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Business Cycles, Credit Cycles, and Bank Holdings of Sovereign Bonds: Historical Evidence for Italy 1861-2013

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Abstract

We propose a joint dating of Italian business and credit cycles on a historical basis by applying a local turning-point dating algorithm to the level of the variables. Along with short cycles corresponding to traditional business cycle fluctuations, we also investigate medium cycles, because there is evidence that financial booms and busts are longer and more persistent than business cycles. After comparing our cycles with the prominent qualitative features of the Italian economy, we carry out some statistical tests for comovement between credit and business cycles and find evidence that credit and business cycles are poorly synchronized, especially in the medium term. Nonetheless, we demonstrate that only for medium-term frequencies the coincidence of financial downturns and economic recessions significantly increases output losses. We do not find evidence that the credit cycle leads the business cycle, both in medium and short-term fluctuations. On the contrary, in the short cycle, we find some evidence that the business cycle leads the credit cycle. Finally, credit and business cycle comovement increases when credit embodies public bonds held by banks, i.e., bank financing to the public sector.

JEL Classification: E32, E44, N13, N14
Keywords: business fluctuations, financial cycle, bank credit, medium-term fluctuations

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1. Introduction[1]

Historically, the study of the business cycle has focused on the behavior of macroeconomic data with cycles lasting on average no more than 8 years (A'Hearn and Woitek 2001; Zarnowitz 1992). Although the idea of long swings in economic activity goes back to economists such as Kuznets, Abramovitz and Schumpeter, and the idea of long financial swings was discussed in Minsky (1964), the renewed interest in the relationship between real and financial/credit cycles has revealed that real and financial variables interact at lower frequencies than those of the traditional business cycle (Aikman, Haldane and Nelson 2015; Drehmann, Borio and Tsatsaronis 2012). Similar to those studies, we focus on two types of cyclical patterns, namely those that have the same periodicity as the business cycle and those that have considerably longer periodicity. Moreover, we explore how comovement/causality among real and financial variables changes with the definition of the cycle.

Our study complements and extends the recent literature in several ways. First, we propose a joint dating of Italian business and financial cycles during the last 150 years (1861-2013). Second, we use a local turning-point dating algorithm based on the level of variables (the so-called NBER approach). Finally, we explore how credit cycles change by including the public debt held by banks as a further channel of bank financing to the economy.

Among the stylized facts, we find evidence that credit and business cycles are weakly synchronized in the medium term, whereas they steadily comove in the short term. When credit and public bonds held by banks are jointly taken into account, they are significantly correlated with fluctuations in economic activity in the medium term. A further evidence concerns the crowding out of loans. Although the increase in public bonds helps to stabilize the total credit available to the economy during downturns in lending, a strong negative correlation emerges between loans and public bonds in the postwar era, commencing in the 1970s.

As to our major results, we first emphasize that medium term cycles account for the largest part of fluctuations of the Italian financial cycle. Second, we find evidence about GDP leading bank credit in short cycles. Differently from Jorda, Schularick and Taylor (2012) who find that "the prior evolution of credit does shape the business cycle", our findings are broadly consistent with the financial accelerator scheme. However, over the medium cycles, economic downturns associated with credit crunches and financial disruption are more severe than the others (Aikman, Haldane and Nelson 2015; Jorda,

[1] This paper benefited from many comments and suggestions by colleagues and scholars: Federico Barbiellini Amidei, Stefano Battilossi, Riccardo de Bonis, Rui Pedro Esteves, Alfredo Gigliobianco, Matteo Gomellini, Kilian Rieder, Solomos Solomou, Gianni Toniolo, and Francesco Vercelli. We also thank the participants at the Third CEPR Economic History Symposium (Norges Bank, Oslo, 2015), the seminar at the University of Crete (2015), the 56th Annual Conference of The Italian Economic Association (Naples, 2015), and the FED Conference on Economic and Financial History (Richmond, 2016). As usual, all remaining errors are ours. The views expressed do not necessarily reflect those of the Bank of Italy. Bartoletto, Chiarini and Marzano acknowledge financial support from University of Naples "Parthenope".

Schularick and Taylor 2012). Fourth, the broader the financial aggregate, the larger the effect on the business cycle. This suggests that when banks also restrict credit provision to the public sector, the effect of a credit crunch on the real economy is more intense.

The rest of the paper is organized as follows. Sections 2 and 3 describe the data and the dating methodology, and provide the reader with some evidence of long-lasting fluctuations in the series under scrutiny. Section 4 presents the results of the turning-point analysis for GDP, credit aggregates and public bonds held by banks, and describes the main features of the cycles in connection with important economic and financial events. Finally, it explores the relationship between holdings of public bonds and bank loans on banks' balance sheets over different credit cycles. Section 5 is devoted to the empirical results: the relationship between loans and public bonds held by banks over the credit cycle, the degree of synchronization/comovement[2] between real and credit cycles, the test for causality from credit to real cycles and vice versa, and the impact of credit crunches on recessions. Section 6 concludes.

2. Data

We draw annual data on national accounts from Baffigi (2013) and on bank credit from De Bonis *et al.* (2012).[3] Loans include loans granted to households, non-financial corporations and government; interbank loans are excluded.[4] Loans have been reconstructed net of bad debts because of the difficulty of finding data in the past. As regards public bonds held by banks, we combine some series from the Bank of Italy's Statistics Data Base. For the period 1861-1993, we use the series "General Government: securities held by other monetary financial institutions" (other than the Bank of Italy) from the Bank of Italy (2014a). This is the longest updated series of government bonds in banks' balance sheets, and largely coincides with amounts drawn from other sources (Cotula *et al.* 1996, part IV, Table 32; Garofalo and Colonna 1999, Table 3). For the remaining years, we draw on the series "Public sector securities held by banks" from the Bank of Italy (2014b) after excluding the holdings of Cassa Depositi e Prestiti.[5]

We analyze the behavior of GDP as the representative variable for the business cycle. Credit aggregate, i.e. total bank loans, is the key variable in our analysis. In addition, we consider the cyclical pattern of another aggregate, public bonds held by banks, because of its importance on banks' balance sheets over the business and financial cycles and its interplay with credit aggregates. In addition to this aggregate, we compile the aggregate sum of loans

[2] These two terms are used interchangeably.

[3] Although in the first few years after unification a significant proportion of total lending to the economy was granted by the banks of issue, we do not include their loan activity in our aggregates (see, e.g., De Bonis and Silvestrini 2014).

[4] Data on loans by Institutional sector are not available before WWII; hence our bank loans are not strictly "credit to the private sector" (the usual benchmark aggregate in the macroeconomic analysis), because they include loans to the public sector.

[5] Cassa Depositi e Prestiti SpA (CDP), the Italian development bank, is a joint-stock company under public control, and is usually excluded from private credit series. See the Bank of Italy's Financial Stability Report (Bank of Italy 2013).

and public bonds held by banks, which for convenience of exposition, we will call "bank claims on the economy."[6]

We look at credit series only, mainly because of a lack of long time series for other assets. Nonetheless, this is not a serious limitation to our analysis for at least two reasons. First, Italy's financial system has traditionally been more dominated by credit institutions than those of other advanced economies (Ciocca and Biscaini Cotula 1994; Battilossi 1998; Rajan and Zingales 2003). Second, recent studies have emphasized the role played by credit aggregates in providing information about the likelihood of future financial crises (Schularick and Taylor 2012; Borio 2012; De Bonis and Silvestrini 2014).

Often the financial cycle has been dated and analyzed starting from the series of credit to GDP ratio (Drehmann, Borio and Tsatsaronis 2012; De Bonis and Silvestrini 2014). Beyond this, the level of stocks of financial assets (bonds, stock market capitalization, loans) relative to GDP may help to investigate many far-reaching economic issues. For instance, they are a measure of financial development or financial deepness often employed in cross-country comparisons (e.g. Mendoza and Quadrini 2009) and in a historical perspective (Schularick and Taylor 2012). Moreover, by reporting the stock of the financial variable, namely credit, to the GDP has been proven to be an important source of information for macro prudential purpose, since it is a reliable indicator of financial distress (Drehmann and Tsatsaronis 2014; Bartoletto *et al.* 2017).

In this paper, in order to date the financial cycle, we inspect the pattern of the credit series, a stock variable, like in Claessens, Kose and Terrones (2011). The main reason for this choice is that by employing the credit-to-GDP ratio would prevent to separate real and financial fluctuations. As a result, this would make more difficult to investigate the different timing of turning points (a drop in GDP might result in a peak in credit/GDP ratio), and might engender a major flaw in the analysis, since the main goal of our article is to compare business and credit cycles.

All series are in real terms; therefore, we deflate them using a GDP implicit deflator (Baffigi 2013).[7]

3. Short and medium cycle

3.1. Methodology

To identify business and financial cycles, we use the classical definition of a business cycle used at NBER and introduced by Burns and Mitchell (1946).

This approach to business cycle analysis is quite new in the literature on the Italian economy over a long time span. In fact, an official dating of the Italian business cycle is not available over such a long period. The cyclical chronology according to the NBER approach has been maintained by ISCO since 1945 (ISCO 1962; Bruno and Otranto 2004) and today by Istat (Istat 2011). Moreover, there is no dating of the Italian business cycle according to the classical approach based on annual data, except for the recent work by Jorda, Schularick

[6] This is only a definition of convenience to make it clear that we are including something other than loans in this credit aggregate.

[7] Data at constant prices and GDP deflator are reported in Appendix A.2.

and Taylor (2012). Their analysis is similar to ours, but their historical sources are different and not as homogeneous as the recent reconstructions of GDP and credit series used here and described in Section 2. Clementi, Gallegati and Gallegati (2015) put forward a business cycle analysis based on Baffigi's (2013) reconstruction, but they identify turning points in the deviation from trend series (growth cycles). Finally, in Appendix A.1, we evaluate our business cycle dating by comparing it with other historical analyses of the Italian business cycle using other approaches.

The advantage of using the classical methodology arises from the fact that it is a "local" procedure. As a result, the turning points that are identified are robust to the inclusion of newly available data with respect to other filter-based procedures. More importantly, turning point identification relies on data around the date considered, not involving observations over a long time, as is the case with filter-based or detrending procedures (Canova 1998). In fact, this can be questionable when data span different historical periods, because their quality inevitably changes over time, and the evaluation of magnitudes in the distant past at constant prices gives rise to distortions. Although these shortcomings are somehow unavoidable when long historical periods are involved, we still think that a classical approach to business cycle dating can mitigate them.

The specific cycle-dating algorithm we use is that introduced by Harding and Pagan (2002), who extend the so-called BB algorithm developed by Bry and Boschan (1971) to identify the turning points in the (log) level of a series. Here, we modify Harding and Pagan's procedure by adapting it to annual data and considering two different cycles, a short cycle and a medium cycle.

For the short cycle, we follow Watson (1994), who first adapted the BB algorithm to annual data: contractions are defined as sequences of absolute declines in the series, and expansions are defined as sequences of absolute increases. One year being the minimum time unit, the minimum duration of a phase is 1 year and that of a complete cycle (peak to peak) is 2 years. To capture cycles that are longer than those typically considered in business cycle analysis, we also define a medium[8] cycle by adjusting Harding and Pagan's (2002) method and applying it to yearly data. We define peaks (troughs) at time t if they fulfill two conditions: (i) each cycle has a minimum length of 4 years; and (ii) each phase (expansion or contraction) is at least 2 years long.

