation of saving may be operationalized by analyzing the changes in the household's stock of assets. If the real value of assets at the end of the day is higher than yesterday's value, it is evidence of positive net saving.[1] In the real world, however, an increase in the stock of assets in a given period may be related to both the income from the previous date and that from the current period. Thus, an increase in the assets may represent deferred consumption as well as a higher disposable income, which is intended to be consumed. To focus on the former, one may exclude

[1] Assuming that there are no changes in asset prices during a day and that capital income is paid analogously to wages at the beginning of the next day.

transaction deposits and analyze only those assets that are typically considered as saving instruments.

In this paper I follow Robertson's interpretation of saving and narrow down the analysis to funds deposited in banks. Deposits may be analyzed together with credit extended by banks as their natural counterpart. That is, savings deposited in banks are supposed to be converted into investment due to the credit activity of banks. Furthermore, banks play a special role in the transmission of saving into investment. In principle, they are the only private institutions that can finance a larger amount of credit than the sum of the savings accumulated in their liabilities.

This paper supplements the existing research on credit booms by analyzing the dynamics of core deposits. To the best of my knowledge, this is the first attempt to characterize this dimension of credit booms empirically. The analysis is conducted on an unbalanced panel data set of 20 countries with the time dimension covering the 1961–2015 period. The database merges the Bank for International Settlements data on credit to the private non-financial sector with data on deposits obtained from central banks. An appropriate effort has been made to clear the data set of the noise related to breaks in series or to exchange rate fluctuations. My contribution to the literature also includes the implementation of a new procedure for credit boom identification. It performs better in indicating the timing of booms than the existing methods, which are based on analyses of the deviation of a credit variable from its trend.

The rest of the paper is structured as follows. Section two briefly reviews the related theoretical and empirical literature. Section three presents the estimation strategy, and section four discusses the methodology of credit boom identification. Section five describes the data set. Section six shows the estimation results, followed by section seven, which contains a robustness analysis. Section eight discusses the policy implications, paying special attention to full-reserve banking.

II. Related literature

The notion that a discrepancy between the market and the natural interest rate may push the economy out of equilibrium dates back to the seminal work of Wicksell ([1898] 1936). Importantly, there are two popular interpretations of the natural interest rate. The first one, which was presented by Wicksell and is contemporaneously used by central banks, defines the natural rate as the rate that is consistent with stable inflation or the stable price level. In this case market rates below the natural level may entail increases in the prices of consumer goods or various other assets. The second one, which is used particularly by Austrian economists, views the natural level of the interest rate as equalizing the demand for loanable funds and the supply of voluntary savings.[2]

Austrian economists argue that the stability of prices is not necessarily evidence of macroeconomic stability. Mises (1949) points out that economic growth may cause systematic deflation if the money stock is not expanding rapidly. Thus, even if voluntary savings are significantly lower than investment (i.e. the market rate is below the natural rate), the price level may remain stable for a prolonged period of time. In other words, it is possible that a certain fraction of investment may be financed systematically by money creation. However, in such a case, the capital structure of the economy may be inconsistent with households' time preferences, which in turn poses some risks for the sustainability of economic growth.

Although the two above interpretations differ in identifying the level of the natural rate, they do agree that an increase (decrease) in propensity to save tends to decrease (increase) the natural rate. Therefore, for the market interest rate to follow the natural rate, changes in savings should have a substantial impact on the funding availability for borrowers.

In the macroeconomic theory, there is no consensus regarding the role played by voluntary saving in determining investment or credit. The loanable funds theory claims that an increase in thrift lowers the interest rate and leads to higher investment (Tsiang 1956). The underlying equation of this theory states that the flow of investment is equal to the flow of saving plus the newly created money minus the increase in the hoarding of money. Although money creation is explicitly accounted for in that framework, it is not viewed as a dominant factor. An opposite view is held by, for example, Keynes (1937), who claims that it is the bank's decision to provide liquidity that determines credit, not the act of saving. An interpretation reconciling these contrary ideas is that, while thrift has an impact on the natural rate of interest, the market interest rate is also influenced by monetary factors in the short run (ECB 2004).

In modern macroeconomic models, the role of money creation is not acknowledged properly. Most DSGE models are based on the loanable funds paradigm, whereby investment is constrained by the *ex-ante* saving of households. In the banking theory, it is also usually

[2] In his late work, Wicksell ([1906] 1935) also states that the normal rate is the rate of interest at which the demand for loan capital and the supply of savings exactly agree.

assumed that banks are intermediaries that collect funds from savers. Jakab and Kumhof (2015) introduce money creation into the DSGE framework and show that the enriched model performs better in reproducing real-world dynamics.

The dependence of investment on saving is also implied by the theoretical background of the Feldstein–Horioka (1980) puzzle. Feldstein and Horioka assume that, in a financially integrated world, savings from one country may be used to finance investment in other countries. The puzzle results from the observation that domestic ex-post saving is actually highly correlated with ex-post investment. A similar narration may be found in recent papers that analyze the role of capital inflows during credit booms. They suggest that foreign funding is needed to fill the gap that arises between the financing needs and the domestic deposit base (e.g. Hahm et al. 2013, Lane and McQuade 2014). Indeed, domestic deposits at commercial banks may rise more slowly than credit. Some of the newly created money may end up as direct liabilities of the central bank, for example cash in circulation or government deposits. Furthermore, if credit is used to purchase foreign currency, the supply may be provided by institutions that will not deposit money back into domestic commercial banks.

Borio and Disyatat (2015) criticize the Feldstein–Horioka interpretation and demonstrate that investment is constrained by financing rather than by saving and that financing does not require saving. Moreover, they claim that domestic financial intermediaries are generally able to provide financing elastically for the local economy. In a similar vein, Werner (2016) argues that the lending of an individual bank is not constrained by *ex-ante* funding. He analyzes the IT procedures at a German bank and finds that extending a new loan simultaneously generates a new deposit, which essentially becomes a source of funding for the loan. However, as Werner admits, such funding is not stable, and later a bank may need to rely on the interbank market.

Although it seems valid that the banking system can freely extend credit without prior savings (especially if the central bank provides reserves endogenously), there are reasons to believe that the availability of long-term funding may encourage the credit activity of individual banks and thus contribute to the aggregate credit growth. Hence, it seems worthwhile to analyze empirically the impact of the funding availability on the credit growth. To the best of my knowledge, so far no analysis has been undertaken of the impact of genuine savings on credit activity. The existing literature on the determinants of credit growth takes into account either aggregate measures of domestic deposits or non-core liabilities (which are interpreted as wholesale or foreign funding).

Within the former strand, Hansen and Sulla (2013), using a sample of 107 countries, find that the credit-to-GDP ratio is cointegrated with the deposits-to-GDP ratio, which confirms that an increase in deposits may facilitate credit growth. Everaert et al. (2015) analyze a sample of 400 European banks and find that liquidity is an important determinant of credit expansion at the individual bank level. There are some papers that incorporate contemporaneous deposit growth as an explanatory variable for credit growth (e.g. Mohanty et al. 2006, Guo and Stepanyan 2011, Hansen and Sulla 2013). Such an approach, however, seems to be inappropriate, as deposits are clearly endogenous with respect to changes in credit during the same period.

