CREDIT CONTRACTIONS AND UNEMPLOYMENT

2016

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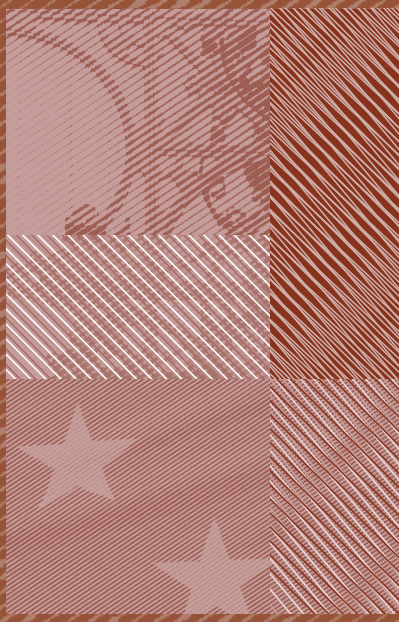

Documentos de Trabajo
N.º 1617

BANCO DE ESPAÑA
Eurosistema

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UNIVERSITAT RAMON LLULL

(*) I would like to thank Máximo Camacho, Matteo Ciccarelli, María Dolores Guilló, Jean Imbs, Norbert Metiu, Fidel Pérez Sebastián, Vincenzo Quadrini, Francesco Turino, and seminar participants at the Banco de España, Central Bank of Hungary, Paris School of Economics, Universidad de Alicante, AEA 2015, and RES PhD Meetings 2015 for helpful discussion and comments. This paper was partly written while visiting the Research Department of the Central Bank of Hungary and the Associate Directorate General International Affairs of the Banco de España. Financial support from the Spanish Ministry of Economy and Competitiveness (ECO2012-36719), the Summer Visiting Researcher Program of the Central Bank of Hungary (2014), and the research project in economics at the Banco de España (2015-2016) is gratefully acknowledged. The views expressed in this paper are those of the author and do not necessarily reflect the views of the Banco de España. All remaining errors are my own.
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Documentos de Trabajo. N.º 1617

2016

ISSN: 1579-8666 (on line)

Abstract

This paper investigates the impact of private credit contractions on labor market performance. Impulse responses for total, youth, and long-term unemployment are estimated using local projections for a panel of 20 OECD countries over the period 1980-2013. The empirical findings suggest that a decline in private credit can generate sizable and statistically significant increases in all three unemployment measures. On average, credit contractions in the sample increase total unemployment rates by nearly 1 percentage point at the peak. This effect is even stronger for youth unemployment. The persistent impact on long-term unemployment emphasizes the sluggish recovery of labor markets following a credit downturn. The results also reveal that increases in joblessness depend heavily on the scale of the build-up in financial leverage prior to the onset of a contraction. Specifically, excessive credit booms tend to be followed by a significantly larger rise in unemployment in the subsequent bust phase. Moreover, credit contractions associated with rigid labor market institutions lead to disproportionately greater increases in unemployment. These findings underline the important relationship between disruptions in the credit market and unemployment fluctuations.

Keywords: financial leverage, private credit, labor market, unemployment, local projections.

JEL classification: E24, E44, G10, J01.

Resumen

Este trabajo investiga el impacto de las contracciones de crédito privado sobre el rendimiento del mercado laboral. Se estiman respuestas al impulso para el desempleo total, juvenil y de larga duración utilizando proyecciones locales para un panel de 20 países de la OCDE durante el período 1980-2013. Los resultados empíricos sugieren que una disminución en el crédito privado puede dar lugar a un aumento considerable y estadísticamente significativo en cada una de estas tres medidas de desempleo. En promedio, las contracciones de crédito en la muestra incrementan la tasa de desempleo en casi 1 punto porcentual en su máximo. Este efecto es aún más fuerte para el desempleo juvenil. Los efectos duraderos en el desempleo de larga duración indican un alto grado de persistencia y lenta recuperación de los mercados de trabajo tras una caída del crédito. Los resultados también revelan que el grado de desempleo varía en gran medida con la intensidad del apalancamiento financiero antes del comienzo de una contracción. En concreto, las expansiones crediticias altamente apalancadas tienden a ser seguidas por un desempleo significativamente más grave en la posterior caída. Por otra parte, contracciones crediticias asociadas con instituciones del mercado laboral más rígidas producen una tasa de desempleo sustancialmente más alta, especialmente entre los jóvenes. Estos resultados demuestran la importante relación entre las disrupciones en el mercado de crédito y las fluctuaciones de desempleo.

Palabras clave: apalancamiento financiero, crédito privado, mercado de trabajo, desempleo, proyecciones locales.

Códigos JEL: E24, E44, G10, J01.

1 Introduction

The most recent financial crisis has severely deteriorated labor market perspectives across the globe. It is estimated that nearly 202 million people, of which, 74.5 million young – aged 15-24 – were unemployed in 2013 worldwide, an increase of about 31.8 million – including 4.6 million young people – since the onset of the downturn in 2007 (ILO, 2014). OECD economies exhibited a massive increase of 15.2 million in total unemployment and 2.6 million in youth unemployment during the same period. Remarkably, youth unemployment has become one of the most urgent issues to deal with, characterized by a substantial rise and slow recovery (Verick, 2009; Bell and Blanchflower, 2011). The topic is of great importance, mainly due to the broader consequences of unemployment that policymakers should care about. Rising unemployment may lead to scarring effects – i.e., negative long-term effects on future labor market prospects –, social and political unrest, and growing inequality in the long run (Matsumoto, Hengge, and Islam, 2012).

This paper investigates empirically the relationship between private credit contractions and unemployment. The Great Recession that started in 2007 has led to renewed interest in the linkages between the financial sector and labor market outcomes, and there is compelling evidence that frictions underlying financial crises derive primarily – although not exclusively – from imperfections in the credit markets (Schularick and Taylor, 2012).[1] Related contributions suggest that disruptions in the financial sector have a sizable effect on business cycle fluctuations (e.g., Gilchrist and Zakrajsek, 2012; Meeks, 2012), especially through the demand of labor (Jermann and Quadrini, 2012). In this regard, focusing on the decline in credit as a potential source of unemployment fluctuations is motivated by the transmission mechanism, according to which perturbations in the financial markets propagate directly to the real economy (see, e.g., Quadrini, 2011; Jermann and Quadrini, 2012; Kiyotaki and Moore, 2012). Since such disturbances affect the firms' ability to borrow, credit tightening can lead to increases in unemployment by cutting new investment and vacancies.

Hence, the goal of this study is to offer novel insights on the empirical relevance of private credit contractions for unemployment dynamics on the aggregate level, using a

[1] Such disruptions may arise from the tightening of collateral or credit constraints, heightened uncertainty, reduced risk-bearing capacity of the financial intermediaries, or informational asymmetries.

panel of 20 OECD countries spanning the period 1980-2013. In particular, the main contribution lies in investigating the impact of credit downturns along three dimensions. First of all, by providing a direct measure of the extent to which contractions in private credit affect total, youth, and long-term unemployment. Secondly, the article explores the hypothesis that credit contractions, which arise after highly leveraged credit expansions tend to be followed by more severe unemployment and slower recovery. This conjecture is supported by the idea that increased leverage raises the financial fragility of an economy due to excessive risk-taking and lower lending standards as private debt piles up.[2] Thirdly, the role of labor market institutions is additionally considered, since the variation in the size of the impact across contractions may stem from differences in the flexibility of labor regulations.[3]

The dynamic impact of private credit contractions on labor market performance is assessed by employing a direct forecast approach proposed by Jordà (2005). Specifically, the average cumulated path of unemployment across the panel is calculated with local projections for the years following the start of a contractionary episode. Credit contractions in the 20 OECD economies are identified by using the Bry and Boschan (1971) dating algorithm. The estimation of impulse response functions with local projections has several attractive features. It does not require the specification and estimation of a true multivariate system, therefore, local projection techniques – based on multi-step direct forecasts – are robust to the misspecification of the data generating process. In addition, the method can conveniently accommodate nonlinearities in the response function. This enables to obtain consistent estimates of the average response of unemployment to the onset of a credit contraction by a sequence of projections, without imposing dynamic restrictions or additional structure. Potential endogeneity concerns are addressed by performing a variety of sensitivity analyses, including the estimation of the impact of credit downturns that begin during GDP expansions.

The findings of the paper suggest that disruptions in the credit market have a large and

[2] Articles that discuss the amplification effect of rising leverage preceding economic downturns include Sharpe (1994), Rajan (2005), Pagano and Pica (2012), Boeri, Garibaldi, and Moen (2012, 2013), Claessens and Kose (2013), Jordà, Schularick, and Taylor (2013), and Gorton and Ordonez (2014).