It is important to note that these two definitions of a cycle are seemingly arbitrary. Not only is the procedure consistent with the practice at the NBER, but given the frequency of the data the short cycle is also the shortest that can be identified using annual data (Watson 1994). Similarly, once the short cycle is defined, the medium cycle is the closest one in terms of the minimum length of the phase. In other words, given these two cycles, it is not possible to identify a cycle in between them. Finally, one or more short cycles are exactly nested within each medium cycle as a result of the relative minimum/maximum criterion: a turning point of a medium cycle is always also the turning point of a short cycle.

[8] As is made clear in the next paragraph, we follow the literature by using the label "medium" to denote a cycle that is longer than the usual business cycle.

3.2. Evidence of medium-term fluctuations

Comin and Gertler (2006) and Blanchard (1997) pointed out that over the postwar period, many industrialized countries, Italy included, have tended to oscillate between phases of robust growth and relative stagnation, displaying longer oscillations than those typically considered in conventional business cycle analysis. They proved the importance of the medium-term component of fluctuations in GDP exceeding the short-term component.[9] Finally, they underlined that conventional business cycle detrending methods tend to sweep these kinds of oscillations into a linear trend, which instead exhibit considerable variation, reflecting the presence of significant cyclical activity at the medium frequencies.

Aikman, Haldane and Nelson (2015) presented some empirical evidence across countries (Italy among them) over the last 150 years stressing how credit cycles (measured by variations in the ratio of bank lending to GDP) are distinct from business cycles in their frequency and amplitude because fluctuations in credit to output operate over the medium term, that is, beyond the business cycle frequency, with peak-to-trough cycles completed over the course of a decade or more. Finally, Drehmann, Borio and Tsatsaronis (2012) showed that the medium-term component of fluctuations is more important in the joint behavior of credit and property prices than GDP.

With reference to our real and credit series, we provide some evidence of the role played by medium-term fluctuations in our data. Following Aikman, Haldane and Nelson (2015), we compute the spectral density of GDP and the credit series available to us. This analysis, based on a simple tool, evaluates the weight of the fluctuations at different frequencies in accounting for variability (variance) over time of our series. However, spectral analysis requires a stationary process, and this raises the issue of detrending, which, as mentioned above, is not irrelevant for the cyclical properties of resulting series. As is standard in the literature, we analyze the spectrum of difference-stationary series (growth rates) in order to emphasize the differences in the cyclical properties of real and credit variables, bearing in mind that our cyclical dating is drawn from the (log) level of the series.[10]

Figure 1 plots the estimates of the spectral density of growth rates of GDP and the credit series. The horizontal axis shows the frequency, (ϕ), normalized between 0 and 1, and the vertical axis shows the weight of each frequency. A roughly flat spectrum means that every frequency contributes to the variance of the series (absence of cycles), whereas when a specific frequency or range of frequencies accounts for the spectrum more than others, it features a peak at those frequencies, which defines the period of the underlying cycle.

Despite the limited sample size, the spectral density is suggestive of the empirical relevance of medium-term variations in our series. In all cases, peaks lie close to zero frequency, which implies the presence of long-lasting cyclical components, while the contribution of short cycles is generally very low. In particular, the peak in GDP spectrum is

[9] In a growth cycle approach, short-term cycles are those lasting up to 8 years, while medium cycles are those lasting between 8 and 50 years (Comin and Gertler 2006).

[10] A useful reference in the case of historical time series is A'Hearn and Woitek (2001). As a robustness check, we also carried out an analysis on the transformed binary series of expansions and recessions, which are stationary, although in this case, the periodicity of fluctuations is partly imposed by construction. The results confirm the main results of the growth rate analysis.

at frequency ϕ=0.17, which entails a period of $2(\pi)/\phi$ =13 years.[11] Overall, credit variables show even longer cyclical components, with peaks in the spectra at frequencies less than 0.1. In these cases, the main cyclical components are all about 30-35 years.

From this preliminary analysis of cyclical properties, three main regularities emerge. First and foremost, long-lasting fluctuations are the main cyclical component in our annual centenarian time series in both real and financial series, and they are much longer than those studied in standard business cycle analysis. This evidence underlies our focus on medium-term cycles along with the usual business cycles. Second, business and financial cycles feature different cyclical regularities. Credit fluctuations are generally longer than business cycles, and the contribution of shorter fluctuations, 4 years or less (ϕ=0.5 or more), is modest compared with GDP fluctuations. Third, public debt holdings by banks plausibly respond to different (shorter-term) investment needs compared with loans, and this is reflected in a very peculiar pattern in their cyclical fluctuations.

4. Business and credit cycles dating

4.1. The business cycle

Table 1 reports the main cyclical features of the Italian business cycle over the period 1861-2013. Medium cycles range from 4 to 68 years, while short cycles last between 3 and 35 years. Upturns are generally much longer than downturns, both in the short term and the medium term: expansions last up to 62 years, as in the post-WWII cycle, while recessions do not exceed 6 years. While there is no clear tendency in medium-cycle duration, it seems that the length of the short cycles has increased, as witnessed by the fact that in the 80 years before WWII, the Italian economy went through 12 different cycles, but only five in the next 70 years.

The first medium cycle runs from 1866 to the year prior to the outbreak of World War I, with a minimum peak in 1872 and an expansion lasting until 1913. In the period considered, there is a huge potential for growth: during the 41 years of expansion (1872-1913), real GDP grew by 107% at an annual rate of 1.8%. This growth shows surprising stability when analyzed in terms of the five short cycles that make up this long period. Finally, the average intensity of downturn, less than 1%, is the lowest value recorded over all the medium cycles examined.

The second historical period, which includes medium cycles 2, 3, and 4, is particularly complex for a number of reasons such as the economic effects of World War I, the rise of fascism, the spread of the Great Depression, and the massive intervention of the government in the economy. All of these factors undermined the credibility of the gold standard and affected capital and trade flows. The duration of the cycles is reduced and their slopes (downturns and upturns alike) become more violent.

Medium cycle 5 (1939-2007) starts with the deepest recession in our history, as a consequence of the massive destruction of capital and labor during WWII (the GDP fell by 44% in 1939-1945, short cycle 13). However, the most striking evidence about medium

[11] We neglect the peak at zero frequency, because it simply refers to the variance of the white noise error term (stationary) of the differenced I(1) component of the series (Cochrane 1988).

cycle 5 is the exceptional expansion (1945-2007) that began at the end of World War II and continued for 62 years, during which time real GDP grew by 15 times at an average annual rate of 4.6% (Table 1).

Of course, several interruptions to GDP growth occurred during this period, although consistent with our definition of a medium cycle, none of them signified a medium-cycle turning point. None of the recorded recessions, the oil recession of 1974-1975, the 1992-1993 financial crisis, and the 2002-2003 stagnation, lasted for more than 1 year.

Relevant political events and real and financial aspects interacted to shape this very long cyclical phase. Clementi, Gallegati and Gallegati (2015) find that two structural breaks occur, in 1974 and 2001, in GDP growth, which coincide with turning points of our dating (short cycles 14 and 16). The first break put an end to the strong recovery that began with the postwar capital reconstruction (short cycle 13), supported by substantial international aid, which had led to the so-called "economic miracle." After the oil recession, the Italian economy experienced two long-lasting expansionary phases (of 17 and 9 years, respectively, short cycles 14 and 15), although at a slower pace of growth.[12] During these years, a steep increase in the debt-to-GDP ratio commenced, leading to debt-fueled growth, which was followed, after the currency crisis of 1992, by a restrictive fiscal stance, with a large primary surplus but also stagnant economic performance.

Hence, what has really shaped this unusually long-lasting medium-term expansion is not an exceptional rate of growth (apart from short cycle 13), but rather the unusually short-lived recessions, to which further research should be devoted. The joint interaction of fiscal and monetary policies and the active role of the central bank and the government in stabilizing the economy provide a possible explanation, especially during the years preceding the austerity plans introduced by the European Monetary Union (early to mid-1990s). The role of fiscal policy was completely different in the early 1990s, when Italian governments were strongly committed to pursuing primary surpluses following the currency crisis of 1992, although once again, the devaluation of the lira helped the recovery by raising foreign demand. In the early years of the 21st century, there was no support from either fiscal or monetary policy to mitigate the impact of the recession experienced in 2001-2002; therefore, a further explanation of the brief duration of the recessions recorded during the period 1945-2007 might be the role of wealth effects originating from real and/or financial assets, since during the entire period of 1950-2007 private consumption contributed about 60% to GDP growth, more if we exclude the period 1950-1974. This issue is certainly worthy of further investigation because, as we note in the next section, while this long period of expansion occurred, some medium-term contractions adversely affected the financial side of the economy.

4.2. The credit cycle

In Table 2, we summarize the cyclical properties of bank lending to the economy, while Figure 2 plots the level of the series along with turning-point years. In the figure, the shaded parts correspond to the periods of recession in economic activity as calculated by GDP medium cycles. Credit medium cycles range from 17 to 40 years, while short cycles

[12] Battilossi, Foreman-Peck and Kling (2010) finds evidence of a recession in the early 1980s, although using a growth cycle approach.

last between 2 and 15 years, except for short cycle 12, which includes WWII, after which an exceptionally long credit expansion commenced (1945-1973).

Cycle characteristics have been quite homogeneous over the examined period, although the intensity of the downturns in medium cycles seems to have declined since the 1970s. In medium cycles, the duration of the contraction phase (downturn) is always shorter than that of the expansionary one, and similar evidence emerges in relation to amplitude and slope. However, when looking at the short cycles, there are some exceptions to these regularities (namely short cycles 3, 4, 10, 11, 13 and 14).

The first medium bank lending cycle, 1888-1913, is quite procyclical, and therefore consistent with the medium GDP cycle of 1866-1913, with an increase in total loans of 130% and GDP growth of about 107%. To better understand the dynamics of the credit cycle during this period, it is important to consider the effect of the gold standard on interest rates and international investments (Fenoaltea 2006; Bloomfield 1968). In Italy, the gold standard was resumed in 1883, and together with a better organization of the financial system thanks to the new banking law of 1874, it had a positive impact on the inflow of foreign capital, which financed an important surge in economic growth, especially in the construction sector (James and O'Rourke 2013). In addition, during this medium cycle, a major reform of the banking system, in 1893, followed the Banca Romana scandal, and allowed to cope with the bail-out of two largest commercial banks, Credito Mobiliare and Banca Generale, failed in 1893 and 1894, respectively. The reform reduced the number of issuing banks from six to three and led to the foundation of the Bank of Italy, which had a monopoly over note issuing, together with Banco di Napoli and Banco di Sicilia. Later, with the 1926 banking law, the Bank of Italy gained the monopoly of issue (Gigliobianco 2006).