Turning to the research on the role of non-core liabilities, Calderon and Kubota (2012) argue that inflows of private capital lead to credit booms. Lagged ratios of gross capital inflows to GDP are statistically significant in explaining the occurrence of credit booms in a sample of 71 countries in the period 1975–2010. Two caveats seem to be important for the interpretation of these results. First, if capital inflows are pulled in by credit growth during the initial phase of a credit boom, then they would appear to explain significantly the dependent dummy variable in the later phase of a boom. Second, as I will explain in section four, the standard methods of credit boom identification (Gourinchas et al. 2001, Mendoza and Terrones 2008) may generate periods that are delayed with respect to the actual boom episodes. Igan and Tan (2015) provide more evidence that capital inflows influence credit growth. Using a sample of 33 countries in the period 1980–2011, they find that lagged capital inflows significantly explain both the credit growth and the occurrence of credit booms. In their paper the evidence on the causality direction is also supported by the analysis at the firm level. Lane and McQuade (2014) show that an increase in the credit-to-GDP ratio is correlated with the net inflow of debt capital. However, the relation is most visible in the run-up to the crisis period and was not significant in the 1990s.

The second issue analyzed in the present paper is the dynamics of savings during credit booms. The relevant related literature includes the theory of saving, empirical works on money demand and the literature on credit booms. The theory of saving that should matter most in the short-term periods of credit booms is the permanent income hypothesis (Friedman 1957). According to this theory, agents save a transitory component of their income to smooth their consumption. That is, if households perceive their current economic situation as extraordinarily good, they are supposed to increase their saving rate. Otherwise, if their current income is below the permanent one, a household may spend its savings or, if it is feasible, borrow money. This framework does not clearly predict what happens to savings during credit booms. Households may perceive a boom as a temporary improvement in the economic environment and save extraordinary income. However, if a boom is interpreted as a structural change in the level of permanent income, agents may choose not to increase their saving rate. In addition, credit booms are usually associated with easier credit standards. Hence, some agents who previously faced binding liquidity constraints can increase their consumption during a credit boom, which leads to lower aggregate saving.

The money demand theory postulates that the demand for money consists of a transaction motive (which is related to economic activity), a precautionary motive (which should be linked with income and perhaps wealth) and a speculative motive (dependent on interest rates). Empirical research confirms that the above-mentioned variables are helpful in explaining the variation of monetary aggregates (Sriram 1999). However, most of the research focuses on headline monetary aggregates, and relatively little attention is paid to the differences in demand functions for different categories of deposits.

Jung (2016) estimates the demand for the components of M3 in the euro area in the period 1999–2013. In particular, he analyzes overnight deposits and short-term deposits, which in the present paper are used as a proxy for, respectively, transaction and savings deposits. Jung finds that the share of overnight deposits is significantly negatively affected by an increase in the composite rate of return on M3 and that the opposite is true for the share of short-term deposits. The velocity measure of M3 (nominal GDP/M3) is insignificant in the short run, but it is included in each cointegration relation, together with the share of the respective type of deposits and the rate of return on M3. However, the overall effect of M3 velocity on the deposit structure is unclear. An analogous analysis for the period 1990–1999 is conducted by Calza et al. (2000). The effect of interest rates on the deposit structure is generally similar, while the effect of the velocity is also inconclusive.

Predictions about changes in the deposit structure during credit booms may be found in the Austrian theory of the business cycle. According to this theory, a credit boom starts when the market interest rate becomes significantly lower than the natural rate (the rate at which the demand for and the supply of savings are equal). Hayek (1933) emphasizes that such a situation often results from an increase in the unobserved natural interest rate, which may be related, for example, to an improvement in the profit expectations or a diminution in the propensity to save. A subsequent increase in the volume of circulating media is expected to be faster than the growth of savings. The following quote from Hayek (1933) is illustrative particularly of the case in which the discrepancy between the market rate and the natural rate is caused by the rise of the latter:

> By creating additional credits in response to an increased demand, and thus opening up new possibilities of improving and extending production, the banks ensure that impulses towards expansion of the productive apparatus shall not be so immediately and insuperably balked by a rise of interest rates as they would be if progress were limited by the slow increase in the flow of savings.

Garrison (2001) focuses on the case in which a credit boom is initiated by a policy-driven lowering of the market interest rate. Then, the impact on the share of savings in the total deposits is quite straightforward: "With no change in intertemporal preferences, the actual amount of saving decreases as the interest rate falls, while the amount of investment financed by the newly created funds, increases."

In this framework unsustainable credit booms are characterized by a simultaneous increase in both investment and consumption. Thus, the analysis of saving patterns is crucial to assess the sustainability of credit growth. The boom ends when, as a consequence of the scarcity of real resources, the market interest rate rises. The central point of the Austrian theory, which will not be analyzed in the present paper, is that credit booms are associated with badly allocated investment that is difficult to recover later.

III. Empirical strategy

The influence of saving on credit growth is tested using the concept of Granger causality. It may be expected that, if there is any impact of an exogenous increase in funding availability on credit expansion, it will materialize with a delay. There are three stages that sum up the delay. First, a time lapse is expected between the recording of the inflow of funds and the decision to ease the credit policy. Second, it takes time to attract new debtors and sign credit agreements. Third, many types of credit are paid in tranches, sometime after the credit agreement is signed. Hence, employing the Granger causality test in a quarterly sample seems to be an appropriate strategy. The variables included in the test equation are a measure of deposits (total or proxy for savings), the credit extended by the banking sector, and the GDP representing general economic activity that may affect both deposits and credit. The series for deposits and credit are deflated using the CPI index.

I use seasonally adjusted real growth rates of all the variables rather than levels. As presented in Table 4, those variables are non-stationary. Moreover, there may be no stable long-run relation between the level of savings deposits and the level of credit, even if the former causes the latter. One reason is that the proportion of genuine savings in savings deposits may vary due to institutional and technological developments. The other issue is that the data on deposits and credit are derived from different sources and the respective procedures of break adjustment may sometimes differ. The baseline specification for testing the impact of saving on credit growth can be written as:

$$\Delta credit_{it} = \alpha_{0i} + \sum_{p=1}^{P} \alpha_{1,p} \Delta credit_{i,t-p} + \sum_{p=1}^{P} \alpha_{2,p} \Delta deposits_{i,t-p} + \sum_{p=1}^{P} \alpha_{3,p} \Delta gdp_{i,t-p} + \varepsilon_{it} \quad (1)$$

$$H0\colon \alpha_{2,1} = \alpha_{2,2} = \ldots = \alpha_{2,P} = 0 \quad (2)$$

Information criteria and tests for the autocorrelation of residuals indicate that the appropriate number of lags is about 6 or 7. However, as a sensitivity analysis, I also report the results for a broad range of lags. Rejecting the null hypothesis means that a given category of deposits causes credit in the Granger sense. If the null hypothesis cannot be rejected at the standard level of significance, it implies that there is probably no causality relationship.