[3] A rich set of works focuses on the importance of labor market institutions in explaining differences in unemployment patterns (see, e.g., Blanchard and Wolfers, 2000; Nickell, Nunziata, and Ochel, 2005; Feldmann, 2009).

statistically significant impact on unemployment. According to the estimation results, credit market downturns account for between one-quarter and one-half of the overall increase in joblessness in the sample in the four years following the onset of a contraction. The peak effect occurs, on average, two years after the beginning of the decline in credit, and it does not quite vanish after four years. A credit contraction in a typical OECD country increases total unemployment rates by nearly 1% at the peak. The impact on young workers is even more pronounced, increasing the rate of youth unemployment by more than 2.4%. The lasting effects on long-term unemployment indicate a high degree of persistence and slow recovery of labor markets following a credit downturn. In addition, severe credit busts are coupled with a greater rise in unemployment rates than milder contractions, with differences amounting to over 2% in the medium term. Moreover, evidence in the paper shows that credit downturns following expansions with high financial leverage – as opposed to low financial leverage – trigger, on average, up to five times greater increases in joblessness. Finally, the severity of the impact depends heavily on the flexibility of labor regulations. Credit contractions in economies with more rigid labor market institutions result in substantially higher unemployment, especially among the young.

The remainder of the paper is organized as follows. Section 2 reviews the literature on the sources of labor market fluctuations, with a particular focus on the relationship between financial frictions and unemployment. Section 3 introduces the data and presents some preliminary analyses. Section 4 details the methodological framework and describes the results. Section 5 provides robustness checks for the empirical estimation, and finally, Section 6 concludes.

2 Related literature

The study relates to three strands of literature. Firstly, it links to the dominant stream of pre-crisis research that explores the role of labor market institutions in accounting for differences in the evolution of unemployment. Empirical evidence suggests that unemployment dynamics largely depends on the flexibility of these institutions, with heavier regulation of labor associated with lower labor force participation and higher unemploy-

ment (Scarpetta, 1996; Nickell, 1997; Blanchard and Wolfers, 2000; Botero, Djankov, Porta, Lopez-de Silanes, and Shleifer, 2004; Nickell et al., 2005; Feldmann, 2009). Moreover, a recent article by Kawaguchi and Murao (2012) shows that labor market regulations affect age-specific cohorts differently, with stricter firing restrictions increasing the effect of adverse macroeconomic shocks on youth unemployment rates. The current work contributes to this field of studies by examining how labor market institutions may amplify the impact of credit contractions on unemployment.

Secondly, this paper relates to a growing literature that investigates the impact of financial crises on labor market performance. These articles unanimously conclude that the aftermath of banking crises is associated with deep and lasting effects on unemployment, exacerbating the negative impact that recessions bring about (Reinhart and Rogoff, 2009a; Boeri et al., 2012; Calvo, Coricelli, and Ottonello, 2012; Bernal-Verdugo, Furceri, and Guillaume, 2013). In addition, a handful of studies argue that highly leveraged firms – that are more dependent on finance – are more vulnerable during financial recessions. For instance, Pagano and Pica (2012) and Boeri et al. (2012, 2013) show using industry- and sector-level data that in financial crises, employment growth suffers disproportionately more in economies in which firms rely more heavily on external finance.[4] The present work lends further support to their evidence by highlighting the importance of a country's credit build-up prior to a contraction for the subsequent changes in aggregate unemployment rates.

Finally, the study connects to a large body of papers that focus on the specific relationship between financial markets and the real economy. Besides analyzing the effects of financial downturns in general, the years following the start of the latest crisis have witnessed a burgeoning of works on the driving forces behind such events. Claessens, Kose, and Terrones (2009, 2012) and Mendoza and Terrones (2012) emphasize the importance of credit and housing markets in shaping business cycle fluctuations. A series of recent papers demonstrate that financial crises can be regarded as credit booms gone bust (see Jordà, Schularick, and Taylor, 2011; Taylor, 2012a, b; Schularick and Taylor, 2012; Jordà,

[4] In an earlier paper, Sharpe (1994) documents that highly leveraged firms experience greater variation in employment over the business cycle. For a thorough discussion of the role of credit booms for macroeconomic fluctuations, see Hume and Sentance (2009).

Schularick, and Taylor, 2015b).[5] In a historical analysis, these studies provide statistical evidence that financial crises in advanced economies originate strictly from developments in the private credit markets, and there is no systematic correlation with either preceding inflation rates, current account deficits, or growth in public debt levels.[6] Moreover, Jordà et al. (2013) show that the credit intensity of an expansion preceding the onset of a crisis is closely associated with the severity of the recession. In sum, these articles corroborate the finding that private credit is the single reliable predictor of financial crises.[7] Yet, linkages between credit markets and unemployment dynamics have received less attention in the literature.

Related works are mainly based on the seminal papers by Bernanke and Gertler (1989), Bernanke, Gertler, and Gilchrist (1996), Bernanke, Gertler, and Gilchrist (1999) and Kiyotaki and Moore (1997), which explain how financial market imperfections amplify and propagate shocks – that originate in other sectors – to the real economy through an accelerator mechanism. The underlying research suggests that endogenous developments in the financial sector, such as credit market imperfections, can significantly deteriorate labor market performance through restricting investment and firm-entry, i.e., job creation (see, e.g., Acemoglu, 2001; Wasmer and Weil, 2004; Dromel, Kolakez, and Lehmann, 2010). Acemoglu (2001) reveals that differences in the European and U.S. credit markets due to financial system regulations have led to disparities in long-run unemployment dynamics. Wasmer and Weil (2004), and more recently, Petrosky-Nadeau and Wasmer (2013) analyze the financial accelerator that results from the complementarity between search frictions in credit and labor markets. They show that credit imperfections aggravate the negative effect of labor market frictions on unemployment, but intense competition in the credit market enlarges the favorable effect of labor deregulation.[8] Additionally,

[5] A number of earlier studies have already established a strong relationship between the financial system – endogenous credit booms in particular – and economic instability (see, e.g., Kindleberger, 1978; Eichengreen and Mitchener, 2003). In addition, the seminal work of Reinhart and Rogoff (2009b) provides a comprehensive analysis on financial fallouts throughout history, and further supports these findings.

[6] Previous papers that examine rapid credit growth prior to financial crises in emerging market economies include McKinnon and Pill (1997) and Reinhart and Kaminsky (1999). A more recent work by Mendoza and Terrones (2012) investigates credit booms in 61 emerging and industrial countries over the 1960-2010 period, and finds that large credit expansions are often followed by financial crises.

[7] A recent article by Gadea Rivas and Perez-Quiros (2015) provides a critical view of the ability of credit to predict financial recessions.

[8] For an empirical contribution to the theory, see Gatti, Rault, and Vaubourg (2012).

Petrosky-Nadeau (2014) introduces vacancy costs that require external funding, and finds that such frictions can generate sufficient propagation of productivity shocks in a search-and-matching framework.

Another credit channel relies on the hypothesis that shocks, which arise in the financial sector can translate directly to the real economy. Quadrini (2011) proposes a possible mechanism by which exogenous forces can emerge in the financial markets, based on asset bubbles. Such bubbles can generate asset price movements that affect the business cycle through the tightening of the borrowing constraint.[9] In addition, Jermann and Quadrini (2012) argue that financial shocks are transmitted to the real economy through the demand of labor.[10] These authors develop a model with debt and equity financing to explore the macroeconomic effects of disruptions in the financial sector and demonstrate that credit shocks have played an important role in capturing the dynamics of labor and output in the U.S. economy over the last decades. Finally, Bentolila, Jansen, Jiménez, and Ruano (2013) and Chodorow-Reich (2014) assess the impact of large credit supply shocks on firm-level employment in a single-country analysis for Spain and the U.S., respectively. Both articles exploit differences in lender health at the onset of the Great Recession, and show that unanticipated reductions in bank lending have a sizable effect on employment outcomes.

Despite the increasing number of studies investigating the linkages between financial markets and labor market performance, empirical works addressing the topic on the aggregate level are limited. Hence, this paper contributes to the existing literature by providing new evidence on the direct relationship between private credit contractions and unemployment fluctuations in a cross-country analysis.

[9] The role of financial shocks for business cycle dynamics has been discussed in numerous papers, including Benk, Gillman, and Kejak (2005), Gertler and Karadi (2011), Helbling, Huidrom, Kose, and Otrok (2011), Quadrini (2011), Jermann and Quadrini (2012) Kiyotaki and Moore (2012), among others.

[10] Monacelli, Quadrini, and Trigari (2011) propose and alternative transmission mechanism to capture the effect of financial disturbances on unemployment fluctuations. They embed financial frictions in a search-and-matching model with wage bargaining, where credit constraints affect the bargaining of wages.