Medium cycle 2 lasts from 1913 to 1933, and includes only two short cycles. This period shows an increased amplitude in both contractions and expansions of total loans. In the 15 years of upturn from the end of World War I to 1933, the average annual growth rate of credit to the economy was 10%. The requirements of war and reconstruction between the two wars prompted a substantial injection of credit into the economy, in particular to firms which, in various phases of the First World War and the fascist period, were able to increase their profit margins.

During medium cycles 1 and 2 (Table 2), the prevailing bank business model was a relationship model, the so called "banca mista" (universal banks). It is likely that this model contributed to shaping the credit cycle. In particular, relationship lending alleviated credit constraints during the period of the Great Depression, as can clearly be seen from medium cycle 2 and short cycle 9. These results are in line with the main finding in the international literature on banking relationships over the credit cycle, namely that firm-bank relationships provide continued access to finance during downturn phases (Battilossi 2000; D'Auria, Foglia and Marullo Reedtz 1999).

The beginning of medium cycle 3 corresponds with an important change in banks' lending practices, that is, the end of "banca mista" and the 1931-1936 banking reform that established a distinction between short-term and long-term credit institutions as a consequence of the financial and economic crisis of the early 1930s (Bartoletto and Garofalo 2014; Barbiellini Amidei, Giordano and Gigliobianco 2012). In 1931, the Istituto Mobiliare Italiano (IMI) was created. This was a state-owned credit institution specializing in the provision of long-term credit to industry. After the establishment of the Institute for

Industrial Reconstruction (IRI) in 1933, the state took control of the major banks and a significant proportion of the industrial system.

Interestingly, the medium cycle is characterized by three strong credit contractions in 1933-1938 (short cycle 10), 1939-1940 (short cycle 11), and 1941-1945 (short cycle 12), followed by a very long expansionary phase in 1945-1973. The first two credit contractions were more intense than the corresponding expansion, while the third, which occurred during World War II, as is clearly shown in Figure 2, was the most intense contraction of the last 150 years. The decline averaged more than 30% per year over the 4-year period.

After the WWII, there was a long phase of 25 years of upturns (short cycle 12). We should consider that the institutional reform of the financial system might have contributed to this economic boom (see Table 1). Battilossi, Gigliobianco and Marinelli (2013), among others, argue that the Italian banks supported the real economy effectively in the period 1948-1970 when industrial production increased annually by about 8% and Italy joined more advanced economies, recording the highest growth rates of loans to GDP in Italy's history (6.9% per year on average).

The medium cycle during the period 1973-1993 is characterized by rather divergent fiscal and monetary policies. On one hand, nominal income grew, driven by public spending, consumption, and inflation, while on the other hand, monetary policy, which was based on the intermediate target of total domestic credit, became restrictive. In the context of wage indexation to prices and strong depreciation of the lira, governments have continued to create budget deficits pushing consumption and inflation. Comparing Tables 1 and 2, it appears that during this medium cycle, a negative comovement between credit and economic activity prevailed. As already noted in Section 4.1, apart from the 1975 recession, GDP had been growing steadily since 1945. Conversely, short credit cycles 13, 14 and 15 showed sharp loan contractions during the period 1973-1978 (with the exception of 1976) and 1979-1982.

There were two reasons for the contraction in the stock of real credit experienced during the period of 1973-1982: first, the administrative controls on credit expansion, and second, the very strong rise in prices. The credit ceiling was in place from 1973 to 1975, and then, after a suspension during the period March 1975-October 1976, a new ceiling for private sector loans was in place until 1983.

The last medium cycle (1993-2010) is characterized by an initial sharp contraction of credit during the period 1993-1996, a particularly fragile period for the Italian economy, which faced the imminent establishment of the Eurozone, along with a crisis linked to fiscal imbalance and the exchange-inflation relationship. Moreover, during this period, the Italian banking system was affected by massive losses from loans stemming from the deterioration of corporate finances in 1992 and 1993 and the long stagnation of the southern economy following the termination of the program of extraordinary measures for this area.

The beginning of credit cycle 5 corresponds with another important reform of the banks' business model, namely the 1993 banking law (Testo Unico Bancario), which prescribed the elimination of any distinction between short-term and long-term credit institutions and a return to a universal banking model. Thanks to the significant reforms introduced during the 1990s, the banking system succeeded in overcoming these difficulties, and in the following years of upturn, credit growth was excellent, with an average of 5% per year (Ciocca 2000; Messori 2002).

4.3. Public debt held by banks and bank claims on the economy

The credit cycle discussed in the previous section overlooks an important channel through which banks provide credit to the economy, namely the subscription of government bonds.[13] In advanced economies, banks often have sizeable exposures to the home sovereign, and generally have a strong home bias in their sovereign portfolios. Moreover, holdings of domestic government bonds as a percentage of bank capital tend to be larger in countries with high levels of public debt (CGFS 2011). Figure 3 shows the share of governments bonds in banks' balance sheets and the weight of government bonds with respect to other bonds.

There are a number of incentives for banks to operate with massive investments in government bonds, the main one being that because of the official nature of the issuer, sovereign obligations have traditionally been considered as risk-free assets, at least until recently. The subscription of government bonds was one of the main areas of investment banking during the first half of the nineteenth century, along with the financing of railway construction and industrial activities.

Banks also hold large amounts of government debt on their balance sheets as liquid assets and collateral. In Italy, domestic banks have always held a considerable fraction of total public debt,[14] even though interest rates on government assets have generally been lower than those on other assets.

Table 3 presents the cyclical features of the time series of the banks' public debt holdings. First, as stressed by the spectral density analysis in Section 3.2, we observe that the number of cycles, both medium and short, increases compared with that of bank loans. We identify 23 short cycles and 10 medium cycles. Second, before WWII, increases in bank loans to the state are hardly related to periods of growth of public debt and they reflect market and portofolio strategies, as well as the impact of political and administrative controls, as documented in previous section.

Table 4 shows the cyclical properties of the banks' claims on the economy. The series differs from that commented on Table 2 because here, credit includes government bonds held by the banking system. The two series are almost perfectly synchronized, especially with regard to the medium cycles, but with some major differences. First, the credit downturn in the 1970s is much shorter, since the crunch only commences in 1980 (bank loans to the private sector declined in 1974) during the second oil shock. Moreover, contrary to Table 2, here, upturn phases are always longer than contraction phases, with the only exceptions being the short-term contractions during WWI (short cycle 6) and the Great Depression (short cycle 9).

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[13] Since we are talking about the behavior of private banks, we do not refer to the subscription of government bonds by monetary authorities, which brings about a creation of money (monetary base). This distinction, which is quite obvious nowadays, is to be made with reference to the first decades after unification, when relevant shares of credit to the economy and the state came from banks of issue, which also operated as private banks, even though they were only entitled to issue money (Confalonieri 1974).

[14] International comparisons are available only for recent times. According to ECB data, in 1999, 10.5% of Italian banks' assets were Italian government bonds, a much higher share than the average of Eurozone banks (5.2%). After some years of decline, this share rose again during the financial crisis: in 2013, these shares were 10.0 and 4.3%, respectively (Affinito, Albareto and Santioni 2016).

4.4. Evidence of crowding out of loans

In this section, we explore the relationship between holdings of public bonds and bank loans on banks' balance sheets over different credit cycles. We are aware that with few time series available, it is practically impossible to disentangle the different mechanisms underlying the demand for public bonds and the credit supply by banks. For instance, during periods of crisis, investment opportunities – the demand for corporate loans – might contract and so lead banks to increase their holdings of sovereign debt. To demonstrate that sovereign debt on banks' balance sheets crowds out corporate credit, we should show a contraction in the banks' credit supply to corporate borrowers (Becker and Ivashina 2014), not simply a drop in credit stock. However, due to limits on the available data, we can only investigate the relationship between bank credit and public bonds on banks' balance sheets over the credit cycles.

Comparing annual growth rates of holdings of public bonds during credit recessions over medium cycles (Table 5), a clear pattern emerges: holdings of public bonds increase during credit recessions, especially in the post-WWII era, starting from the 1970s, when the increase of public bonds almost offsets the drop in loans (although the share of public bonds is much smaller than that of loans on banks' balance sheets). This phenomenon is remarkable in the recent crisis (2010-2013), with the largest decline in total loans since the end of World War II (–3.4% per year[15]) and a striking annual growth rate in public bonds (21%). Thus, the recent financial crisis has been accompanied by a strong increase in the weight of public securities in banks' portfolios, bringing the share of government bonds in total assets in the banking system to more than 10% in 2014 (see Affinito, Albareto and Santioni 2016).

This effect is less evident before 1945, mainly because two of the three credit recessions coincide with war periods, and in these extreme circumstances credit is tightened and governments mainly resort to seigniorage to finance debt. On the contrary, in normal times (1888-1891), bond holdings by banks actually increased.

To overcome the confounding influences in times of war, we measure correlations in annual growth rates of credit and public bonds during the same credit recessions (Table 6). By so doing, we are measuring the year-by-year correlation, rather than comparing the overall change over a medium cycle, and the war years carry a lower weight. Although the correlation over the whole period 1861-2013 is positive (0.28), it becomes strongly negative in the postwar era with an increasing trend. The correlation is positive in the pre-WWII period, and also during the 1888-1891 recession. This result seems to suggest that crowding out is mainly a recent phenomenon. During a recession, crowding out could be the result of a "flight to quality" by banks, which substitute increasingly risky credit with safer government bonds. In an attempt to isolate this effect, we compare credit and public bond dynamics during expansions in medium cycles of public bonds, which are not necessarily periods of credit downturns. Growth rates (peak to trough) are compared with growth rates in bank loans in the same years. Figure 4 shows a negative correlation (–0.31): when holdings of public bonds increase, the credit sector slows down.

[15] It is worthwhile recalling that we are talking about a drop in real terms.

5. Empirical results

5.1. Business and credit cycles: evidence of synchronization

Having defined the cycle in terms of the turning points of a series, this section uses parametric and nonparametric methods to assess the degree of synchronization between credit aggregates and GDP cycles (short and medium) by using the concept of *concordance* defined by Harding and Pagan (2002, 2006) and other correlation measures.

To examine the extent of synchronization across cycles, we use different indexes. First, we use the concordance index (CI) developed by Harding and Pagan (2002, 2006). Two series are perfectly procyclical (countercyclical) if the index is equal to unity (zero). However, Harding and Pagan suggest to examine jointly the expected concordance index (E(CI)) and the CI: an actual concordance that is higher than the expected one indicates procyclicality, while a lower concordance indicates countercyclicality.

The concordance index is linked to other measures of synchronization such as the common (Pearson's) coefficient correlation, that, according to Harding and Pagan (2006) can be estimated in regression-based approach, providing a standard error for the significance of correlation.

Finally, we deal with the corrected contingency coefficient (CC) suggested by Artis, Kontolemis and Osborne (1997), which lies between 0 and 100 and is equal to 0 in the case of independence and 100 in the case of perfect association. In our context, independence indicates that there is no contemporaneous relationship between the two cycles.

Table 7 (column a) reports the unconditional concordance (CI), the expected concordance index (E(CI)), the corrected contingent coefficient (CC), and the Pearson's correlation among credit and GDP cycles.

Table 7 lists a number of elements that deserve attention.

First, loans are pro-cyclical and there is some synchronization between total loans and GDP for both short-term and medium-term cycles. The concordance index, which is, respectively, 0.73 and 0.75, being higher than their expected values (0.64 and 0.68) implies procyclicality.