To analyze the changes in the structure of deposits during credit booms, for each country I calculate the long-term trend of share of transaction deposits in total deposits. The trend is calculated using the Hodrick–Prescott filter with a large lambda, 400,000 for quarterly data. Its purpose is to control for the institutional and technological factors that influence the money demand in the long run. The dependent variable is the deviation of the transaction deposits' share (seasonally adjusted) from the trend. Panel unit root tests tend to reject the hypothesis that this variable is non-stationary (see Table 4). However, the autoregressive coefficient is around 0.95. Hence, I also report the results of a regression with a differenced dependent variable. The baseline specification is the following:

$$y_{i,t} = \alpha_{0,i} + \alpha_1 y_{i,t-1} + \alpha_2 \Delta cred_{i,t-1} + \alpha_3 CB_{i,t} \Delta cred_{i,t-1} + \alpha_4 infl_{i,t-1} + \alpha_5 output_{i,t-1} + \alpha_6 cris_t + \varepsilon_{it} \quad (3)$$

where the increase in credit is the seasonally adjusted quarterly real growth rate, CB is a dummy variable denoting the occurrence of a credit boom and the output gap is derived from the real GDP using the Hodrick–Prescott filter with a lambda equal to 1600. The output gap controls for the general economic situation, which may not be perfectly correlated with the credit growth. Inflation (the year-on-year growth rate of the CPI index) reflects the cost of holding money in transaction accounts, which usually do not bear an interest rate. In an alternative specification, I also include the money market interest rate, as it should be a better proxy for the opportunity cost of holding transaction accounts. However, due to missing data, it reduces the sample size. I also include a dummy variable denoting the global financial crisis, which covers the period 2008Q3–2012Q4.

By estimating equation (3), I primarily check whether $\alpha_2 + \alpha_3 > 0$ holds, that is, if banks increase their reliance on transaction deposits, as their funding source, during credit booms. The sum of these two coefficients may be negative if agents perceive a boom as a temporary event. However, it may be positive if booms relax liquidity constraints and are associated with optimistic expectations about future income. It is also interesting to verify the effect of an output gap on the deposit structure. A negative coefficient would give some support to the permanent income hypothesis. As regards inflation, a negative coefficient is definitely expected.

Explanatory variables are lagged one quarter not only due to the risk of endogeneity. Importantly, agents usually base their decision on the available data, which refer to a previous period. With reference to credit growth, it is unlikely that this variable will be endogenous to changes in the deposit structure. By using its lagged value, I rather try to capture the effect of newly created money that has already become someone’s income. For the baseline specification, I employ the fixed-effects estimator, because variations within individual series are of primary interest. Although the dependent variable has almost the same mean value across different countries, explanatory variables such as inflation or credit growth have country-specific distributions.

Standard errors are computed using Rogers’s (1993) robust estimator, because serial correlation of residuals is an issue in the specification (3). Pesaran’s (2004) test for cross-sectional dependence does not reject the hypothesis of no cross-sectional correlation of residuals. One reason why the autocorrelation is present is that some short-run variations in the deposit structure do not result from changes in the demand for transaction and savings accounts but may be driven by the policy of banks. That is, some institutional, market or technological factors are not captured by the long-term trend calculated with the Hodrick–Prescott filter. For example, if a large bank pursues the strategy of advertising a certain type of account, it will be reflected in the values of residuals for a few quarters in a row. In other words, there may be some omitted explanatory variables, which would be difficult, or even impossible, to include in the model.

IV. Credit boom identification

In the literature there are two popular methods of credit boom identification. Generally, they are based on the comparison of a particular measure of credit with its long-term trend. A boom is identified when the analyzed measure of credit is significantly above (e.g. by 1.5 or 1.75 times the standard deviation) the Hodrick–Prescott trend. Mendoza and Terrones (2008) use the logarithm of the real credit per capita as the measure of credit. The other method (developed by Gourinchas et al. 2001 and Barajas et al. 2007) takes the ratio of credit to GDP, but, apart from deviations of the credit to GDP ratio from the trend, it also allows a period to be classified as a boom episode if the annual growth rate of the ratio exceeds 20%.

The drawback of these methods is that the actual boom may be lagged with respect to the episode identified. If credit accelerates when its measure is below the long-term trend, then a threshold will be reached only after some time. Similarly, if the credit slows down (or even starts to decrease) when its value is well above the threshold, the episode will continue to be labelled as a boom for a few additional quarters. To capture the timing of booms more accurately, I propose the following method based directly on the quarterly and annual growth rates of the real bank credit to the private sector. As the robustness analysis, I also use growth in the bank credit to GDP ratio as an underlying indicator.

A quarter belongs to a boom episode if either the quarterly or the annual dynamics of real credit growth exceeds the appropriate threshold. However, the last quarter in a boom needs to fulfill the quarterly dynamics criterion. The annual dynamics is primarily used to obtain the smoothness of boom episodes and to avoid gaps between quarters of fast growth. Furthermore, the whole episode is not considered as a boom if the overall credit growth is lower than the threshold for annual dynamics. The country-specific thresholds are defined as follows. For each country I calculate the median absolute deviation (i.e. median of absolute deviations from the median) of the quarterly real credit growth (RCG). The quarterly threshold, ϕ_i, is set at

$$\phi_i = median(RCG)_i + \tau * 1.4826 * mad(RCG)_i .$$

In a normal distribution, the median absolute deviation multiplied by 1.4826 is equivalent to the standard deviation. In the baseline scenario, I set τ at 1.25, but I also conduct regressions using a more restrictive boom classification with τ equal to 1.75. The annual threshold, ψ_i, is given by $\psi_i = (1 + \phi_i)^3 - 1$. That is, I allow one quarter in a year to record growth close to zero.

To compare the newly proposed method with the procedure developed by Mendoza and Terrones (or the MT criteria, 2008), I also conduct boom identification using the latter. Originally, that method was applied to annual data, using the Hodrick–Prescott filter with a typical lambda equal to 100. To implement it for quarterly data, I use a lambda of 1600, which is standard for this frequency. The occurrence of a boom is detected by the MT criteria when the deviation of the logarithm of the real credit per capita from the trend is higher than 1.75 of the country-specific standard deviation. The starting and ending dates of a boom correspond to the moment when the credit deviation from the trend crosses the threshold value of one standard deviation. The boundary date is chosen from the two adjacent quarters that encompass the threshold, and the selected quarter is the one displaying a smaller absolute difference in the credit deviation from the threshold.

Figure 1 uses the example of France to demonstrate that the method based on the comparison of the credit stock with its trend tends to identify booms with a delay. The graph shows that the deviation of credit from the trend (expressed in standard deviations) peaks only after several quarters of fast credit growth. For the sample 1969Q4:2015Q1, the MT method identifies four credit booms, of which three are also found with the method introduced in the present paper. In each of the three overlapping booms, the MT boom starts and finishes considerably later than the boom defined according to the credit dynamics. Importantly, during the last observations of MT booms, the annual growth rate of credit approaches zero, and in three out of four MT booms, the quarterly dynamics even becomes negative. The pattern observed in France is universal. For example, the MT criteria identify 10 credit booms that preceded the 2008 financial crisis out of 20 countries in the sample. It turns out that 8 of these credit booms lasted until the year 2009, that is, a period that could hardly be considered a boom.

V. Data

The data on credit come from the Bank for International Settlements database (Dembiermont et al. 2013), downloaded in November 2015. In this paper I use credit extended by banks to the private non-financial sector, denominated in the domestic currency and adjusted for breaks. The database contains 39 countries and the further data search is limited to this set. The upside of this source is that it provides long series on credit. Moreover, if a particular country is not included, it suggests that the availability or quality of its credit data is probably poor. The downside is that variables are in stock values, that is, not adjusted for non-transaction changes. This is particularly important for countries with a large share of foreign currency loans, because the stock values are affected by the exchange rate fluctuations. For that reason I drop Korea, Hungary and before 2001 Mexico. In addition, for Poland I replace the BIS data with a credit index adjusted for exchange rate changes. I also drop countries recording extraordinarily high inflation, because hyperinflation disrupts monetary developments. That includes Turkey and before 1996 Brazil.