3 Data and preliminary analysis

3.1 Data

The study makes use of a dataset that covers 20 OECD economies spanning from 1980 to 2013.[11] The choice of the sample period is justified by two reasons. First, as documented by Schularick and Taylor (2012), credit markets took time to recover in many developed countries after the collapse during World War II and grew very rapidly starting from the post-Bretton Woods era. Second, the paper innovates with respect to related works by encompassing economic fluctuations following the most recent financial crisis.

The core data include annual series of output, unemployment, private credit, and a composite measure of labor market flexibility. Series of nominal GDP and total unemployment rate are taken from the World Economic Outlook (WEO) database, while youth and long-term unemployment rates are from the OECD, Eurostat, and the World Bank's World Development Indicators (WDI) database.[12] The financial variable considered is credit to the non-financial private sector by domestic banks, which covers loans and debt securities, and a balanced panel is obtained from a relatively new database constructed by the Bank of International Settlements (BIS).[13] Private credit series are converted into real terms using consumer price indices (CPI) from the WDI database. Following Feldmann (2009), labor market flexibility is proxied by a composite indicator taken from the Economic Freedom of the World (EFW) database (Gwartney, Lawson, and Hall, 2013). The EFW component 'labor market regulations' measures labor market flexibility based on six sub-indicators: minimum wages; hiring and firing regulations; centralized collective bargaining; hours regulations; mandated cost of worker dismissal; and military conscription. The composite index as well as each sub-component is scaled to take values between 0

[11] The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

[12] Youth unemployment is defined as the share of the labor force aged 15-24 without work but available for and seeking employment. Long-term unemployment refers to the number of people with continuous periods of unemployment extending for a year or longer, expressed as a percentage of the total unemployed.

[13] One advantage of the data provided by the BIS is that the series are adjusted for breaks, which result from the combination of the various sources and methodological frameworks. Annual series are derived from quarterly data.

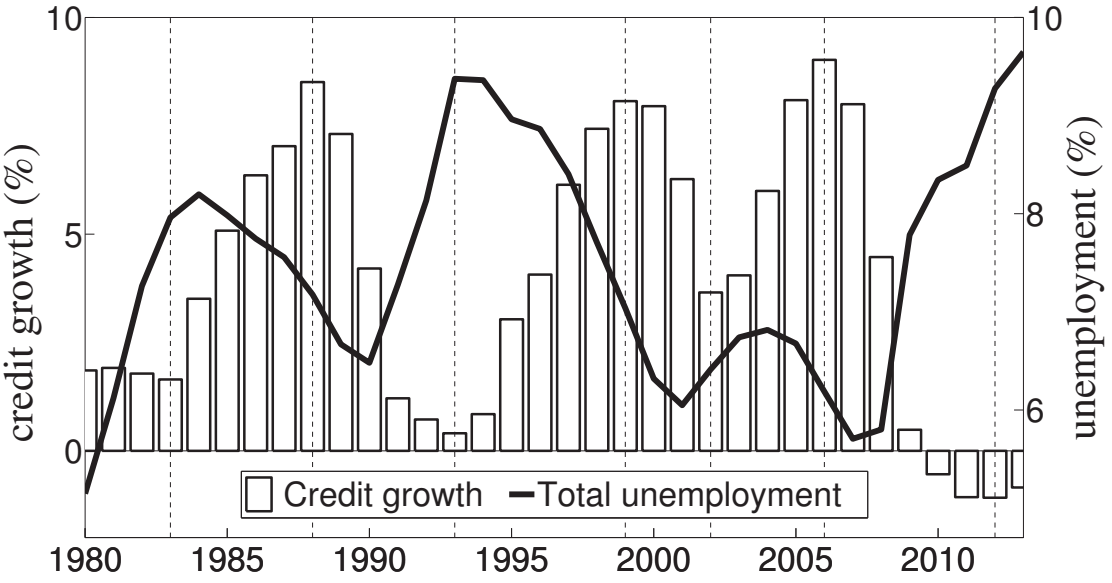
and 10, with higher values indicating more flexible labor market.[14] In addition, the paper uses an extensive set of other variables in the formal empirical analysis. A complete list of variables and their sources is provided in Appendix A.

3.2 Descriptive statistics

Figure 1 displays the evolution of private credit together with total unemployment rate for the panel average over the last 34 years. It is evident from the figure that declining credit growth in a typical OECD country tends to be followed by an increase in the rate of unemployment. Notice that such negative relationship between the two time series prevailed already before the most recent financial turmoil, therefore pointing toward the existence of an important regularity between private credit contractions and joblessness.

The upper panel of Table 1 reports summary statistics for the three measures of unemployment, private credit, private credit to GDP, and the composite index of labor market flexibility. One thing to notice is the disproportionately high ratio of average youth

Figure 1: Private credit and unemployment between 1980 and 2013



Note: The sample period is 1980-2013 and cross-country averages are shown for 20 OECD economies. Annual change in private credit (bars, left axis, %) is plotted against total unemployment rate (solid line, right axis, %).

[14] See Feldmann (2009) for a comprehensive discussion on the conveniences of employing the EFW database.

Table 1: Descriptive statistics

	Mean	Std. dev.	Min	Max
Total Unemployment	7.5	3.3	0.2	27.3
Youth Unemployment	15.8	7.8	3.2	58.3
Long-term Unemployment	33.3	15.2	4.3	75.6
Private Credit Growth	4.0	2.1	-18.8	25.9
Private Credit to GDP	80.9	12.2	25.3	205.3
Labor Market Index	5.9	1.7	2.6	9.3

Cross-correlation	Total U	Youth U	Long-term U	Private Credit	Credit to GDP	Labor Market I
Total Unemployment	1					
Youth Unemployment	0.87	1				
Long-term Unemployment	0.52	0.56	1			
Private Credit	-0.28	-0.29	-0.42	1		
Private Credit to GDP	-0.16	-0.19	-0.14	0.42	1	
Labor Market Index	-0.21	-0.27	-0.39	0.42	0.24	1

Note: Summary statistics for labor market variables refer to rates of total (Total U), youth (Youth U), and long-term (Long-term U) unemployment. Private credit growth is annual change of credit to the non-financial private sector by domestic banks, and private credit to GDP measures the financial leverage of an economy. Labor Market Index (Labor Market I) refers to a composite indicator of labor market flexibility taken from the Economic Freedom of the World database, scaled to take values between 0 and 10, with higher values indicating a more flexible labor market. All outcomes in the correlation matrix are significant at 1%.

to overall unemployment that stands at 2.1. This suggests that youth unemployment has been a problem in many countries for several decades, and raises the issue of the negative long-term consequences for the young as well as for the society as a whole. Youth unemployment in Southern European countries like Greece, Italy, and Spain is of particular concern, where it accounts for up to one-half of the labor force aged 15-24. Private credit is a variable trending generally upward over time, with mean growth of 4% per year. In financial recessions however, the trend is muted, exhibiting even negative growth rates in some occasions. This also applies to the ratio of private credit to GDP, a commonly used measure to capture the financial leverage of an economy.

The lower panel of Table 1 presents the correlation matrix for the key variables of interest.[15] All cross-correlation coefficients are significant at 1%. The outcomes are suggestive of a negative contemporaneous correlation among private credit and unemployment, which is even stronger if the lagged values of credit are considered. Hence, fluctuations in private credit seem to lead unemployment. Moreover, there is a significantly negative association between labor market regulations and unemployment, which appears to be more pronounced for the long-term unemployment series. This implies that in OECD countries with more flexible labor markets, long-term unemployment is lower, that is, less people suffer a year or longer period of joblessness, on average. In addition, young people are affected more by the type of labor market institutions, most likely due to hiring and firing restrictions that insulate rather the older workers (Kawaguchi and Murao, 2012).

3.3 Identification of credit contractions

This subsection presents the identification of credit contractions and summarizes their cyclical properties along three dimensions, namely, the severity, financial leverage, and the flexibility of labor market institutions. The dating method used to identify turning points (i.e., peaks and troughs) in the credit cycles relies on the seminal papers by Bry and Boschan (1971) and Harding and Pagan (2002), which analyze the business cycle characteristics of various macroeconomic variables.[16] The Bry and Boschan (1971) algorithm searches for local minima (troughs) and maxima (peaks) in the panel based on a set of criteria over a given period of time. In line with this approach, a credit cycle is defined here as a sequence of expansionary and contractionary phases in the annual series of (log-levels of) real private credit, where an expansionary phase lasts from trough to peak, whilst a contractionary phase lasts from peak to trough. Thus, each peak in the private credit series (hereafter, credit peak) refers to the start of a credit contraction.