Second, bank claims on the economy comove with the business cycle more than do bank loans, both in the short and medium cycles.

Third, looking at the contingency index CC, the Table shows that in the medium cycles, bank loans and bank claims on the economy are significantly synchronized with the business cycle, but the correlation is only significant for bank claims on the economy. On the contrary, in the short cycles, the CC and correlations are strongly significant for both credit aggregates.

Finally, Table 7 also shows correlations between GDP and the other variables 1 year earlier (t-1) and 1 year ahead (t+1). In the medium cycles, they are generally lower than the contemporaneous ones, and no lead/lag relationship arises between GDP and credit. However, in the short cycles, bank claims on the economy show a very significant and higher correlation with past GDP, which means that GDP leads this broader credit aggregate.

Synchronization has been also assessed for two sub-periods, 1861-1939 (Table 7, column b) and 1939-2013 (Table 7, column c), where the threshold year 1939 comes from GDP turning points. This time split turns out to be very informative about how synchronization between real and financial cycles has changed over time. Although the degree of concordance is similar between the two periods, the CC and correlation between the credit and business cycles in both medium and short cycles are much stronger and more significant in recent decades.

This time-increasing interaction between credit and business cycles is consistent with the process of financial deepening of the main advanced economies (including Italy), where the weight of credit markets (and financial markets) with respect to the real side of the economy has displayed a growing trend in the post-WWII era.

5.2. GDP and loans: a Granger causality analysis

In this section, we explore the dynamic relationship between credit and real activity and ask whether downturns in loans Granger cause future declines in GDP, or instead whether cyclical credit activity is Granger caused by the business cycle. To the best of our knowledge, despite the importance this issue might assume in light of the present crisis, these questions have rarely been asked in classical analyses of the business cycle, and few studies have addressed them (Haavio 2012). Instead of the usual linear specification, we use a logit regression, the cycle being a binary variable (1 for expansion, 0 for recession as so far across the paper). Moreover, we use only one lag, which is the specification that minimizes the AIC/BIC information criteria. Standard errors are robust to account for autocorrelations of residuals. The regressions are as follows, estimated by ML estimator as usual:

$$GDP_t=F[\zeta+\alpha GDP_{t-1}+\beta(\text{credit variable})_{t-1}]+\varepsilon_t \quad (1)$$

$$(\text{credit variable})_t = F[\theta + \delta(\text{credit variable})_{t-1} + \gamma\, GDP_{t-1}] + \varepsilon_t, \quad (2)$$

where F[ ] is a logit link function and GDP and credit variables are the cyclical components (as derived in Section 4) of GDP, bank loans and bank claims on the economy, respectively.

The pairwise Granger causality tests are shown in Table 8. Along with the estimated coefficients, when they are significant, we also report the marginal effects (MEs).

The pairwise Granger causality tests basically provide support for the results reported in Table 7. In the medium cycles, there is no causality in both directions between credit and the business cycle. However, in the short cycles, the probability of upturns in credit is significantly increased by a turn in the business cycle, although the reverse is not true. In particular when GDP turns from recession to expansion, the probability of an expansionary credit phase increases by 26 percentage points with regard to bank loans and by 37 percentage points in relation to the bank claims on the economy.

This evidence agrees with the earlier correlation analysis and other studies, according to which, especially in the post-WWII era, GDP leads bank credit (EBF 2011; ECB 2012), at least at the usual business cycle frequencies (our short cycle).

This result warrants comment. First, it is not surprising that causality relationships depend on the definition of the cycle and on the frequency of fluctuations. From a purely statistical point of view, as shown by Granger and Lin (1995), intensity of causation changes

at different frequencies: medium and short cycles fluctuate at different frequencies and the constructed (cyclical) binary variables interact differently with each other at different frequencies.

Second, the evidence of GDP leading bank credit in short cycles implies that during the period examined, episodes of financial distress have not shaped the Italian business cycle. Our evidence about synchronization and Granger causality in short cycles is broadly consistent with the financial accelerator scheme, where financial frictions amplify and propagate shocks in macroeconomic fundamentals rather than triggering business cycle movement. In other words, the initial driving force of movements in economic activities are non-financial factors (see amongst others, Quadrini 2011 and Viziniuc 2015). From this perspective, credit must lag behind the GDP turning points.

Finally, we propose an economic rationale underlying the lack of causality between credit and growth in the medium cycles in line with the results about correlation discussed in the previous section. It is likely that medium credit cycles are brought about and driven by structural changes in the banking and financial markets rather than by GDP fluctuations. The main example of this is the impact of the banking law of 1936, which improved the stability of the banking system through regulation and better banking supervision by the Bank of Italy, thereby contributing to stabilization of the credit cycle.

5.3. The impact of credit crunches on recessions

In this section, we investigate what happens when recessionary phases of credit and GDP are synchronized. Similar to Claessens, Kose and Terrones (2011) and Bordo and Haubrich (2010), we wonder whether coincidence of recessions makes recessions more intense. In Table 9, the unconditional probability of being in a downturn phase is 16% in the medium cycle and 20% in the short cycle. These percentages almost double (to 31 and 37%, respectively) under credit recession, and the effect is even stronger when bank claims on the economy are declining.

To appreciate the impact of a credit recession on an ongoing real recession, we now measure how much a credit downturn affects the deepness of a GDP recession. A simple test consists of estimating the average rate of GDP growth by adding appropriate dummies to control for years of: i) GDP recession; and ii) GDP recession and financial contraction. If we denote the yearly rate of GDP growth as g, the estimated equations are as follows:

$$g_t = a + bD\left(GDP_{recession}\right) + \varepsilon_t \tag{3}$$

$$g_t = a + bD\left(GDP_{recession}\right) + cD\left(GDP\ \&\ Financial_{recession}\right) + \varepsilon_t \tag{4}$$

where D( ) is an indicator variable that takes a value of 1 under the condition in parentheses (0 otherwise). We repeat the regression for both the short cycle (SC) and the medium cycle (MC), and in regression (7), we control for two different measures of the financial cycle: i) loans; and ii) bank claims on the economy. To control for autocorrelation of residuals, we provide robust standard errors using the Newey-West estimator.

In Table 10, the constant coefficient in the regression reported in columns (1) and (2) provides us with growth rates in expansions (3.5% in the MC and 3.9% in the SC). By adding the estimated coefficient for the dummy (row b), we can estimate the average growth rate in recessions: –7.4+3.5=–3.9 in MC and –7.8+3.9=–3.9 in SC. To appreciate the effect of financial contractions, we look at columns (3) and (4) and columns (5) and (6).

Now, the constant term still represents the growth rate in expansion, while the coefficient associated with "GDP recession" is the decline in the GDP growth rate in recession, conditional on the credit variable being in expansion (that is, the second dummy=0 in equation (7)). As expected, the estimated coefficient of the GDP recession falls compared with columns (1) and (2): if credit is not declining during a business cycle downturn, the recession is less intense. Conversely, and more importantly, when credit and real downturns coincide, GDP recessions are more severe. Consider column (4), when the negative effect of loans contraction is significant: GDP drops by 3.5–5.2–4.7=–6.4% (a+b+c), and the impact is even stronger when bank claims on the economy drop (–7.7%); this negative change is much higher than the unconditional growth rate in recession. Although still negative, the impact of financial turmoil is not significant during short cycle recessions (columns 3 and 5).

As Table 10 shows, only when we pay attention to medium-term frequencies we obtain that the coincidence of financial downturn and economic recession increases (significantly) output losses. The adverse effect of including the dummy "GDP and total loans recession" in the regression worsens the recession strongly, bringing the fall of the GDP growth rate from 1.7 to 6.4.

The estimates in Table 10 suggest two conclusions. First, the financial cycle can worsen economic downturns, but only when we look at medium term fluctuations, when downturns are associated with more severe credit crunches and financial disruption (Aikman, Haldane and Nelson 2015; Jorda, Schularick and Taylor 2012). Second, the broader the financial aggregate, the larger the effect on the business cycle. This suggests that when banks also restrict credit provision to the public sector, the effect of a credit crunch on the real economy is more intense.

6. Concluding remarks

In this paper, we investigated the link between business and credit cycles in Italy, over the period 1861-2013. We looked at both the standard business cycle frequencies and at longer fluctuations, and we paid special attention to medium-term frequencies, that identify the most significant events of financial turmoil and macroeconomic disruption. We defined short and medium cycles for GDP and several credit aggregates (total bank loans and bank claims on the economy, which includes bank holdings of public bonds).

Accordingly with Aikman, Haldane and Nelson (2015) and Drehmann, Borio and Tsatsaronis (2012), we show that long-lasting fluctuations are the main cyclical component of the business and notably financial cycles.

At the usual business cycle frequencies, all measures of comovement are significant for all credit aggregates. On the contrary, in the medium term, cycles in bank loans appear to be weakly associated with business cycles. However, comovement increases and measures

become significant when the broader aggregate of bank claims on the economy (including public bonds held by banks) is taken into account.

The fact that credit and business cycles are weakly synchronized is only an apparent contradiction. In fact, two cycles may be weakly synchronized and still influence each other: when their negative phases overlap, as in the recent crisis and in a few other cases in the past, the recession is deeper.

As a matter of fact, the most interesting result is about the relationship between the GDP growth rate during recessions and medium term financial cycles. The coincidence with a credit downturn worsens the recession strongly, bringing the fall of the GDP growth rate from 1.7 to 6.4 and peaking to –7.7% when broad credit aggregate is taken into account.

Finally, we do not find evidence that credit leads the business cycle, both in the medium and the short fluctuations. On the contrary, in the short cycle, we find some evidence that the business cycle leads the credit cycle. A causality analysis performed using logit regressions confirms that GDP Granger causes credit in short cycles and that the impact in terms of probability is large and increasing with the credit aggregate. In particular, when GDP turns from recession to expansion, the probability of an expansionary credit phase increases by 26 percentage points with regard to credit and by 37 percentage points in relation to the bank claims on the economy.