For the remaining countries, I gather the available data on the deposit structure. The main source is the statistics provided by central banks. I focus on the domestic currency deposits of private non-financial residents. Transaction deposits are approximated by sight (overnight) deposits that are usually included in the M1 aggregate. Savings deposits include time deposits with agreed maturity (most often up to two years) and deposits redeemable at notice, both categories that are commonly included in the M2 aggregate. Obviously, the distinction between genuine transaction and savings deposits is somewhat blurred. For instance, Gelman et al. (2015) analyze a large micro data set for US consumers and find that many consumers have liquid balances (including overnight and savings accounts) equal to barely a few days of average spending. Moreover, banks in the USA often shift funds out of checking accounts that are subject to reserve requirements into savings accounts that are not subject to reserve requirements. This indicates that, in the case of the USA, overnight deposits may actually underestimate the transaction demand for money. Indeed, the USA and Brazil are the two countries in the panel that exhibit a strikingly small share of transaction deposits.

Nevertheless, the measure of transaction deposits used in this paper is supposed to include “core” transaction funds, and the measure of savings includes deposits that are most evidently placed as deferred spending. Most importantly, I am interested in short-term fluctuations in the structure of deposits, while longer-term changes, related for example to the evolution of the characteristics of savings accounts, are dealt with by the Hodrick–Prescott filter.

When available, I gather the growth rates of deposits adjusted for non-transaction changes. To calculate the structure of deposits, I use indices derived from the adjusted growth rates of transaction and savings deposits. For some countries I append two series generated with different methodologies. Then, the break adjustment is performed analogously to Dembiermont et al. (2013).[3] In some cases, in which the breaks are significant and there are no proper data to handle the break adjustment, I drop a country from the sample (Australia, Ireland and Spain). In the cases of Germany and Switzerland, where single breaks occur in the middle of long series, I split the sample and calculate separate HP trends of the deposit structure, before and after the breaks. I also do not include countries for which the data on deposits are shorter than 15 years. Detailed notes concerning the data sources are provided in the appendix. The remaining variables, namely the real GDP, CPI index and money market interest rates, are taken from the IMF's International Financial Statistics. The output gap and credit booms are computed using all the available data since 1961.

Eventually, the relevant data set contains 20 countries and the time dimension ranges from 57 to 217 quarters. Using the baseline method for identifying credit booms, I categorize 201 quarters as belonging to boom periods out of 2189 observations in the overall sample. The more restrictive procedure of boom identifications (with $\tau = 1.75$) yields only 70 quarters. Figure 2 in the appendix provides a country-by-country illustration of boom periods together with developments in the deposit structure. Three countries (Austria, Canada and the UK) do not record any boom period in the relevant sample.[4] In almost all the countries, there are visible long-term changes in the deposit structure; that is, the trend line is not flat. Table 1 reports the main descriptive statistics. Boom periods are on average associated with an elevated share of transaction deposits. The transaction deposits' share during a credit boom is larger by 0.9 percentage points, but the standard errors are considerably large. Credit booms tend to be associated with a larger output gap, but again the standard errors are larger than the difference between the two states. Interestingly, inflation is not larger during the periods of booms.

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[3] When breaks occur, all the earlier observations are proportionally scaled up or down. The factor by which series are scaled is given by the ratio of the deposits' values coming from two different methodologies in a quarter when two series overlap.

[4] Although it is often considered that the UK experienced a credit boom in the run-up to the recent financial crisis, the annual growth rate of real credit actually reached less than 7% (or 8.5% when considering all lending sectors). Using the method of Mendoza and Terrones, I also do not identify a boom in this period.

Table 1 Descriptive statistics

	Overall sample	No boom sample	Boom sample τ = 1.25	Boom sample τ = 1.75
Observations	2189	1988	201	70
Deviation of transaction deposits' share from trend	0.0000 (0.0342)	-0.0008 (0.0342)	0.0081 (0.0333)	0.0073 (0.0407)
Real growth of bank credit, quarter on quarter, s.a.	0.0108 (0.0177)	0.0082 (0.0156)	0.0365 (0.0163)	0.0467 (0.0159)
Inflation	0.0373 (0.0358)	0.0379 (0.3669)	0.0323 (0.0248)	0.0325 (0.0145)
Output gap	0.0001 (0.0161)	-0.0004 (0.0163)	0.0051 (0.0129)	0.0067 (0.0115)

Note: The table reports the mean values together with the standard errors, the latter being shown in parentheses.

VI. Estimation results

I begin by verifying the order of integration of the relevant variables. Table 4 reports the results of the panel unit root tests. As expected, the growth rates of credit and deposits are I(0). More interestingly, inflation and the output gap turn out to be stationary, while the interest rates may be trend-stationary or non-stationary. The stationarity of the dependent variable from equation (3) should be tested without including the trend, as it is already a detrended variable and the trend cannot be removed once more. Appropriate tests reject the hypothesis that all the panels contain a unit root.

Table 2 Results of the Granger causality tests

Excluded variable/lags	4	5	6	7	8	9	10
Total deposits	0.030	0.006	0.007	0.003	0.000	0.000	0.000
Savings deposits	0.297	0.232	0.282	0.300	0.088	0.220	0.098

Note: The table reports the p-values of the hypothesis that all the lagged growth rates of a given category of deposits are insignificant in predicting the growth rate of credit.

Table 2 reports the outcome of the Granger causality test given by equation (2). The results are consistent irrespective of the number of lags applied. At the standard 5% level of confidence, the hypothesis of insignificance of savings cannot be rejected. Thus, it may be concluded that changes in thrift do not influence credit (and thus investment), at least in the short run. On the contrary, growth in the total deposits contains relevant information for predicting credit growth. One interpretation is that banks care about funding and an abundance of retail deposits makes it easier to originate new loans. Banks, however, may not differentiate between savings and transaction deposits. Another possible interpretation is that growth in total deposits is a signal of an increased demand for money, which may put pressure on the subsequent credit growth.

The analysis of the deposit structure during credit booms is presented in Table 3. The baseline specification from equation (3) is presented in column 2. The autoregressive coefficient is clearly very important, indicating a high level of inertia of the deposit structure. As expected, inflation contributes positively to the share of savings deposits in the total deposits. The effect of the output gap on savings is also positive and statistically significant at the 1% level of confidence. A 1% higher GDP than the potential product increases the share of savings deposits by 0.1 percentage point during one quarter. It should be mentioned that an effect of a positive output gap may be cancelled out by the constant term, which is responsible for a 0.1–0.2 percentage point increase in the transaction deposits' share each quarter.