In what follows, the cyclical measures examined are amplitude, duration, and slope. The amplitude of an expansionary phase is defined as trough-to-peak change in private credit, while the amplitude of a contractionary phase measures the change in credit from peak to trough. The duration of an expansion is the number of years between a trough

[15] Private credit and private credit to GDP are transformed here by taking the natural logarithm and applying the Hodrick and Prescott (1997) filter, with the smoothing parameter set to 100.

[16] Other works that employ this approach in order to describe financial cycles include Pagan and Sossounov (2003), Drehmann, Borio, and Tsatsaronis (2012) and Claessens et al. (2009, 2012).

Table 2: Cyclical characteristics of private credit contractions and unemployment

Type of contraction	Private Credit			Total U	Youth U	Long-term U
	Amplitude	Duration	Slope	Amplitude		
All	-9.11	2.81	-2.92	2.11	4.56	4.63
Severe	-21.88	4.92	-5.02	4.40	9.67	11.74
Non-Severe	-4.86	2.10	-2.22	1.35	2.91	2.19
High Leverage	-11.68	2.85	-3.58	3.47	7.06	9.43
Low Leverage	-6.16	2.00	-2.56	0.91	1.87	-0.12
Flexible labor	-8.09	2.32	-2.93	1.48	2.77	5.02
Rigid Labor	-10.06	3.26	-2.92	2.70	6.29	4.13

Note: The table shows the cyclical properties of private credit (Private Credit), total (Total U), youth (Youth U), and long-term (Long-term U) unemployment for credit contractions, for a sample of 20 OECD countries between 1980-2013. Amplitude is peak-to-trough change in real private credit (in percent) and unemployment rates (change in levels, in percentages). Duration refers to the number of years from peak to trough. Slope denotes the annual rate of change in private credit during a contraction (in percent). Severe credit contractions correspond to peak-to-trough declines in private credit that fall within the top quartile of all credit contractions. Credit contractions are classified as highly (low) leveraged if the excess rate of change per year in the private credit to GDP ratio during the preceding expansionary phase was above (below) its full sample mean. Credit contractions are characterized by flexible (rigid) labor market institutions if the composite indicator of labor market flexibility was above (below) the full sample historical mean at the onset of the contraction. All values are reported in means.

and the following peak. Similarly, the duration of a contraction is the number of years from a peak to the subsequent trough. Finally, the slope is annual growth rate of private credit, given by the ratio of amplitude over duration for each phase.

Since the primary focus of the paper is to assess the impact of credit downturns on unemployment, cyclical properties are obtained only for the contractionary phase, for both private credit and unemployment (Table 2). In addition, contractionary episodes are sorted into two groups, depending on the severity of the fall in private credit (top panel). Following Claessens et al. (2009), a peak-to-trough credit contraction is classified as severe if the decline in private credit falls within the top quartile of all credit contractions, and non-severe otherwise. A total of 52 credit peaks, and therefore, credit contractions are detected for the panel of 20 OECD economies over 1980-2013, of which 13 are identified as severe (credit peak dates are presented in Appendix B). A typical contraction lasts

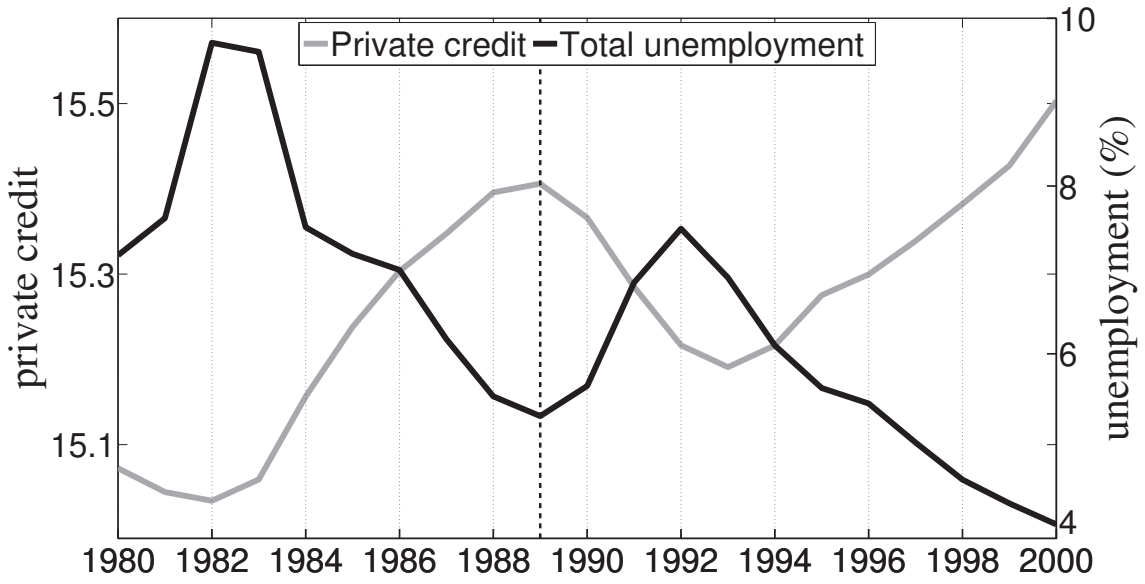
almost 3 years, with a peak-to-trough fall in private credit by 9.11%. Not surprisingly, the loss in severe contractionary episodes is sharper, accounting for an annual decrease of 5.02% (versus 2.22% per year in non-severe contractions). Moreover, severe declines in credit last on average more than two times longer than milder contractions. Table 2 also highlights a clear association between the severity of a credit contraction and unemployment. In particular, total unemployment increases by 2.11 percentage points during a contractionary phase, whereas labor market performance deteriorates significantly more during severe contractions (4.40%) compared to other episodes (1.35%). The summary statistics are similar for youth and long-term unemployment.

To complement the analysis, this study examines how the decline in unemployment varies with the financial leverage of an economy. The build-up of leverage is potentially linked to the severity of a downturn through increased systemic fragility due to greater risk-taking (see, e.g., Claessens and Kose, 2013; Gorton and Ordonez, 2014). Consequently, economies in which firms depend more on external finance may be hit more heavily when a credit contraction occurs, as a subsequent deleveraging triggers larger cuts in hiring (Pagano and Pica, 2012; Boeri et al., 2012, 2013). An excess credit variable is thus constructed in the spirit of Jordà et al. (2013), which refers to the rate of change per year in private credit to GDP, in deviation from its mean, in each expansionary episode preceding a credit peak. A following credit contraction is then defined as highly leveraged if the excess rate during the credit expansion was above its full sample mean.[17] The middle panel of Table 2 reveals that the amplitude of highly leveraged private credit contractions is, on average, substantially larger than that of low leveraged contractions. More interestingly, increases in each measure of unemployment appear to be significantly greater during a contractionary phase with high financial leverage.

Finally, the bottom panel of Table 2 shows the cyclical features of credit contractions based on the labor market dimension. Credit downturns are characterized by flexible labor market institutions, if the composite measure of labor market flexibility in an OECD country was above the full sample historical mean at the beginning of the contraction, and by rigid labor institutions otherwise. It seems that contractionary phases with rigid

[17] Note that only credit contractions preceded by a complete expansionary phase (i.e., for which data is available from trough to peak) are considered in this exercise. As a result, the sample is reduced to 39 (out of 52) credit contractions for which the excess credit variable can be computed.

Figure 2: Turning points in the credit cycle and unemployment (United States, 1980-2000)



Note: Real private credit (log-levels, left axis) is plotted against total unemployment rate (right axis, %) for the United States between 1980 and 2000. The sample period corresponds to the Savings and Loan crisis of the 1980s and 1990s. The dashed line indicates the year of the credit peak, i.e., the beginning of the credit contraction.

labor markets are not only more severe and prolonged, but also display greater increases in unemployment rates on average (2.70% versus 1.48%). In addition, the climb in youth unemployment during such episodes (6.29%) is more than double the increase throughout credit contractions with flexible labor markets (2.77%), reflecting the adverse consequences of labor rigidities for young workers. All descriptive results are formally tested in the next section.