Tables and Figures

Table 1.
GDP (2005 prices) and basic features of medium and short cycles

Cycles	Turning Points			Duration (years) (1)			Amplitude (2)		Slope (3)	
	Peak 1	Peak 2	Trough	Downturns	Upturns	Cycle	Downturns	Upturns	Downturns	Upturns
Medium Cycle 1	**1866**	**1913**	**1872**	**6**	**41**	**47**	**-4.1**	**106.9**	**-0.7**	**1.8**
short 1	1866	1870	1867	1	3	4	-7.8	7.5	-7.8	2.4
short 2	1870	1875	1872	2	3	5	-3.2	6.7	-1.6	2.2
short 3	1875	1883	1876	1	7	8	-1.9	15.6	-1.9	2.1
short 4	1883	1888	1884	1	4	5	-0.8	9.1	-0.8	2.2
short 5	1888	1913	1889	1	24	25	-2.5	62.3	-2.5	2.0
Medium Cycle 2	**1913**	**1917**	**1915**	**2**	**2**	**4**	**-8.9**	**9.5**	**-4.5**	**4.6**
short 6	1913	1917	1915	2	2	4	-8.9	9.5	-4.5	4.6
Medium Cycle 3	**1917**	**1929**	**1921**	**4**	**8**	**12**	**-9.0**	**43.7**	**-2.3**	**4.6**
short 7	1917	1920	1919	2	1	3	-8.7	2.7	-4.4	2.7
short 8	1920	1926	1921	1	5	6	-2.9	31.2	-2.9	5.6
short 9	1926	1929	1927	1	2	3	-1.9	11.6	-1.9	5.7
Medium Cycle 4	**1929**	**1939**	**1931**	**2**	**8**	**10**	**-5.7**	**23.0**	**-2.9**	**2.6**
short 10	1929	1932	1931	2	1	3	-5.7	2.1	-2.9	2.1
short 11	1932	1935	1934	2	1	3	-1.4	5.4	-0.7	5.4
short 12	1935	1939	1936	1	3	4	-3.5	20.1	-3.5	6.3
Medium Cycle 5	**1939**	**2007**	**1945**	**6**	**62**	**68**	**-43.9**	**1522.3**	**-9.2**	**4.6**
short 13	1939	1974	1945	6	29	35	-43.9	721.9	-9.2	7.5
short 14	1974	1992	1975	1	17	18	-2.1	61.3	-2.1	2.9
short 15	1992	2002	1993	1	9	10	-0.9	18.2	-0.9	1.9
short 16	2002	2007	2003	1	4	5	0.0	6.7	0.0	1.6
Medium Cycle 6	**2007**	**2011**	**2009**	**2**	**2**	**4**	**-6.6**	**2.2**	**-3.3**	**1.1**
short 17	2007	2011	2009	2	2	4	-6.6	2.2	-3.3	1.1

Sources: see Section 3.1 and 4.1. Notes: (1) The duration of the full cycle is measured from peak to peak. (2) Percentage change from trough to peak (downturns) of peak to trough (upturns). (3) The slope is the average (geometric) growth rate in the phase.

Table 2.
Bank loans (2005 prices); basic features of medium and short cycles

Cycles	Turning Points			Duration (years) (1)			Amplitude (2)		Slope (3)	
	Peak 1	Peak 2	Trough	Downturns	Upturns	Cycle	Downturns	Upturns	Downturns	Upturns
short 1	1872	1879	1873	1	6	7	-13.2	79.6	-13.2	10.2
short 2	1879	1888	1880	1	8	9	-1.7	125.1	-1.7	10.7
Medium Cycle 1	**1888**	**1913**	**1891**	**3**	**22**	**25**	**-14.9**	**129.6**	**-5.2**	**3.8**
short 3	1888	1892	1891	3	1	4	-14.9	8.4	-5.2	8.4
short 4	1892	1897	1895	3	2	5	-5.0	0.8	-1.7	0.4
short 5	1897	1906	1898	1	8	9	-3.0	66.9	-3.0	6.6
short 6	1906	1910	1907	1	3	4	-1.2	30.2	-1.2	9.2
short 7	1910	1913	1911	1	2	3	-0.5	6.8	-0.5	3.3
Medium Cycle 2	**1913**	**1933**	**1918**	**5**	**15**	**20**	**-41.1**	**319.1**	**-10.0**	**10.0**
short 8	1913	1924	1918	5	6	11	-41.1	108.7	-10.0	13.0
short 9	1924	1933	1925	1	8	9	-3.3	107.8	-3.3	9.6
Medium Cycle 3	**1933**	**1973**	**1945**	**12**	**28**	**40**	**-81.3**	**3697.7**	**-13.0**	**13.9**
short 10	1933	1939	1938	5	1	6	-20.8	6.7	-4.6	6.7
short 11	1939	1941	1940	1	1	2	-6.5	3.0	-6.5	3.0
short 12	1941	1973	1945	4	28	32	-77.0	3697.7	-30.8	13.9
Medium Cycle 4	**1973**	**1993**	**1982**	**9**	**11**	**20**	**-16.0**	**77.8**	**-1.9**	**5.4**
short 13	1973	1976	1975	2	1	3	-3.9	1.6	-2.0	1.6
short 14	1976	1979	1978	2	1	3	-7.1	2.4	-3.6	2.4
short 15	1979	1993	1982	3	11	14	-9.6	77.8	-3.3	5.4
Medium Cycle 5	**1993**	**2010**	**1996**	**3**	**14**	**17**	**-5.5**	**99.4**	**-1.9**	**5.1**
short 16	1993	2008	1996	3	12	15	-5.5	93.3	-1.9	5.6
short 17	2008	2010	2009	1	1	2	-3.5	6.9	-3.5	6.9

Sources: see Section 3.1 and 4.2. Notes: (1) The duration of the full cycle is measured from peak to peak. (2) Percentage change from trough to peak (downturns) of peak to trough (upturns). (3) The slope is the average (geometric) growth rate in the phase.

Table 3.
Public bonds held by banks (2005 prices); basic features of medium and short cycles

Cycles	Turning Points			Duration (years) (1)			Amplitude (2)		Slope (3)	
	Peak 1	Peak 2	Trough	Downturns	Upturns	Cycle	Downturns	Upturns	Downturns	Upturns
short 1	1869	1873	1870	1	3	4	-25.7	114.6	-25.7	29.0
short 2	1873	1884	1874	1	10	11	-3.5	334.2	-3.5	15.8
short 3	1884	1889	1885	1	4	5	-3.4	34.2	-3.4	7.6
short 4	1889	1902	1890	1	12	13	-5.3	110.4	-5.3	6.4
short 5	1902	1905	1903	1	2	3	-1.0	14.6	-1.0	7.1
Medium Cycle 1	**1905**	**1909**	**1907**	**2**	**2**	**4**	**-8.5**	**9.7**	**-4.3**	**4.7**
short 6	1905	1909	1907	2	2	4	-8.5	9.7	-4.3	4.7
Medium Cycle 2	**1909**	**1934**	**1920**	**11**	**14**	**25**	**-45.5**	**348.5**	**-5.4**	**11.3**
short 7	1909	1914	1913	4	1	5	-9.1	0.7	-2.4	0.7
short 8	1914	1919	1918	4	1	5	-27.8	11.6	-7.8	11.6
short 9	1919	1924	1920	1	4	5	-26.2	43.7	-26.2	9.5
short 10	1924	1934	1925	1	9	10	-18.3	282.1	-18.3	16.1
Medium Cycle 3	**1934**	**1942**	**1938**	**4**	**4**	**8**	**-32.8**	**57.7**	**-9.5**	**12.1**
short 11	1934	1942	1938	4	4	8	-32.8	57.7	-9.5	12.1
Medium Cycle 4	**1942**	**1961**	**1947**	**5**	**14**	**19**	**-75.5**	**496.1**	**-24.5**	**13.6**
short 12	1942	1961	1947	5	14	19	-75.5	496.1	-24.5	13.6
Medium Cycle 5	**1961**	**1968**	**1964**	**3**	**4**	**7**	**-14.2**	**37.2**	**-5.0**	**8.2**
short 13	1961	1966	1964	3	2	5	-14.2	25.8	-5.0	12.2
short 14	1966	1968	1967	1	1	2	-2.2	11.5	-2.2	11.5
Medium Cycle 6	**1968**	**1979**	**1970**	**2**	**9**	**11**	**-11.8**	**367.9**	**-6.1**	**18.7**
short 15	1968	1973	1970	2	3	5	-11.8	60.0	-6.1	17.0
short 16	1973	1975	1974	1	1	2	-9.6	47.0	-9.6	47.0
short 17	1975	1979	1976	1	3	4	-18.1	168.5	-18.1	39.0
Medium Cycle 7	**1979**	**1985**	**1981**	**2**	**4**	**6**	**-14.3**	**43.9**	**-7.4**	**9.5**
short 18	1979	1983	1981	2	2	4	-14.3	39.1	-7.4	17.9
short 19	1983	1985	1984	1	1	2	-1.2	4.7	-1.2	4.7
Medium Cycle 8	**1985**	**1994**	**1990**	**5**	**4**	**9**	**-27.9**	**74.8**	**-6.3**	**15.0**
short 20	1985	1994	1990	5	4	9	-27.9	74.8	-6.3	15.0
Medium Cycle 9	**1994**	**1999**	**1997**	**3**	**2**	**5**	**-21.7**	**-0.9**	**-7.8**	**-0.5**
short 21	1994	1996	1995	1	1	2	-11.8	3.3	-11.8	3.3
short 22	1996	1999	1998	2	1	3	-18.6	4.6	-9.8	4.6
Medium Cycle 10	**1999**		**2004**	**5**			**-52.0**		**-13.7**	
short 23	1999	2006	2004	5	2	7	-52.0	23.5	-13.7	11.1

Sources: see Section 3.1 and 4.3. Notes: (1) The duration of the full cycle is measured from peak to peak. (2) Percentage change from trough to peak (downturns) of peak to trough (upturns). (3) The slope is the average (geometric) growth rate in the phase.

Table 4.
Bank claims on the economy (2005 prices); basic features of medium and short cycles

Cycles	Turning Points			Duration (years) (1)			Amplitude (2)		Slope (3)	
	Peak 1	Peak 2	Trough	Downturns	Upturns	Cycle	Downturns	Upturns	Downturns	Upturns
Medium Cycle 1	**1888**	**1913**	**1891**	**3**	**22**	**25**	**-11.1**	**124.8**	**-3.8**	**3.8**
short 1	1872	1888	1873	1	15	16	-9.9	314.4	-9.9	9.9
short 2	1888	1894	1891	3	3	6	-11.1	13.0	-3.8	4.2
short 3	1894	1906	1895	1	11	12	-1.6	60.8	-1.6	4.4
short 4	1906	1910	1907	1	3	4	-1.9	24.5	-1.9	7.6
short 5	1910	1913	1911	1	2	3	-1.9	4.9	-1.9	2.4
Medium Cycle 2	**1913**	**1933**	**1918**	**5**	**15**	**20**	**-38.3**	**304.4**	**-9.2**	**9.8**
short 6	1913	1919	1918	5	1	6	-38.3	30.1	-9.2	30.1
short 7	1919	1924	1920	1	4	5	-0.6	44.7	-0.6	9.7
short 8	1924	1933	1925	1	8	9	-5.6	129.1	-5.6	10.9
Medium Cycle 3	**1933**	**1941**	**1938**	**5**	**3**	**8**	**-22.9**	**10.9**	**-5.1**	**3.5**
short 9	1933	1939	1938	5	1	6	-22.9	6.0	-5.1	6.0
short 10	1939	1941	1940	1	1	2	-3.6	8.6	-3.6	8.6
Medium Cycle 4	**1941**	**1979**	**1945**	**4**	**34**	**38**	**-73.2**	**2887.3**	**-28.0**	**10.5**
short 11	1941	1973	1945	4	28	32	-73.2	2587.4	-28.0	12.5
short 12	1973	1975	1974	1	1	2	-3.6	3.2	-3.6	3.2
short 13	1975	1979	1976	1	3	4	-0.8	12.7	-0.8	4.1
Medium Cycle 6	**1979**	**1994**	**1981**	**2**	**13**	**15**	**-7.3**	**69.6**	**-3.7**	**4.1**
short 14	1979	1994	1981	2	13	15	-7.3	69.6	-3.7	4.1
Medium Cycle 7	**1994**	**2012**	**1996**	**2**	**16**	**18**	**-5.0**	**75.3**	**-2.5**	**3.6**
short 15	1994	2008	1996	2	12	14	-5.0	61.4	-2.5	4.1
short 16	2008	2010	2009	1	1	2	-1.2	8.6	-1.2	8.6
short 17	2010	2012	2011	1	1	2	-0.2	1.4	-0.2	1.4

Sources: see Section 3.1 and 4.3. Notes: (1) The duration of the full cycle is measured from peak to peak. (2) Percentage change from trough to peak (downturns) of peak to trough (upturns). (3) The slope is the average (geometric) growth rate in the phase.