Table 3 Econometric analysis of the deposit structure

	1	2	3	4	5
	Pooled model, OLS	Baseline, FE	Augmented with interest rate	τ =1.75	Δy_{it} as dep. variable
Dep. variable (-1)	0.954*** (0.000)	0.951*** (0.000)	0.953*** (0.000)	0.951*** (0.000)	
Δcredit(-1)	-0.040** (0.020)	-0.053*** (0.007)	-0.052** (0.015)	-0.044** (0.020)	-0.067*** (0.002)
Credit_boom* Δcredit(-1)	0.091*** (0.001)	0.091*** (0.002)	0.078** (0.011)	0.106*** (0.006)	0.095*** (0.001)
Inflation (-1)	-0.032*** (0.004)	-0.040** (0.011)	-0.041** (0.012)	-0.040*** (0.009)	-0.031** (0.032)
Output gap (-1)	-0.101*** (0.001)	-0.099*** (0.001)	-0.081*** (0.004)	-0.100*** (0.001)	-0.094*** (0.001)
Dummy 2008Q3–2012		-0.002 (0.171)	-0.002 (0.151)	-0.002 (0.156)	-0.001 (0.500)
Δinterest (-1)			-0.070** (0.043)		
Constant	0.001*** (0.005)	0.002*** (0.004)	0.002*** (0.006)	0.002*** (0.004)	0.002** (0.015)
Country effects	No	Yes	Yes	Yes	Yes
r^2	0.925	0.925	0.927	0.925	0.054
Observations	2116	2116	1859	2116	2116
$P(\alpha_2 + \alpha_3 = 0)$	0.005	0.034	0.144	0.013	0.178

Note: *p*-values in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

For the whole sample, the credit growth also contributes positively to the share of savings deposits. That is, money created in the previous quarter is relatively likely to be saved. However, during a credit boom, the situation reverses. Then, an increase in the real credit of 1 percentage point leads to an increase in the share of transaction deposits of 0.04 percentage points in the next quarter. An average credit boom is associated with growth in the real credit of 33%, which implies the effect of transaction deposits' share being larger by about 1.3 percentage points. Assuming for illustration purposes that transaction deposits are equal to 50% of the total deposits and that there are no changes in their velocity, an average boom would be associated with the domestic demand being larger by more than 2% than in the hypothetical scenario, in which the structure of deposits remains constant. Thus, the effect should be considered as economically significant. If we focus on the more restrictive definition of a boom ($\tau = 1.75$), the impact of 1% percent credit growth is larger and amounts to a change of 0.06 percentage points in the transaction deposits' share.

When the money market interest rate is added, the results are qualitatively the same as in the baseline specification. The effect of credit growth during a boom is somewhat diminished, but low interest rates are actually one of the reasons why the propensity to save may decrease during a credit boom. The baseline results are also largely confirmed using the differenced dependent variable. However, contrary to the baseline specification, the sum of the effect of credit growth during a boom and the effect of credit growth in the whole sample is not significantly higher than zero.

VII. Robustness analysis

To verify whether the lack of causality between savings and credit growth holds for each country, I re-estimate regression (1) for each country separately. For each country I consider equations with 4, 5 and 6 lags and select the final number based on information criteria and the Breusch–Godfrey LM test for autocorrelation of residuals. Table 5 reports the results of 40 Granger causality tests, which include an analysis of savings deposits and total deposits as the tested variable. It turns out that savings are a significant determinant of credit growth in the case of 3 countries out of 20. On the one hand, it confirms the initial finding that credit growth, as a rule, is not dependent on prior savings. On the other hand, such a result may be interpreted as a signal that in some cases an increase in savings may actually facilitate credit growth. Regarding tests of the significance of the total deposits, only 6 out of 20 regressions confirm that the total deposits help in explaining the future credit growth. Thus, despite the highly convincing results of the tests based on the panel sample, the causal relation between total deposits and credit growth is far from being a universal phenomenon.

Now I turn to the robustness analysis of the findings on the evolution of the deposit structure. As a primary exercise, I run 20 regressions given by equation (3), each time excluding 1 country from the panel. The results remain qualitatively the same, with the interaction of credit growth and a boom period being significant at the 1% level of confidence for every regression. This ensures that the baseline estimation output is not driven by a single boom episode.

Table 6 reports a further robustness analysis of equation (3). It is often argued that growth in the ratio of credit to GDP is a proper indicator of financial deepening as well as credit booms. Thus, I employ an analogous procedure of credit boom identification as in the baseline analysis, but instead of the real credit growth I use the seasonally adjusted growth rates of bank credit to GDP (the not seasonally adjusted variable comes from the BIS data set). I also add a condition stating that periods of negative GDP growth should not be classified as booms. For $\tau = 1.25$ there are 131 quarters of booms, significantly fewer than those found using the baseline method. The regression results (column 6) are close to the baseline findings. With $\tau = 1.75$ (column 7), the credit variables are significant only at the 8% level of confidence, but the number of boom observations amounts to barely 43.

In column 8 I use contemporaneous credit growth instead of lagged credit growth. The effect of the interaction term is somewhat smaller and significant only at the 5% level of confidence. In column 9 year effects are added to control for possible time heterogeneity in the intercept. The effect of the output gap becomes smaller and the impact of credit growth during a boom is larger than in the baseline specification. Lastly, I investigate the stability of the results over time. In column 10 the sample starts in 1991. Then, the conclusions from the baseline regression are actually strengthened. The effect of inflation is doubled and the interaction term of credit has a larger coefficient. In this shortened sample, an increase of 1 percentage point in the real credit, during a credit boom, leads to an increase in the share of transaction deposits of 0.07 percentage points in the next quarter. However, the findings on the impact of credit booms do not hold in the sample that excludes recent booms. With the sample ending in 2003 (column 11), the credit booms are insignificant. The findings on the output gap and inflation remain valid for that period. It should be noted, though, that dropping observations after 2003 reduces the sample by over 40%.

VIII. Conclusions and policy implications

The finding that credit growth is not related to prior savings does not come as much of a surprise. However, it has three important implications. First, policies aimed at incentivizing saving should not be expected to boost investment in the short run. Second, economic models should not rely too much on the loanable funds framework, in which credit is constrained by *ex-ante* saving. Third, it means that the fractional-reserve banking system is prone to deviation of the market interest rate from the natural interest rate. Thrift is a variable that influences the natural interest rate, but it may have no impact on the market rate and credit activity. Moreover, the recent financial crisis confirms that it is difficult for monetary authorities to observe deviations of the market rate from the natural rate.

The second important finding of the present article is that banks diminish their reliance on savings, as the funding source, during credit booms. This is in line with the predictions of the Austrian theory of the business cycle. It indicates that the simple loans to deposits ratio may mask some imbalances in the economy, while the deposit structure, or the Divisia monetary aggregates index, may contain important information on macro-financial stability. Most importantly, it strengthens the conclusion derived from the first finding that fractional-reserve banking is conducive to macroeconomic volatility.

Obviously, these results should be treated with some caution. An important caveat is that the measure of savings used in this paper is not a perfect representation of genuine savings, that is, deferred consumption. It is a characteristic of fractional-reserve banking that savings accounts may often be liquidated at a negligible cost and used to settle transactions. In contrast, under hypothetical full-reserve banking, depositors would have a stronger incentive to differentiate between less liquid long-term savings (bearing high interest) and transaction deposits (with interest close to zero or even negative).[5] Having said that, the measure of the dynamics of savings used in this paper is probably as good an approximation as one can achieve for a sample that covers many periods of credit booms.

The proposition that full-reserve banking would be a better system to enhance macroeconomic stability is advocated in many theoretical studies (e.g. Fisher 1936, Friedman 1959, Benes and Kumhof 2012). Under such a system, the ability of private financial

[5] Still, savings might be liquid in the sense of Diamond and Dybvig's (1983) framework. It would be possible to access them for an unanticipated liquidity need during normal times. However, their convertibility would need to depend on the bank's discretion and might be suspended during a bank run, while transaction deposits would operate smoothly even during a financial crisis.

institutions to create money would largely be reduced. Theoretically, banks would not be able to create loans *ex nihilo*, because every checkable deposit would require 100% backing in central bank money. Therefore, the loanable funds would be equal to genuine savings, possibly augmented with money created by the central bank. Obviously, changes in liquidity hoarding and the emergence of near-monies (e.g. money market fund shares) might introduce some noise into this relation. Nevertheless, there would be a significant link between saving and investment, and it would be easier for monetary authorities to keep the market interest rates close to the level consistent with macro-financial stability. For example, if a credit boom were associated with a slow increase in domestic savings, the continuation of credit growth would require an inflow of foreign funding or explicit lending from the central bank.