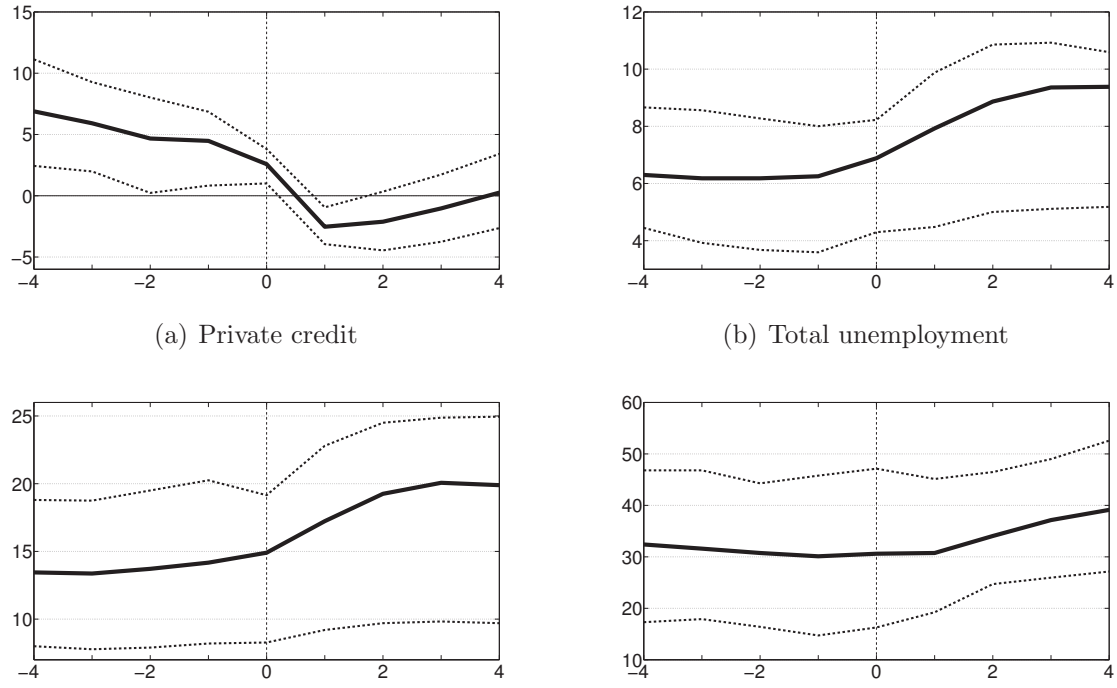
The Savings and Loan crisis of the 1980s and 1990s in the U.S. provides a good illustration of the cyclical characteristics of credit and unemployment. Figure 2 shows that the United States experienced a rapid expansion of credit starting from 1982, which peaked in 1989 after a slowdown in the preceding years. The following period between 1989 (credit peak) and 1993 (credit trough) is referred to as a contractionary episode, displaying a sharp decline in credit and rising unemployment. Credit fell by close to 22% in the four years from the peak to the subsequent trough, therefore the downturn is classified as severe. However, since the preceding credit expansion was low leveraged – due to high GDP growth at the same time –, and labor market institutions in the country

were quite flexible at the beginning of the contraction, joblessness started to recover soon, already after three years. For this reason, the accumulated increase in unemployment rate during the credit downturn was somewhat below the mean across all contractionary phases (1.65% versus 2.11%) as opposed to the year before, when it peaked at 2.23 percentage points.

3.4 Credit growth and unemployment around contractions

Figure 3 offers a visual inspection of the dynamics of private credit and unemployment around credit contractions in the 20-country panel. Year-on-year changes in credit growth and changes in the rates of total, youth, and long-term unemployment are shown for 4 years before and 4 years after a credit peak (at period 0). Means of each series are plotted together with the upper and lower quartiles, to account for potential outliers

Figure 3: Dynamics of private credit and unemployment around credit contractions



(a) Private credit

(b) Total unemployment

(c) Youth unemployment

(d) Long-term unemployment

Note: Solid lines indicate means of (a) private credit growth (%) and rates of (b)-(d) total, youth, and long-term unemployment (%) along with the top and bottom quartiles (dashed lines) for 4 years before and 4 years after a credit peak. Period 0 denotes the year of the credit peak, i.e., the beginning of a credit contraction. Change in private credit growth is in percents per year, and change in unemployment rates is in levels, in percentages.

in the sample. At period 0, private credit growth is about 2.5% on average, but it typically declines already ahead of a credit peak and decreases even more before it starts to recover (Figure 3/(a)). Furthermore, Figures 3/(b)-(d) suggest an association between the evolution of credit and unemployment. Slower credit growth one year before a peak is coupled with a rise in unemployment rates, which becomes sharper in the first year of a contractionary phase (Figure 3/(b)). Total unemployment climbs by 2.5 percentage points four years after the beginning of a contraction, and the increase is substantially larger for youth unemployment (Figure 3/(c)). Long-term unemployment rises notably one year after a credit peak (Figure 3/(d)).[18] While private credit recovers, on average, four years after the start of a downturn, unemployment rates still remain well above their pre-peak level. Thus, the observed labor market patterns do not only hint at high persistence, but reveal that credit contractions are likely to be followed by jobless recoveries.[19]

4 Methodology and results

4.1 Empirical framework

In the econometric investigation, the main focus is directed at the path of unemployment after a private credit expansion has reached its peak, i.e., after which a credit contraction begins. Impulse response functions (IRFs) are obtained using local projections, a single-equation approach introduced by Jordà (2005). The central idea consists in calculating the impact of credit contractions on unemployment by estimating projections at each period of interest. Since the onset of a credit downturn is considered as a binary treatment, the paper strictly follows Jordà et al. (2013) in order to compute impulse responses using a least-squares dummy variable model.

[18] The lagged response of long-term unemployment to a credit contraction follows from the definition of the variable (see Section 3.1 for details).

[19] See Calvo et al. (2012) for an in-depth analysis on jobless recoveries following financial recessions.

To begin with, the average cumulated response of unemployment across countries and credit contractions (C) for $h = 1, 2, ..., H$ future horizons is defined as:

$$\begin{aligned} CR(\Delta_h U_{i,t(p)+h}, C) &= E_{i,t(p)}(\Delta_h U_{i,t(p)+h} | C_{i,t(p)} = 1, \Omega) \\ -E_{i,t(p)}(\Delta_h U_{i,t(p)+h} | C_{i,t(p)} &= 0, \Omega), \qquad h = 1, 2, ..., H, \end{aligned} \tag{1}$$

where $U_{i,t(p)+h}$ denotes unemployment for each country $i = 1, 2, ..., N$, and for every horizon h following a discrete treatment, and $C_{i,t(p)}$ is a binary indicator that takes value 1 for a credit peak, and zero otherwise. The subscript $t(p)$ refers to the period of the p^{th} credit peak in country i, derived from the Bry and Boschan (1971) dating algorithm in Section 3.3. As noted before, the interest lies in analyzing the average change of unemployment following the onset of a credit contraction at $t(p)$ to some distant period $t(p) + h$ after the peak. Thus, a credit peak may be understood as a period in which a country's credit expansion comes to an end – and a contractionary episode starts –, and Expression 1 measures the average treatment response of unemployment to contractions across the panel, conditional on a set of economic variables represented by Ω. Ideally, the estimation of Expression 1 would require a correctly specified model, yet, the average response for each horizon can be likewise approximated by a series of local projections. Specifically, the conditional path of the cumulated response of unemployment is obtained by estimating the following fixed effects panel regression for $h = 1, 2, ..., H$ horizons:

$$\Delta_h U_{i,t+h} = \alpha_i^h + \sum_{j=0}^{1} \beta_j^h \Delta U_{i,t-j} + \gamma_h C_{i,t} + \delta_h L_{i,t} + \sum_{j=0}^{1} \theta_j' \mathbf{X_{i,t-j}} + \epsilon_{i,t}^h, \tag{2}$$

where $\Delta_h U_{i,t+h}$ is the change of unemployment from time t to each future period $t + h$, country fixed effects denoted by α_i capture unobserved country-specific heterogeneity, and the lagged changes of $U_{i,t}$ control for the persistence of unemployment. The coefficient γ_h measures the effect of the onset of a credit contraction on the changes in unemployment for each future period $t + h$. $L_{i,t}$ is the composite index of labor market flexibility, and $\mathbf{X_{i,t-j}}$ is a vector of contemporaneous and 1-year-lagged values of the explanatory variables that potentially affect outcomes, including (1) GDP growth; (2) CPI inflation rate; (3) change

in public debt to GDP; (4) change in trade openness; (5) population; and (6) output gap, which controls for the unemployment effects of business cycle fluctuations.[20]

The greatest benefit of using direct local analysis is that IRFs can be obtained without the specification and estimation of the unknown true multivariate system itself, and therefore, local projection techniques are less prone to misspecification errors. Moreover, the method easily accommodates nonlinearities in the response function, which may be impractical to model with limiting assumptions about the global data generating process. To account for serial correlation induced in regressions for each future horizon, inference can be performed using heteroskedastic and autocorrelation robust standard errors. In addition, as lagged variables enter only as controls in the estimation equation, they are not used to compute explicitly the dynamics of the responses. Since the specification is less sensitive to the choice of the number of lags, impulse response functions generated using local projections are relatively stable. Finally, another appealing feature of the method is that the confidence bands related to the IRFs can be derived from the standard errors of the estimated coefficients of interest, and therefore, no bootstrapping techniques or Monte Carlo simulations are required. The reader is referred to Jordà (2005) for further details.[21]