Table 5.
Public bonds held by banks in credit recessions
(average annual growth rates (%); from peak from trough)

credit (loans) recessions	Total loans	Public bonds held by banks	Bank claims on the economy
1888-1891	-5.2	1.8	-3.8
1913-1918	-10.0	-6.2	-9.2
1933-1945	-13.0	-7.6	-11.6
1973-1982	-1.9	13.7	0.6
1993-1996	-1.9	0.7	-1.3
2010-2013	-3.4	21.0	-0.1

Table 6.
Public bonds held by banks in credit recessions
(correlation in annual growth rates (%))

credit recessions	correlation
pre-WWII	
1889-1891	0.47
1914-1918	0.23
1934-1945	0.64
post-WWII	
1974-1982	-0.56
1994-1996	-0.62
2011-2013	-0.73
overall	
1861-2013	0.28

Source: see Section 4.4.

Table 7.
Comovements of business and credit cycles 1861-2013: measures of synchronization with GDP

Periods	a) 1861-2013		b) 1861-1939		c) 1939-2013	
Measures of synchronization with GDP cycles	Total loans	Bank claims on the economy	Total loans	Bank claims on the economy	Total loans	Bank claims on the economy
	Medium cycle		*Medium cycle*		*Medium cycle*	
CI	0.75	0.80	0.71	0.73	0.80	0.88
E(CI)	0.68	0.74	0.70	0.71	0.66	0.78
CC	32.10***	31.90***	5.60	8.10	58.30***	58.80***
Correlation	0.20	0.23*	0.03	0.05	0.34*	0.47**
Correlation at t-1 (1)	0.21*	0.14				
Correlation at t+1 (2)	0.09	0.19				
	Short cycle		*Short cycle*		*Short cycle*	
CI	0.73	0.76	0.65	0.69	0.81	0.82
E(CI)	0.64	0.67	0.62	0.64	0.66	0.70
CC	35.20***	35.60***	11.70	18.80	59.10***	53.80***
Correlation	0.23**	0.25***	0.07	0.12	0.40**	0.40**
Correlation at t-1 (1)	0.10	0.18*				
Correlation at t+1 (2)	0.20**	0.33***				

Source: see Section 5.1. Notes: Business cycle is represented by real GDP cycle. CI=concordance index; E(CI)=expected concordance index; CC=corrected contingency coefficient. *, **, ***: significant at 10%, 5% and 1% respectively. (1) The variable is leading if this correlation is the highest; (2) The variable is lagging if this correlation is the highest.

Table 8.
Pairwise causality between credit and business cycles
(estimated coefficients)

Cycle	Bank loans	Bank claims on the economy
	From credit to GDP (β)	
Medium cycle	0.996	0.034
Short cycle	0.306	0.743
	From GDP to credit (γ)	
Medium cycle	-0.868	0.637
Short cycle	0.829*	1.596***
Marg. effect.	*0.260****	*0.370****

Source: see Section 5.2. Notes: Logit estimates; robust Newey s.e. for autocorrelation of residuals. The marginal effect (ME) is the change in probability of expansion when the predictor X goes from recession (X=0) to expansion (X=1). *, **, ***: significant at 10%, 5% and 1% respectively.

Table 9.
Probability of recession conditional on financial cycle phase

State of Financial Cycles	Medium Cycle	Short Cycle
	Probability of GDP Recession	
Bank Loans recession	0.31	0.37
Bank Loans expansion	0.11	0.14
Bank claims recession	0.36	0.39
Bank claims expansion	0.12	0.14
Unconditional probability	0.16	0.20

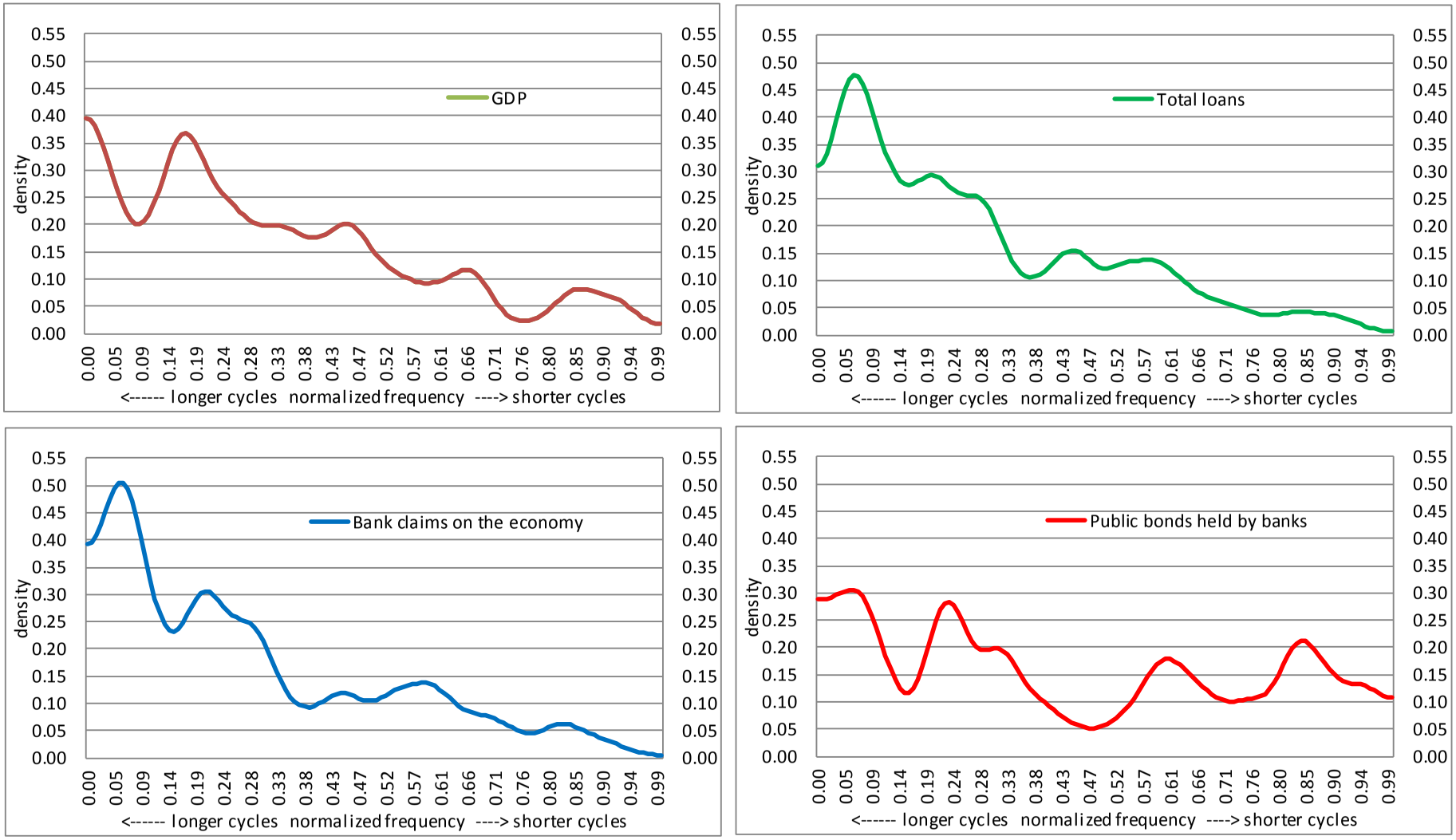
Source: see Section 5.3.

Table 10.
Impact of financial cycle on GDP growth rate in recessions

Dep. Variable: GDP growth rate	SC (1)	MC (2)	SC (3)	MC (4)	SC (5)	MC (6)
Const (a)	3.9***	3.5***	3.9***	3.5***	3.9***	3.5***
	(0.6)	*(0.5)*	*(0.6)*	*(0.5)*	*(0.6)*	*(0.5)*
GDP recession (b)	-7.8***	-7.4***	-6.2***	-5.2***	-7.0***	-5.9***
	(1.4)	*(1.8)*	*(0.8)*	*(0.9)*	*(1.1)*	*(1.8)*
GDP & Total loans recession (c)			-3.2	4.7**		
			(1.9)	*(2.3)*		
GDP & Bank claims recession (c)					-1.6	-5.3**
					(1.5)	*(2.3)*
Average GDP growth in recession (a+b)	-3.9	-3.9				
Average GDP growth in recession and credit expansion (a+b)			-2.3	-1.7	-3.1	-2.4
Average GDP growth in real and financial recession (a+b+c)			-5.5	-6.4	-4.7	-7.7

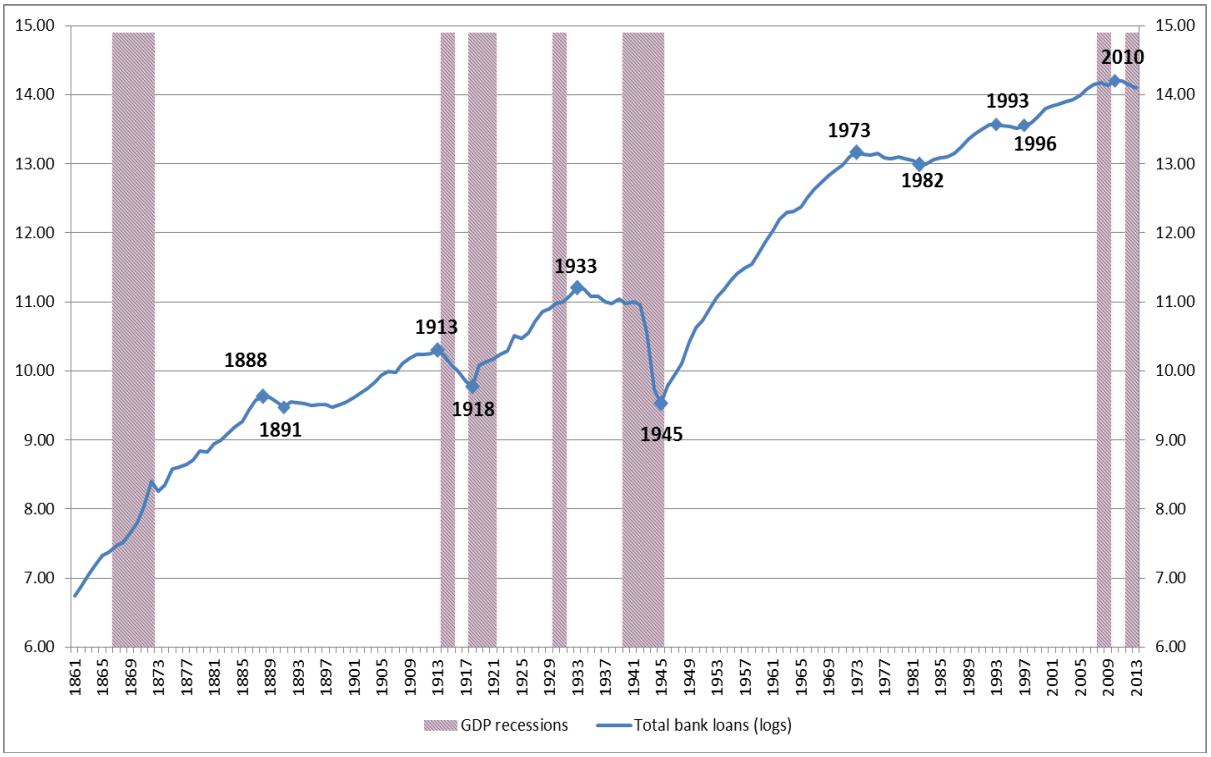
Source: see Section 5.3. Notes: standard error in parentheses, robust for autocorrelation of residuals (Newey-West correction). *, **, ***: significant at 10%, 5% and 1% respectively.