It should be mentioned that the crucial objective of narrow banking proposals, of which full-reserve banking is just one variant, is to protect the payment system and simultaneously reduce the role of publicly funded deposit insurance (Phillips and Roselli 2011, Pennacchi 2012). Likewise, the criticism of narrow banking proposals refers mainly to the issues of stability and efficiency of the financial system (Wallace 1996, Calomiris 1999). Thus, the potential benefits from diminishing macroeconomic volatility may be of secondary importance for the choice of an optimal design of the financial system.

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Appendix

Table 4 Unit root tests

Variable/test	Im–Pesaran–Shin test, no trend	Im–Pesaran–Shin test, trend included	Fisher-type test, ADF, no trend, Z stat.	Fisher-type test, ADF, trend included, Z stat.	Fisher-type test, Phillips–Perron, no trend, Z stat.	Fisher-type test, Phillips–Perron, trend included, Z stat.
Bank credit (real s.a.)	1.000	0.600	1.000	0.526	1.000	1.000
Bank credit (real growth rate s.a.)	0.000	0.000	0.000	0.000	0.000	0.000
Time deposits (real s.a.)	0.999	1.000	0.999	0.999	0.998	1.000
Time deposits (real growth rate s.a.)	0.000	0.000	0.000	0.000	0.000	0.000
Total deposits (real s.a.)	1.000	1.000	1.000	1.000	1.000	1.000
Total deposits (real growth rate s.a.)	0.000	0.000	0.000	0.000	0.000	0.000
GDP (real s.a.)	1.000	0.866	1.000	0.852	1.000	0.999
GDP growth (real s.a.)	0.000	0.000	0.000	0.000	0.000	0.000
Output gap	0.000	0.000	0.000	0.000	0.000	0.000
Inflation (year on year)	0.033	0.007	0.000	0.000	0.000	0.000
Interest rate	0.273	0.000	0.497	0.000	0.003	0.000
Deviation of transaction deposits' share from trend	0.000	0.013	0.000	0.003	0.001	0.720

Note: The table reports the p-values. In each test the null hypothesis is that all the panels contain unit roots. The lags in the IPS tests are chosen to minimize the AIC criterion. For the Fisher-type tests, I use the same number of lags as chosen for the IPS tests. Calculations are conducted in Stata with the xtunitroot package.

Table 5 Granger analysis at the country level

Country (numbers of lags)	Savings deposits	Total deposits	Country (numbers of lags)	Savings deposits	Total deposits
Austria (4,4)	0.887	0.321	Italy (4,4)	0.618	0.116
Belgium (5,5)	0.046**	0.005***	Mexico (4,4)	0.120	0.123
Brazil (4,4)	0.907	0.967	Netherlands (5,5)	0.649	0.350
Canada (4,4)	0.551	0.399	Norway (4,4)	0.012 #	0.113
Switzerland (5,5)	0.754	0.007***	Poland (4,4)	0.346	0.760
Germany (4,4)	0.196	0.486	Portugal (4,4)	0.824	0.820
Denmark (4,4)	0.039**	0.042**	Sweden (4,4)	0.409	0.591
Finland (4,4)	0.484	0.884	UK (4,4)	0.887	0.010***
France (4,4)	0.165	0.037**	USA (6,6)	0.010***	0.003***
Greece (5,5)	0.113	0.000 #	South Africa (4,4)	0.866	0.999

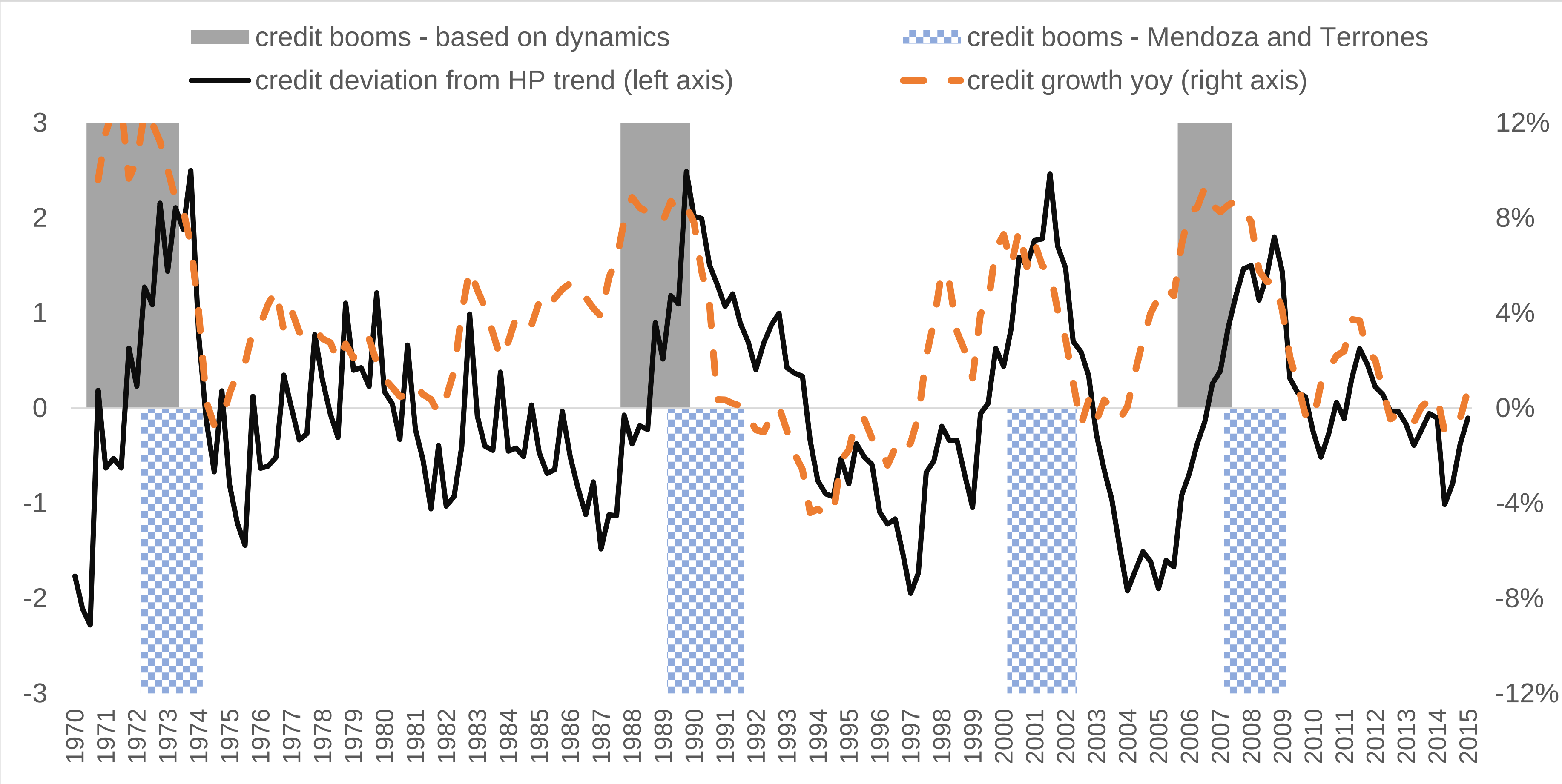
Note: The table reports the p-values of the hypothesis that all the lagged growth rates of a given category of deposits are insignificant in predicting the growth rate of credit. # denotes a negative impact of deposits' growth on credit.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6 Robustness analysis of the findings on the deposit structure