4.2 Estimation results

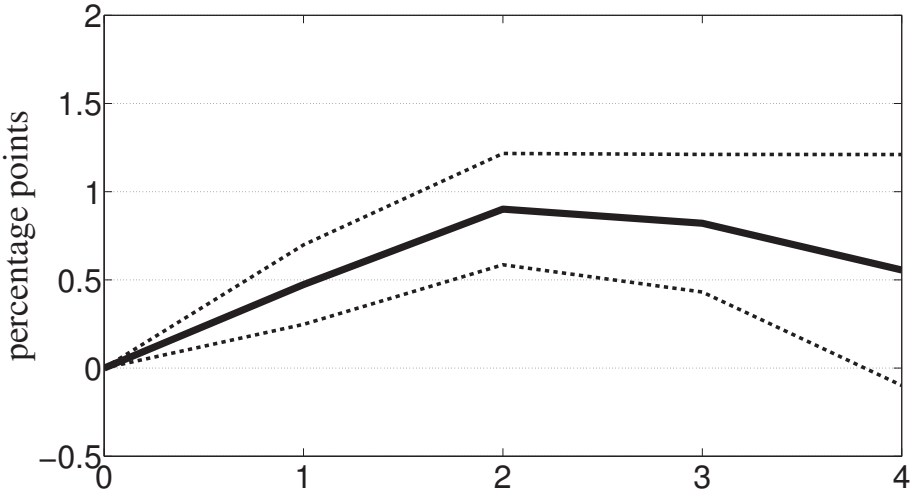
The estimated coefficients γ_h for changes in unemployment are computed for four years following the onset of a credit contraction, and robust Driscoll and Kraay (1998) standard errors are applied to correct for potential heteroskedasticity and error correlation across countries and over time.[22] Figure 4 displays impulse responses along with the 95% confidence bands for total, youth, and long-term unemployment. The results indicate that the impact of a private credit contraction on unemployment is large and statistically significant, increasing total and youth unemployment rates by nearly 1% and 2.4% respectively, after two years. A back of the envelope calculation suggests that in the four years

[20] Output gap is annual real GDP detrended using the Hodrick and Prescott (1997) filter.

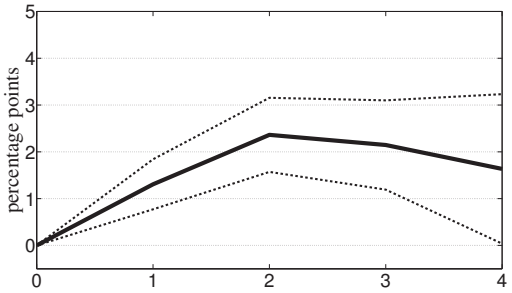
[21] Note that the Jordà (2005) approach is not free of drawbacks. As Ramey (2012) points out, the local projections method tends to produce statistically significant oscillations in the responses at larger horizons. Nonetheless, given that the impulse response functions are estimated for only four periods following the onset of a credit contraction throughout the analysis, the results are not likely to be affected by this particular concern.

[22] For $h > 4$ horizons, several credit peaks surrounding the outbreak of the most recent global financial crisis would be omitted from the estimation.

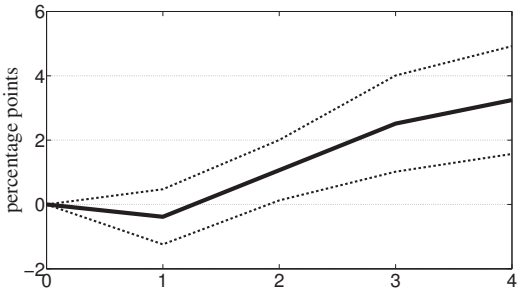
Figure 4: The impact of credit contractions on unemployment



(a) Total unemployment



(b) Youth unemployment



(c) Long-term unemployment

Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total, youth, and long-term unemployment rates to the onset of a private credit contraction at period 0 (in levels, in percentages). Dashed lines correspond to the 95% confidence bands.

following the onset of a contraction, credit downturns account for, on average, between one-quarter and one-half of the total rise in unemployment observed in the data.[23] In addition, at the peak, the contribution of the contraction to the increase in joblessness is about 20% greater for the youth, relative to total unemployment. Long-term unemployment increases starting from the second year, and the effects become significant from the third year on, pointing to the high degree of persistence.[24]

[23] The cumulated path of unemployment estimated with local projections is directly comparable to the average unemployment rate across all contractions presented in Section 3.4.

[24] Due to data limitations, further dimensions of unemployment disaggregation are not included in the analysis. Nevertheless, disaggregation by gender, for instance, suggests that the impact of credit contractions is slightly larger for men than women, but differences are not statistically significant.

The increasing duration of involuntary joblessness can be explained by hysteresis effects operating through various mechanisms; for instance, jobless workers become both less attractive (Ball, 2009) and more discouraged (Krueger and Mueller, 2011) over time, as unemployment lasts longer. These findings are also in line with the existing concerns that structural unemployment in many OECD countries has been shifted upwards following the most recent financial recession, and the increase could persist even when the economies recover (e.g., Guichard and Rusticelli, 2011). Estimation results for total unemployment are shown in Table 3.[25] The coefficients for the 1-period lagged change in unemployment are significant at each horizon, which reflects the persistence of the variable. The negative sign of the coefficient for the composite labor market index shows that more rigid labor regulations are associated with greater increases in unemployment. Such an inverse relationship is consistent with the empirical evidence for OECD countries provided by Blanchard and Wolfers (2000) and Bassanini and Duval (2009). Estimates for real GDP growth, output gap, inflation, and population appear to be significant, with the expected signs. The results are qualitatively similar for youth and long-term unemployment, not reported here, available upon request.

The results presented in Figure 4 indicate that a fall in private credit accounts largely for the increase in the number of unemployed workers. But what about the earnings of those who stay employed? Do wages remain unchanged following a credit downturn, and therefore the impact is absorbed by the changes in joblessness in its entirety? In order to answer this question, Equation 2 is re-estimated using changes in real wages (in logs) as the dependent variable, and Figure 5 depicts the corresponding impulse response function.[26] It turns out that real wages decrease only moderately following the onset of a credit contraction, reaching a negative peak of nearly -1.5% after 3 years, before starting to recover. Thus, evidence in this section suggests that a decline in the flow of credit has an overall adverse effect on labor market performance in industrialized economies,

[25] The estimated coefficients of the 1-year-lagged explanatory variables are not shown here, but are available from the author.

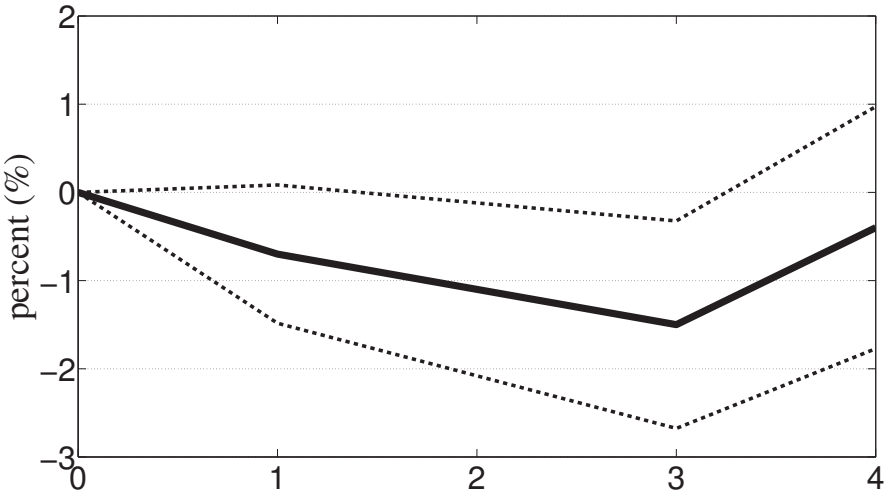
[26] Average annual wages are taken from the OECD and are consistently available from 1990 onward. Nominal wages are deflated by the consumer price index.