Figure 1.
Standardized spectral density (growth rates)



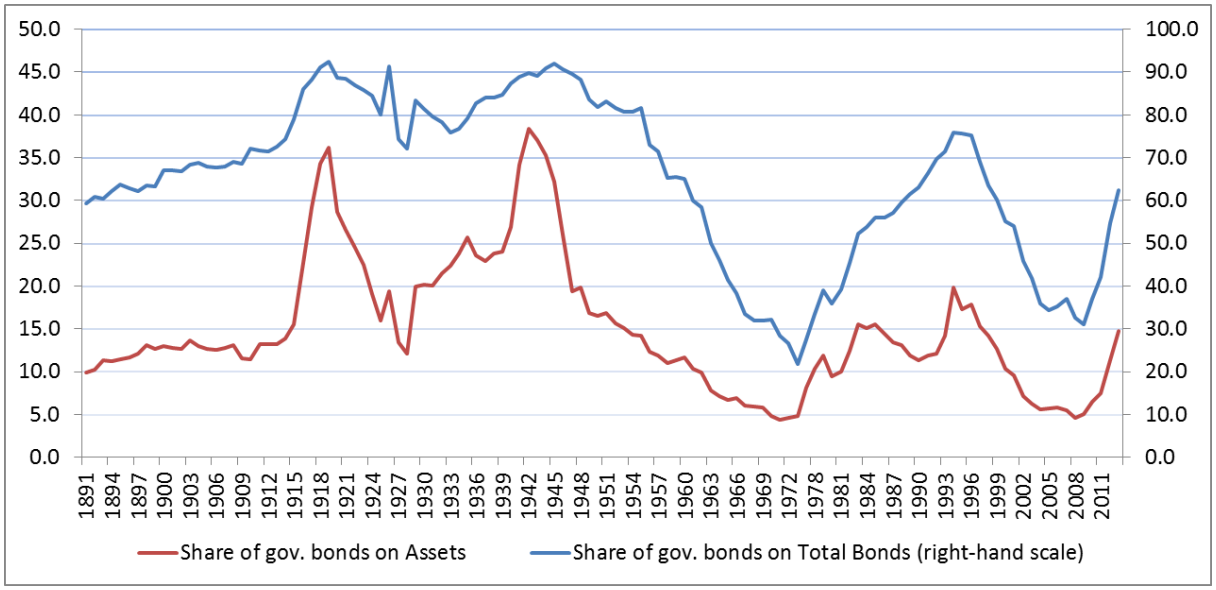
Source: see Section 3.2. Note: Standardized spectral density, obtained by smoothing the sample periodogram of growth rates. Smoothing with a Parzen window with lag parameter=35.

Figure 2.
The medium cycle of bank loans (2005 prices, logs) and GDP recessions, 1861-2013



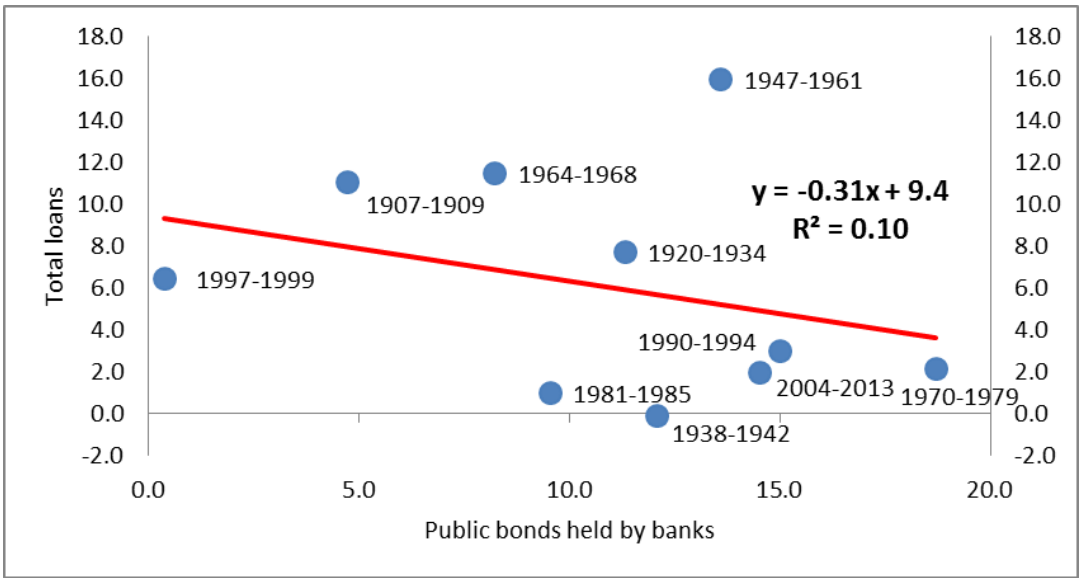
Source: see section 3.1.

Figure 3.
Holdings of public bonds by banks:
Share on Total assets and Total bonds
(percentages)



Source: Piselli and Vercelli (2017).

Figure 4.
Loans and holdings of public bonds components
during expansionary phases in public bonds held by banks
(average annual growth rates (%))



Source: see section 4.4.

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Appendix

A.1. The Italian business cycle: a comparison

In this work, we take real GDP as the representative variable for the business cycle, as this is common practice in the empirical literature and in other papers on Italian business cycles (Gallegati and Stanca 1998; Delli Gatti, Gallegati and Gallegati 2005; Baffigi, Bontempi and Golinelli 2013). Although there is no official dating to examine, because our dating procedure is new, and because of the length of the period studied, we compare our turning points to some of those found in the literature. Baffigi (2013) estimated peaks in Italian GDP over the last 150 years using the methodology introduced by Bai and Perron (1998, 2003). As a benchmark, he also drew up a list of business cycle peaks by combining the results of some previous studies on different periods. Clementi, Gallegati and Gallegati (2015) put forward a business cycle analysis based on Baffigi's (2013) reconstruction, but they identify turning points in the deviations from trend series (growth cycles). Finally, Jorda, Schularick and Taylor (2012) provide a classical dating of the Italian business cycle for the last 140 years using the Bry and Boschan (1971) algorithm, collecting data on GDP from different sources.[16] In contrast to our dating method, they use real GDP per capita to determine turning points in economic activity. In Table A.1, we contrast the peaks of these cycles with those of our short GDP cycles.

Although the combination of previous studies provides a large number of cycles (peaks in column 2), the most recent works over a long time span (column 3, 4, and 5) detect less cycle phases. In particular, we obtain the same numbers of peaks (17) as Jorda, Schularick and Taylor (2012), and roughly the same number as Clementi, Gallegati and Gallegati (2015), who found 18. In a few cases (3 out of 17 and 5 out of 18, respectively), our dating skips peaks pointed out in the other procedures. However, the distance (in terms of years) between the commonly identified peaks is often equal to zero (columns 6 and 7). Moreover, we do not anticipate or postpone the turning point systematically.

[16] As to the sources of data, Jorda, Schularick and Taylor (2012) refer to Schularick and Taylor (2012), who generically cite official statistical publications and the work of individual economic historians.

Table A.1.
Business cycle dating: a comparison of peaks

Short cycles (this work) (1)	Baffigi et al. (2013) (2)	Baffigi et al. (2013) (3)	Clementi et al. (2013) (4)	Jorda et al. (2012) (5)	Difference (1)-(4) (6)	Difference (1)-(5) (7)
	1862					
1866	1866	1867	1865		1	
1870	1870		1870	1870	0	0
1875	1874		1874	1874	1	1
	1878	1879				
1883	1883		1881	1883	2	0
1888	1887		1887	1887	1	1
	1891			1891		
	1896	1897		1897		
	1900					
	1907					
1913	1914	1913	1913		0	
1917	1918		1917	1918	0	-1
1920				1923		-3
1926	1925	1922	1925	1925	1	1
1929	1929	1930	1929	1929	0	0
1932				1932		0
1935						
1939				1939		0
	1943	1941	1942			
	1947	1948	1947			
	1951					
	1957					
	1963		1963			
	1970	1969	1970			
1974	1974		1974	1974	0	0
	1980	1981	1980			
1992	1990	1991	1989	1992	3	0
	1995					
2002	2000	2002	2001	2002	1	0
	2007			2004		
2007			2007	2007	0	0

Notes: (1) Year of peak from our dating. We wittingly excluded 2011 peak, because the most recent years are not included in the other series. (2) Year of peak worked out as the union of different sources: Ciccarelli e Fenoaltea (2007), Delli Gatti, Gallegati and Gallegati (2005), Istat (2001, 2011). (3) Year of peak based on Bai and Perron (1998, 2003). (4) Year of peak based on Baffigi (2013) data and turning point analysis of growth cycles. (5) Year of peak based on levels of GDP per capita.