	6	7	8	9	10	11
Model	Bank to GDP, τ = 1.25	Bank to GDP, τ = 1.75	Contemporaneous bank credit	Year effects added	Year > 1990	Year < 2004
Dep. variable (-1)	0.950*** (0.000)	0.951*** (0.000)	0.950*** (0.000)	0.953*** (0.000)	0.942*** (0.000)	0.945*** (0.000)
Δcredit(-1)	-0.044** (0.026)	-0.035* (0.075)	-0.035* (0.080)	-0.045*** (0.009)	-0.045* (0.054)	-0.033* (0.070)
Credit_boom* Δcredit(-1)	0.086*** (0.009)	0.077* (0.082)	0.064** (0.049)	0.115*** (0.002)	0.115*** (0.003)	0.011 (0.621)
Inflation (-1)	-0.041*** (0.010)	-0.042*** (0.010)	-0.041** (0.013)	-0.050** (0.021)	-0.083*** (0.002)	-0.044** (0.012)
Output gap (-1)	-0.100*** (0.001)	-0.101*** (0.001)	-0.104*** (0.000)	-0.046** (0.048)	-0.109*** (0.001)	-0.056** (0.032)
Dummy 2008Q3–2012	-0.002 (0.166)	-0.002 (0.158)	-0.001 (0.190)		-0.002 (0.161)	
Constant	0.002*** (0.004)	0.002*** (0.004)	0.002** (0.011)	0.005* (0.090)	0.003*** (0.001)	0.003*** (0.001)
r^2	0.925	0.925	0.925	0.929	0.919	0.924
Observations	2116	2116	2120	2116	1594	1246

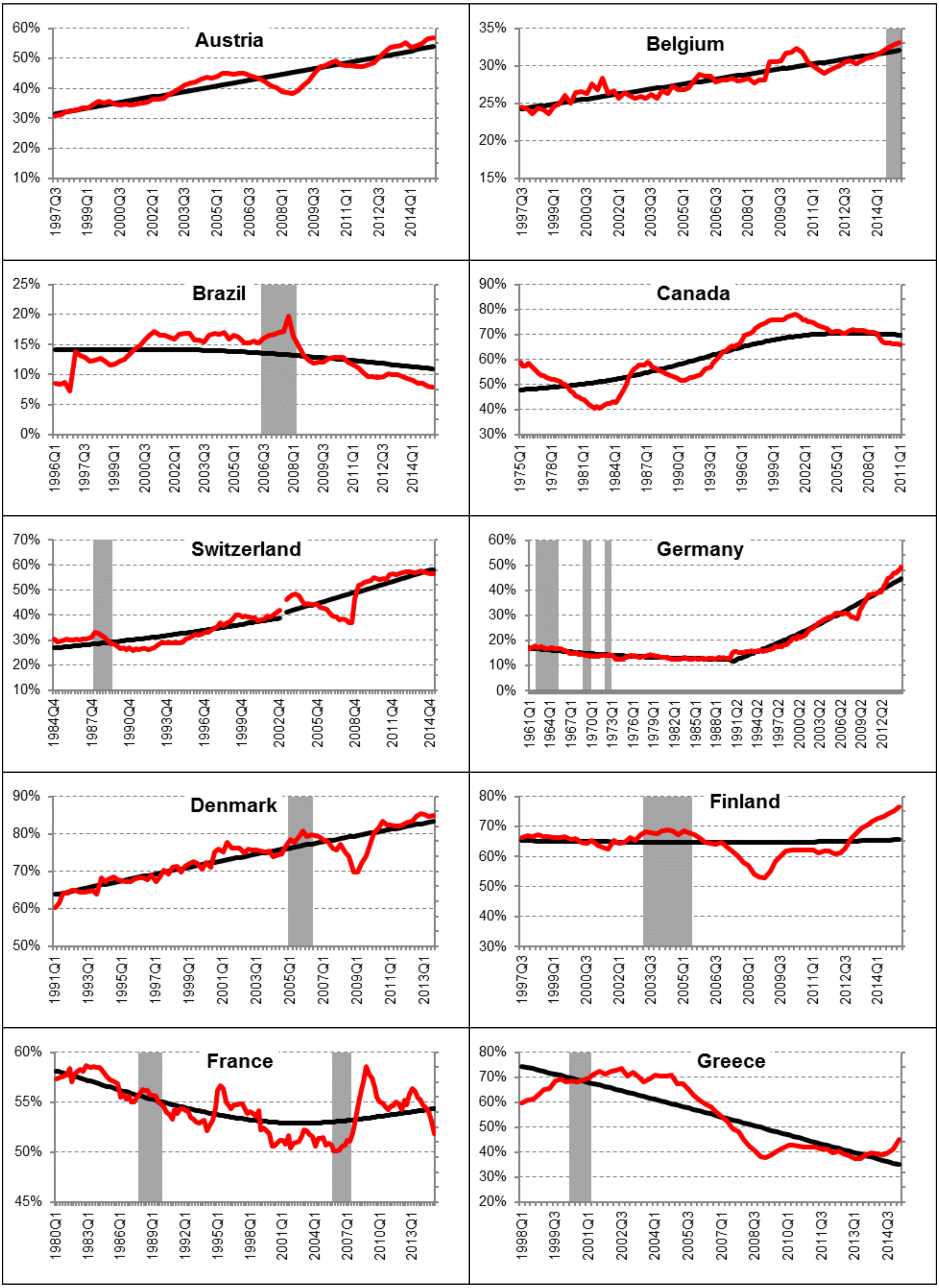
Note: *p*-values in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1 Comparison of boom identification procedures: The example of France



Note: The deviation of the real credit per capita from the long-term trend is expressed in country-specific standard deviations. The methods of credit boom identification are discussed in section four.
Source: Own calculations based on the BIS data on bank credit.

Figure 2 Fluctuations of the deposit structure



Note: A grey shaded area denotes a credit boom. A black line represents the long-term trend of transaction deposits' share in the total deposits, calculated with the Hodrick–Prescott filter. A red line indicates the actual transaction deposits' share.