Table 3: Estimation results

Change in unemployment (relative to year 0)	**Year 1**	**Year 2**	**Year 3**	**Year 4**
1-Period Lagged Change in Unemployment	0.319***	0.454***	0.418**	0.399**
	(0.052)	(0.108)	(0.162)	(0.158)
2-Period Lagged Change in Unemployment	0.056	0.093	0.155	0.118
	(0.046)	(0.105)	(0.125)	(0.145)
Credit Peak	0.473***	0.901***	0.821***	0.556
	(0.115)	(0.161)	(0.199)	(0.334)
Labor Market Index	-0.087**	-0.189**	-0.222*	-0.128
	(0.040)	(0.077)	(0.112)	(0.131)
GDP Growth	-0.062**	-0.096*	-0.084	-0.058
	(0.027)	(0.048)	(0.057)	(0.056)
Output Gap	0.056	0.275***	0.532***	0.738***
	(0.041)	(0.096)	(0.124)	(0.113)
CPI Inflation	0.163***	0.300***	0.272***	0.194*
	(0.043)	(0.053)	(0.089)	(0.113)
Change in Public Debt to GDP	0.014**	0.008	0.011	0.010
	(0.006)	(0.010)	(0.012)	(0.011)
Change in Trade Openness	0.004	0.007	-0.008	-0.020
	(0.009)	(0.011)	(0.013)	(0.026)
Population	0.000**	0.001**	0.002**	0.003**
	(0.000)	(0.001)	(0.001)	(0.001)
Number of Observations	620	600	580	560
Within R^2	0.54	0.58	0.60	0.62
Country Fixed Effects	yes	yes	yes	yes

Note: Estimated coefficients of the least-squares dummy variable model for 1-4 years after the onset of a private credit contraction (year 0). The dependent variable is change in total unemployment rate (in levels, in percentages). ***, **, and * represent statistical significance at 1, 5, and 10 percent levels, respectively. Driscoll and Kraay (1998) standard errors are in parentheses. All variables and their sources are defined in Table A1.

Figure 5: The impact of credit contractions on wages



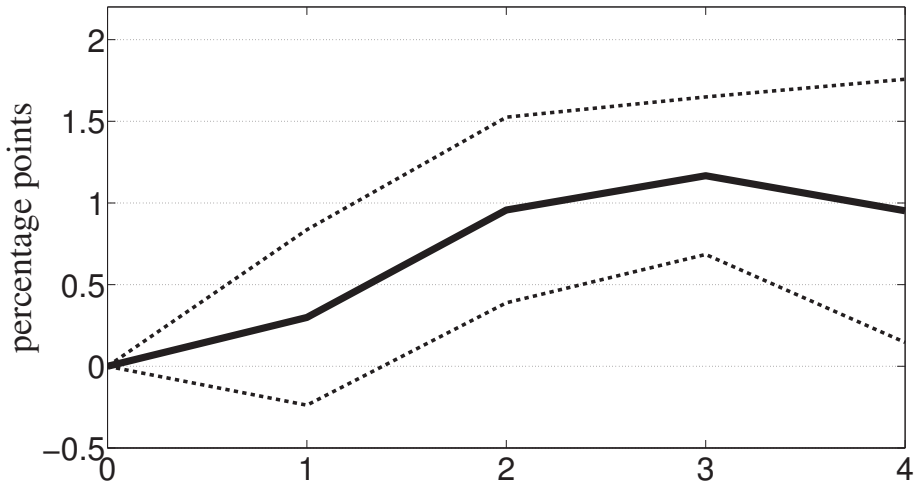
Note: Impulse response function estimated by local projections for a panel of 20 OECD countries between 1990-2013. The solid line represents the average response of real wages to the onset of a private credit contraction at period 0 (in percent). Dashed lines correspond to the 95% confidence band.

yet it is borne mainly by the workers who are eventually left without a job. This finding is consistent with Calvo et al. (2012), who document that financial recessions in the presence of relatively low inflation – as in advanced economies – tend to be followed by jobless recoveries, while crises under high inflation – as in several emerging economies – are associated with wageless recoveries.

4.3 Credit contractions and the business cycle

Notice that the impact of a credit downturn is obtained for the years after the occurrence of a credit peak, therefore the estimation results are not likely to be subject to reverse causality. Yet, the evolution of private credit is expected to be endogenous even after using a rich set of controls and their lags to soak up variation in the labor market outcomes. It is difficult to find a source of exogenous variation in the demand or supply of credit to borrowers in the context of a cross-country analysis encompassing 20 economies over more than three decades. Nonetheless, a possible way to overcome this problem is by exploiting the relationship between credit contractions and the business cycle. To this end, a non-parametric measure of the degree of synchronization advocated by Harding and Pagan (2002) is calculated first. The so-called concordance index is quantified here

Figure 6: The impact of credit contractions on unemployment during GDP expansions



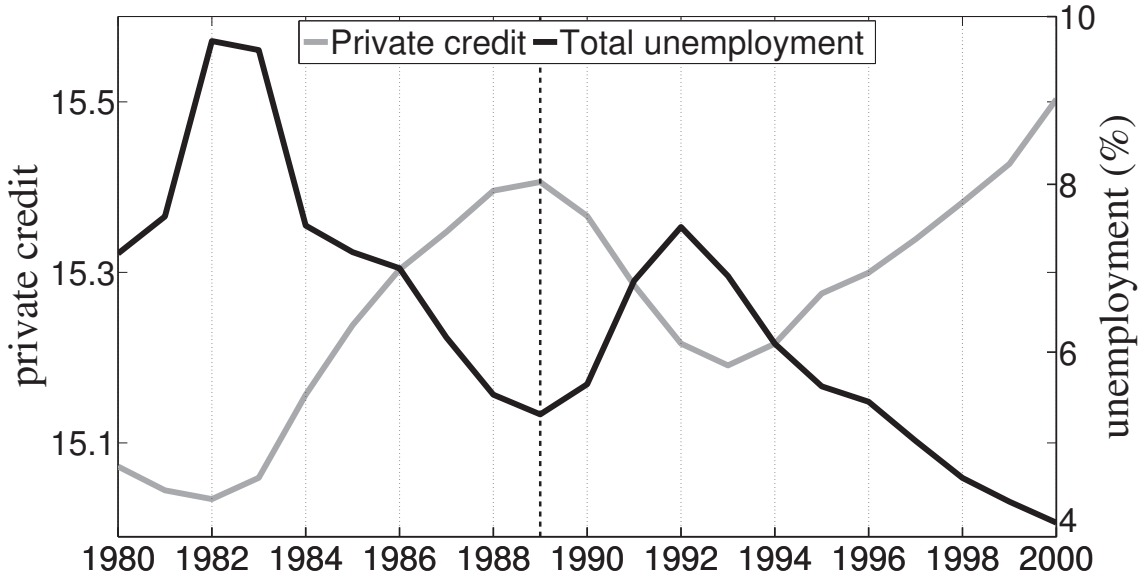
Note: Impulse response function estimated by local projections for a panel of 20 OECD countries between 1980-2013. The solid line represents the average response of total unemployment rate to the onset of a private credit contraction at period 0 (in levels, in percentages). Only credit contractions that start during GDP expansions are considered. Dashed lines correspond to the 95% confidence band.

by the fraction of time in which the series of private credit and real GDP per capita are in the same phase of expansion or contraction. In order to proceed, business cycle turning points are dated by the Bry and Boschan (1971) algorithm using real GDP per capita in addition to private credit. Once the turning points are obtained, a binary variable $S_{j,t}$ is constructed to determine whether an economy is in expansion ($S_{j,t} = 1$) or contraction ($S_{j,t} = 0$) in the respective series j at period t, and the concordance indicator takes the form:

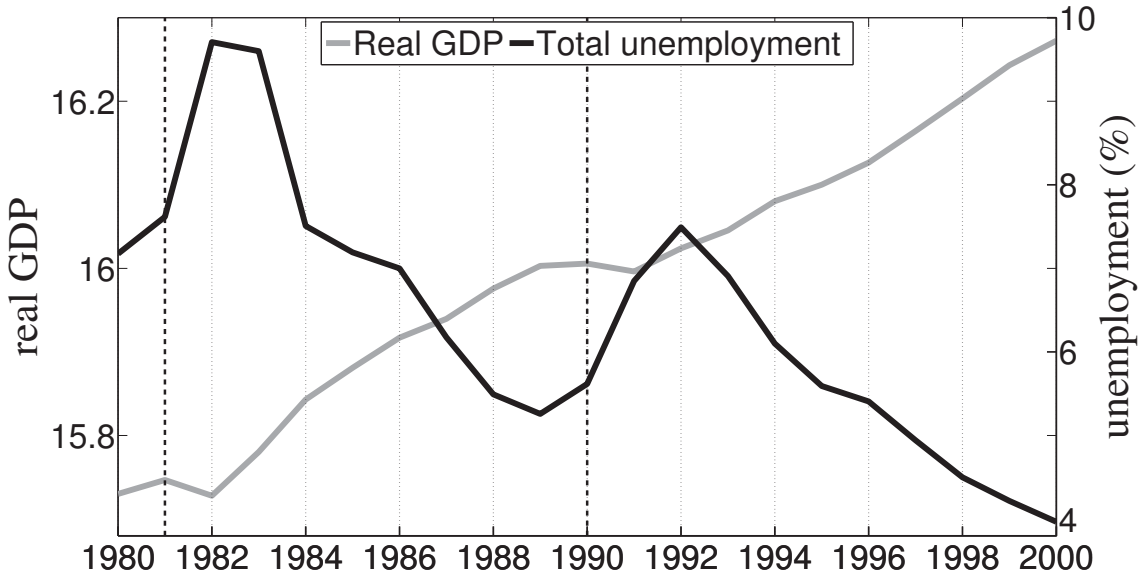
$$CI = \frac{1}{T}\left\{\sum_{t=1}^{T} S_{Credit.t}S_{GDP,t} + \sum_{t=1}^{T}(1 - S_{Credit,t})(1 - S_{GDP,t})\right\}. \tag{3}$$