A.2. Data

Table A.2 GDP, total loans and public bonds held by banks
(millions of euros at constant prices 2005)

Year	GDP	Total loans	Public bonds	Total bank credit	implicit deflator (GDP); 2005=1
1861	47,833.14	850.99	0.00	850.99	0.00
1862	48,783.88	976.95	0.00	976.95	0.00
1863	50,295.40	1,135.32	0.00	1,135.32	0.00
1864	50,757.30	1,325.81	112.92	1,438.73	0.00
1865	54,223.75	1,508.62	195.32	1,703.93	0.00
1866	54,567.62	1,597.61	246.86	1,844.47	0.00
1867	50,289.03	1,751.53	282.14	2,033.66	0.00
1868	51,421.81	1,848.51	357.74	2,206.26	0.00
1869	52,309.18	2,122.04	426.87	2,548.91	0.00
1870	54,066.14	2,445.75	317.22	2,762.97	0.00
1871	53,195.69	3,088.04	411.79	3,499.83	0.00
1872	52,339.98	4,423.56	592.70	5,016.26	0.00
1873	52,366.02	3,840.54	680.68	4,521.22	0.00
1874	55,366.76	4,238.18	657.11	4,895.29	0.00
1875	55,826.21	5,360.27	902.19	6,262.46	0.00
1876	54,762.90	5,468.38	955.34	6,423.72	0.00
1877	55,603.66	5,695.34	986.30	6,681.64	0.00
1878	57,397.21	6,064.71	1,210.80	7,275.51	0.00
1879	57,888.64	6,897.03	1,244.36	8,141.40	0.00
1880	59,157.45	6,780.53	1,475.85	8,256.37	0.00
1881	61,018.56	7,630.31	1,649.69	9,280.00	0.00
1882	62,265.62	8,031.58	1,947.58	9,979.16	0.00
1883	63,286.46	8,951.20	2,284.27	11,235.47	0.00
1884	62,776.37	9,850.09	2,853.17	12,703.26	0.00
1885	64,314.81	10,626.16	2,755.44	13,381.59	0.00
1886	66,289.34	12,579.36	3,074.04	15,653.40	0.00
1887	68,324.64	14,456.53	3,304.18	17,760.71	0.00
1888	68,459.54	15,263.33	3,474.54	18,737.87	0.00
1889	66,725.13	15,026.68	3,697.80	18,724.48	0.00
1890	67,373.48	14,055.78	3,499.98	17,555.77	0.00
1891	68,666.81	12,994.69	3,662.71	16,657.40	0.00
1892	69,176.82	14,083.96	4,300.47	18,384.42	0.00
1893	70,694.21	13,827.98	4,644.13	18,472.11	0.00
1894	71,593.59	13,754.42	5,067.80	18,822.22	0.00
1895	72,598.59	13,379.70	5,141.41	18,521.11	0.00
1896	74,050.13	13,486.90	5,545.06	19,031.96	0.00
1897	74,591.91	13,483.98	5,616.10	19,100.07	0.00
1898	74,845.78	13,072.77	6,595.54	19,668.30	0.00
1899	76,062.31	13,441.06	6,880.52	20,321.58	0.00
1900	78,618.79	14,079.94	6,950.10	21,030.04	0.00
1901	80,231.12	15,020.29	7,080.11	22,100.40	0.00
1902	82,171.53	15,981.34	7,362.71	23,344.05	0.00
1903	83,649.96	17,118.51	7,287.11	24,405.62	0.00
1904	85,712.08	18,797.85	7,703.94	26,501.78	0.00
1905	88,279.17	20,858.69	8,351.80	29,210.49	0.00
1906	91,980.64	21,824.15	7,956.51	29,780.66	0.00
1907	94,414.51	21,564.79	7,641.64	29,206.43	0.00
1908	97,212.40	24,644.93	8,207.27	32,852.20	0.00
1909	98,846.23	26,581.12	8,380.72	34,961.84	0.00
1910	99,806.17	28,081.50	8,291.59	36,373.08	0.00

(continued)

Table A.2, cont.

Year	GDP	Total loans	Public bonds	Total bank credit	implicit deflator (GDP); 2005=1
1911	102,011.57	27,937.39	7,759.18	35,696.57	0.00
1912	102,905.72	28,253.78	7,625.45	35,879.23	0.00
1913	108,269.14	29,832.07	7,617.19	37,449.26	0.00
1914	102,405.77	27,396.31	7,671.06	35,067.37	0.00
1915	98,676.76	23,914.20	7,373.24	31,287.44	0.00
1916	107,851.60	21,764.26	7,370.94	29,135.20	0.00
1917	108,047.39	18,855.43	6,755.85	25,611.28	0.00
1918	104,574.33	17,581.28	5,539.83	23,121.11	0.00
1919	98,655.48	23,884.96	6,184.78	30,069.74	0.00
1920	101,299.52	25,328.20	4,563.35	29,891.55	0.00
1921	98,341.63	26,332.80	5,018.94	31,351.75	0.00
1922	106,640.15	27,849.86	5,663.81	33,513.67	0.00
1923	116,555.25	29,376.08	6,049.01	35,425.09	0.00
1924	119,719.97	36,685.25	6,558.25	43,243.50	0.00
1925	127,987.92	35,457.30	5,356.45	40,813.75	0.00
1926	129,028.66	38,145.48	6,363.90	44,509.38	0.00
1927	126,619.35	45,281.45	7,844.73	53,126.18	0.00
1928	134,626.25	52,128.53	8,844.78	60,973.31	0.00
1929	141,364.23	54,139.18	11,635.84	65,775.02	0.00
1930	134,723.06	58,188.41	12,350.77	70,539.18	0.00
1931	133,331.54	60,300.79	14,512.08	74,812.88	0.00
1932	136,163.38	65,445.10	16,083.01	81,528.11	0.00
1933	134,550.69	73,680.29	19,816.36	93,496.65	0.00
1934	134,209.65	71,645.74	20,464.37	92,110.11	0.00
1935	141,498.20	65,132.37	19,156.79	84,289.15	0.00
1936	136,478.82	64,831.15	19,036.23	83,867.38	0.00
1937	150,046.50	59,954.55	14,080.49	74,035.04	0.00
1938	154,319.85	58,324.31	13,755.77	72,080.08	0.00
1939	163,973.64	62,231.15	14,179.80	76,410.95	0.00
1940	161,227.66	58,217.10	15,405.87	73,622.97	0.00
1941	158,639.98	59,956.32	20,010.11	79,966.43	0.00
1942	149,940.54	58,029.32	21,695.60	79,724.93	0.00
1943	127,135.77	38,670.22	17,504.70	56,174.92	0.00
1944	102,546.22	16,937.73	10,318.48	27,256.21	0.00
1945	92,008.66	13,781.26	7,655.27	21,436.53	0.01
1946	124,175.49	17,661.50	7,031.17	24,692.67	0.01
1947	147,993.75	20,944.59	5,322.27	26,266.86	0.02
1948	159,435.79	24,585.70	7,729.55	32,315.26	0.03
1949	173,129.61	33,515.25	8,078.14	41,593.39	0.03
1950	187,692.24	41,060.58	9,921.76	50,982.34	0.03
1951	205,861.51	45,755.08	10,848.72	56,603.80	0.03
1952	215,316.84	54,580.88	11,674.68	66,255.56	0.03
1953	230,879.86	63,740.22	13,069.86	76,810.09	0.03
1954	239,602.34	71,010.63	14,190.21	85,200.85	0.03
1955	256,195.28	81,570.29	15,227.43	96,797.72	0.03
1956	268,814.29	90,277.80	17,185.84	107,463.64	0.03
1957	284,071.19	97,778.46	18,280.25	116,058.71	0.04
1958	299,997.06	103,237.99	23,327.73	126,565.72	0.04
1959	321,270.16	120,502.56	31,508.12	152,010.68	0.04
1960	344,296.33	144,774.32	31,566.02	176,340.34	0.04

(continued)

Table A.2, cont.

Year	GDP	Total loans	Public bonds	Total bank credit	implicit deflator (GDP); 2005=1
1961	371,887.39	166,258.49	31,724.75	197,983.24	0.04
1962	396,690.16	197,611.53	30,822.02	228,433.55	0.04
1963	420,697.57	218,046.00	27,886.93	245,932.93	0.04
1964	436,583.58	221,112.22	27,213.57	248,325.79	0.05
1965	455,964.16	236,051.70	30,221.71	266,273.41	0.05
1966	486,110.35	272,055.34	34,247.00	306,302.34	0.05
1967	523,516.16	307,113.10	33,487.49	340,600.59	0.05
1968	561,252.65	340,899.59	37,346.04	378,245.63	0.05
1969	597,996.48	370,311.41	35,327.65	405,639.06	0.05
1970	634,291.16	402,562.49	32,944.12	435,506.61	0.06
1971	645,865.84	435,197.31	42,548.83	477,746.14	0.06
1972	669,528.82	485,379.15	50,543.26	535,922.41	0.06
1973	716,864.27	523,370.05	52,724.65	576,094.70	0.07
1974	756,188.18	507,427.71	47,681.96	555,109.67	0.09
1975	740,635.99	502,979.84	70,110.55	573,090.39	0.10
1976	792,890.01	510,891.64	57,403.26	568,294.90	0.12
1977	813,080.60	479,189.32	117,634.09	596,823.40	0.14
1978	839,386.46	474,848.68	149,878.67	624,727.35	0.16
1979	889,162.91	486,210.13	154,156.25	640,366.38	0.18
1980	919,475.61	476,080.40	141,218.18	617,298.58	0.22
1981	927,461.05	461,258.70	132,050.13	593,308.83	0.26
1982	931,454.11	439,466.65	167,676.27	607,142.92	0.31
1983	942,412.07	439,755.15	183,701.57	623,456.72	0.36
1984	972,806.53	469,576.41	181,534.94	651,111.35	0.40
1985	1,000,021.54	479,455.36	190,075.17	669,530.52	0.43
1986	1,028,627.36	491,171.68	186,008.55	677,180.22	0.46
1987	1,061,391.97	511,005.77	173,652.60	684,658.38	0.49
1988	1,105,713.76	562,118.69	161,721.51	723,840.20	0.52
1989	1,143,090.13	635,129.79	146,243.09	781,372.88	0.56
1990	1,166,617.70	682,371.51	137,051.59	819,423.10	0.60
1991	1,184,646.31	726,573.54	170,426.56	897,000.10	0.65
1992	1,194,332.34	777,768.58	204,394.90	982,163.48	0.68
1993	1,184,147.00	781,530.65	214,632.52	996,163.17	0.70
1994	1,209,618.29	766,891.24	239,730.53	1,006,621.76	0.73
1995	1,244,537.99	758,240.81	212,291.63	970,532.44	0.77
1996	1,258,659.57	738,246.32	219,053.28	957,299.60	0.80
1997	1,282,146.31	772,004.66	189,170.63	961,175.29	0.82
1998	1,300,713.91	803,149.52	181,061.62	984,211.15	0.84
1999	1,319,588.47	874,363.83	190,583.07	1,064,946.90	0.86
2000	1,367,800.90	980,457.25	155,263.61	1,135,720.86	0.88
2001	1,393,277.94	1,027,163.47	136,455.15	1,163,618.62	0.90
2002	1,399,567.70	1,053,812.77	110,866.99	1,164,679.76	0.93
2003	1,398,915.81	1,082,888.02	103,854.38	1,186,742.40	0.96
2004	1,423,126.36	1,116,132.25	96,797.63	1,212,929.88	0.98
2005	1,436,379.46	1,192,664.00	106,432.88	1,299,096.88	1.00
2006	1,467,964.35	1,299,997.25	109,124.28	1,409,121.54	1.02
2007	1,492,671.12	1,395,776.21	109,390.91	1,505,167.13	1.04
2008	1,475,412.38	1,426,828.56	116,898.19	1,543,726.75	1.07
2009	1,394,347.22	1,376,900.51	148,913.13	1,525,813.64	1.09
2010	1,419,507.55	1,471,983.32	184,982.35	1,656,965.67	1.09
2011	1,425,626.77	1,462,191.49	190,989.32	1,653,180.81	1.11
2012	1,389,986.10	1,390,364.99	286,263.67	1,676,628.66	1.13
2013	1,364,966.35	1,326,399.60	328,039.09	1,654,438.68	1.14

Source: see Section 2.

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