Figure 2 Fluctuations of the deposit structure – Continued

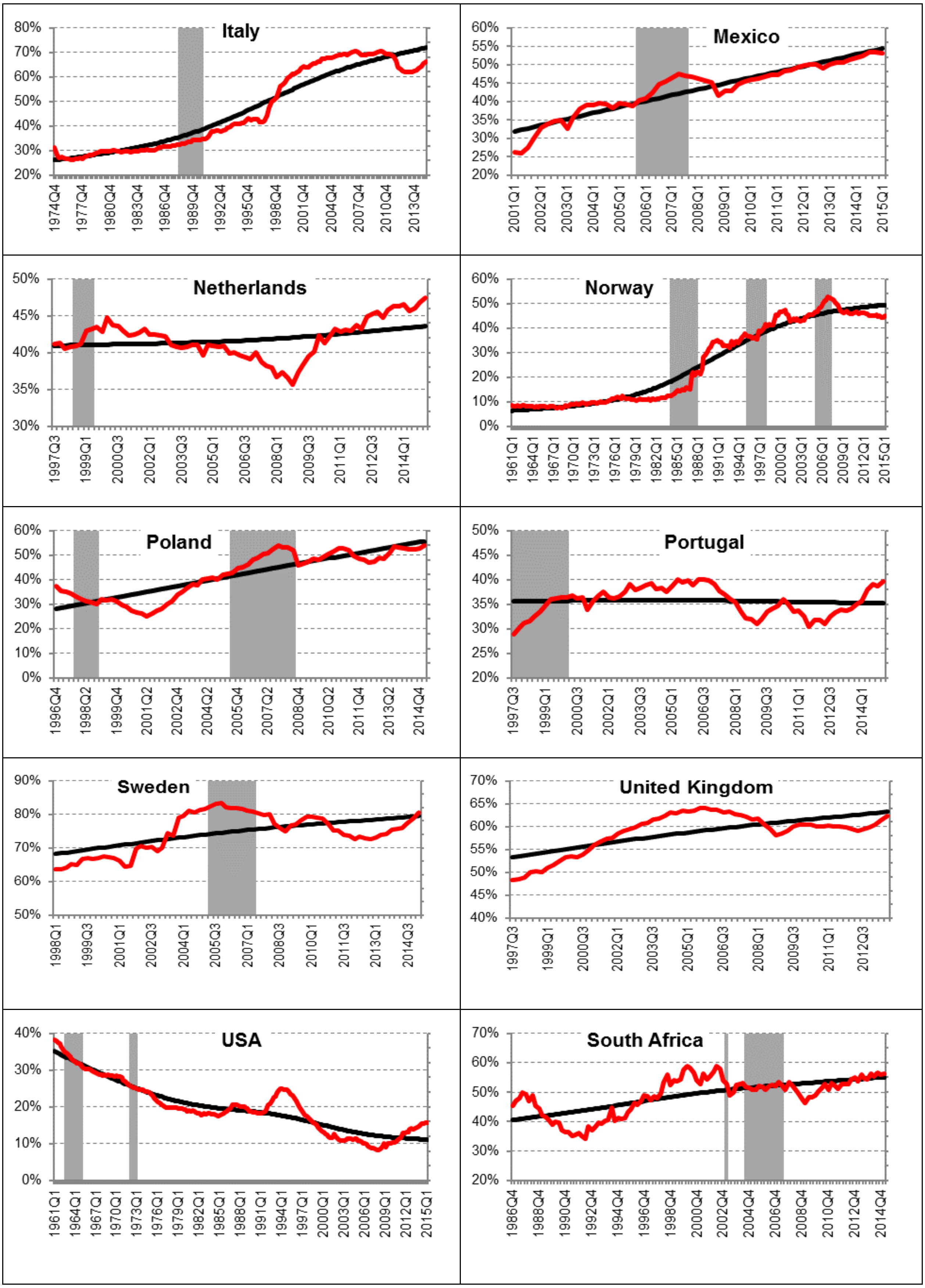


Table 7 Data notes

Country	Starting date of credit data	Starting date of deposit data	Detailed remarks
Austria	1961Q1	1997Q3	Data on deposits come from the ECB database. Savings deposits include deposits with agreed maturity up to two years and deposits redeemable at notice up to 3 months. Transaction deposits are defined as overnight deposits. All deposits comprise liabilities to the non-financial sector, excluding the central government. Growth rates are adjusted for non-transaction changes.
Belgium	1970Q4	1997Q3	As in the case of Austria.
Brazil	1996Q1	1996Q1	Data on deposits come from the central bank of Brazil. Data before 1996 were dropped due to hyperinflation. Savings deposits include "private securities," which cover time deposits, exchange bills, mortgage bills and real estate bills.
Canada	1961Q1	1975Q1	Data on deposits come from http://www.statcan.gc.ca/. Savings deposits are calculated as the difference between monetary aggregates M1++ and M1+. Data on bank credit were deleted from 2011 onward due to the transfer of mortgage-backed securities into the banking sector.
Denmark	1961Q1	1991Q1	Data on deposits come from the Danmarks Nationalbank. Savings deposits are calculated as the difference between M2 and M1, while transaction deposits are defined as the difference between M1 and cash in circulation.
Finland	1974Q1	1997Q3	Data on deposits as in the case of Austria. Data on bank credit were adjusted for non-transaction changes to address a structural break in 2001Q1, which had been overlooked in the BIS data.
France	1969Q4	1980Q1	Data on deposits come from the Banque de France. Savings deposits include passbook savings accounts and time deposits with maturity up to two years. Deposits include all currencies. Liabilities towards non-residents, central government and monetary institutions are excluded. Growth rates are adjusted for non-transaction changes. There is a single missing datum for deposits in 1993Q1.
Germany	1961Q1	1961Q1	Data on deposits come from the ECB and, before 1997Q3, from the Deutsche Bundesbank. In the latter source, savings deposits comprise time deposits with all maturities. A significant break in the data occurs in 1990 due to the inclusion of East German institutions in the sample.
Greece	1961Q1	1998Q1	As in the case of Austria.
Italy	1974Q1	1961Q1	Data on deposits come from the ECB and, before 1997, from the Bank of Italy.
Mexico	2001Q1	1998Q1	Data on credit before 2001 were dropped due to a large share of foreign currency denominated loans. Data on deposits come from the Banco de Mexico and comprise deposits denominated in domestic currency placed in both commercial banks and development banks.
Norway	1961Q1	1961Q1	Data on deposits come from the Norges Bank. Transaction deposits are calculated as the difference between M1 and currency in circulation, while savings deposits are defined as the difference between M2 and M1. Data from 1994 exclude non-transaction changes, while data up to 1994 are based on stock values. A break adjustment was made for the change in the M1 definition in 1992.

Netherlands	1961Q1	1997Q3	As in the case of Austria.
Poland	1996Q4	1996Q4	Data on bank credit were adjusted for exchange rate changes based on the currency structure of credit, provided by the National Bank of Poland. Data on deposits come from the National Bank of Poland.
Portugal	1961Q1	1997Q3	As in the case of Austria.
South Africa	1965Q1	1986Q4	Data on deposits come from the South African Reserve Bank. Savings deposits comprise savings accounts together with short-term and medium-term time deposits. There is no information on structural breaks.
Sweden	1961Q1	1998Q1	Data on deposits come from the ECB from 2001Q4 and from Swedish data for the period 1998Q1–2001Q3.
Switzerland	1961Q1	1984Q4	Data on deposits come from the Swiss National Bank. Savings deposits include time deposits and savings accounts. Only deposits of residents denominated in the local currency are included. A break in the series occurs in 2003.
United Kingdom	1963Q1	1997Q3 (end in 2013Q3)	Data on deposits come from the Bank of England. The time series comprise liabilities towards domestic households and non-financial companies, denominated in the local currency. Savings deposits include time deposits placed in domestic banks and special deposits (ISA, TESSA) in monetary financial institutions. Transaction deposits include interest-bearing demand deposits in banks and non-interest-bearing demand deposits in monetary financial institutions. Growth rates are adjusted for non-transaction changes. Seasonal adjustment comes from the Bank of England.
USA	1961Q1	1961Q1	Data on deposits come from the Federal Reserve Bank of St. Louis. Transaction deposits are calculated as the difference between M1 and currency in circulation, while savings deposits are defined as the difference between M2 and M1. There is no information on structural breaks.