The indices of concordance among the 20 economies range from 0.62 to 0.91 (mean 0.78), suggesting a relatively high, but far from perfect, degree of co-movement between private credit and per capita real GDP. In what follows, isolating the impact of credit contractions for the diverging episodes of the business cycle, i.e., when an economy is simultaneously growing, allows to identify the independent role of credit for unemployment fluctuations. Hence, to alleviate potential endogeneity concerns, the average path of joblessness is computed following credit downturns that begin during economic expansions. A total of

Figure 7: The Savings and Loan crisis of the 1980s and 1990s in the U.S.



(a) Private credit and total unemployment



(b) Real GDP and total unemployment

Note: Log levels of (a) real private credit and (b) real GDP (left axis) are plotted against total unemployment rate (right axis, %) for the United States between 1980 and 2000. The dashed lines indicate the years of the peaks in (a) private credit and (b) real GDP.

12 credit peaks of such type are detected over the years 1980 to 2013, and the cumulated response of unemployment is displayed in Figure 6. Although this particular exercise provides relatively few observations, the estimates remain statistically meaningful, and consistent with the predictions of the baseline formulation for the entire sample.

The Savings and Loan crisis of the 1980s and 1990s presented in Section 3.3 is a good example of such an event. While the banking crisis produced the biggest collapse of U.S. financial institutions since the Great Depression of 1929, real GDP fell only a slight 0.1 percent between 1990 and 1991. In fact, the loss is reflected in the increase of the unemployment rate from 5.2% in 1989 to 7.5% in 1992, owing largely to related drops in credit supply, market confidence and private investment activity (Akerlof and Shiller, 2009; Duygan-Bump, Levkov, and Montoriol-Garriga, 2015). Figure 7 illustrates the unfolding of the crisis, during which credit peaked in 1989, accompanied by increasing unemployment rates (Figure 7/(a)), and a mild recession that followed a year after (Figure 7/(b)).

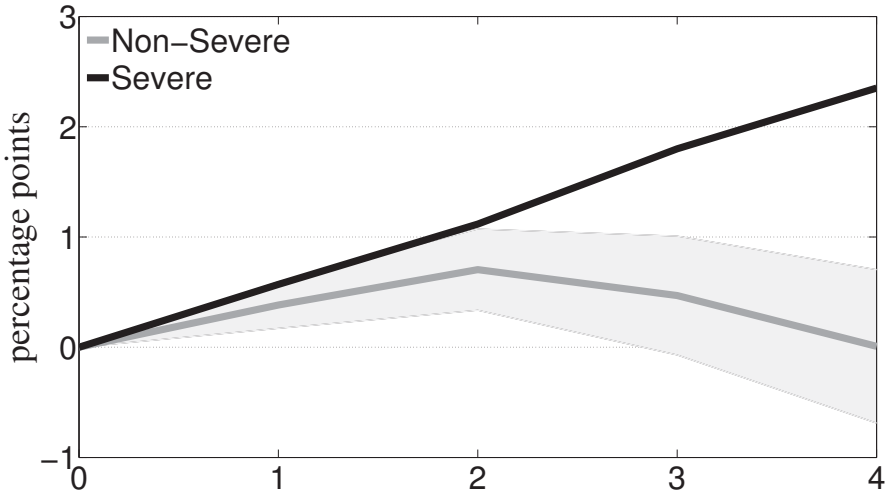
4.4 Unemployment and the severity of credit contractions

To capture the differential variation in joblessness due to the severity of a private credit downturn, unemployment paths following non-severe and severe credit contractions are examined next. For this purpose, the baseline specification given by Equation 2 is augmented to include a binary indicator for each type of contraction separately:

$$\Delta_h U_{i,t+h} = \alpha_i^h + \sum_{j=0}^{1} \beta_j^h \Delta U_{i,t-j} + \gamma_h^{NS} C_{i,t}^{NS} + \gamma_h^S C_{i,t}^S + \delta_h L_{i,t} + \sum_{j=0}^{1} \theta_j' \mathbf{X_{i,t-j}} + \epsilon_{i,t}^h, \qquad (4)$$

where γ_h^{NS} and γ_h^S measure the average response of unemployment to non-severe ($C_{i,t}^{NS} = 1$) and severe ($C_{i,t}^S = 1$) contractions, respectively. The impulse responses displayed in Figure 8 reveal the differential impact attributed to the severity of a credit downturn, which lends further support to the identification strategy. Severe credit busts are typically followed by substantial and long-lasting increases in unemployment, whereas the impact of other, non-severe contractions is moderate, with unemployment recovering, on average, already after four years. The differences become statistically significant three years after

Figure 8: The impact of credit contractions on unemployment: non-severe vs. severe credit contractions



Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total unemployment rate to the onset of a non-severe (gray) and severe (black) private credit contraction (at period 0), separately (in levels, in percentages). The shaded area corresponds to the 95% confidence band of the impulse response to a non-severe private credit contraction. Severe credit contractions are defined as peak-to-trough declines in private credit that fall within the top quartile of all credit contractions.

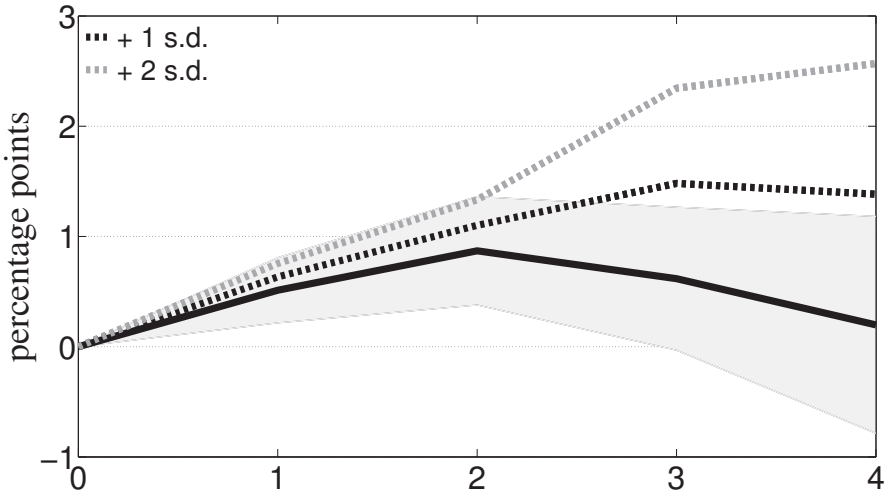
the onset of a credit contraction, amounting to nearly 1.5% in period 3, and over 2% in period 4. In addition, it is important to observe that while severe credit downturns last on average about 5 years (Table 2), unemployment rates seem to remain well above their pre-peak level when the decline in credit is already reversed.

4.5 Unemployment and financial leverage

The stylized facts presented in the preliminary analysis are indicative of the existence of an important connection between the financial leverage of an economy before the onset of a contractionary phase and the subsequent changes in unemployment. In order to validate this hypothesis, the present subsection provides a formal statistical assessment of the relationship in question.

Following Jordà et al. (2013), the marginal treatment response due to perturbations in the excess credit variable is examined first. Specifically, the binary indicator of credit peak is interacted with a term that measures the deviation of the annual growth rate of

Figure 9: The impact of credit contractions on unemployment: increased financial leverage



Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. The solid line represents the average response of total unemployment rate to the onset of a private credit contraction at period 0 (in levels, in percentages). The shaded area corresponds to the 95% confidence band. Dashed lines indicate the trajectories of unemployment rates when the rate of change per year in the private credit to GDP ratio in the preceding expansion is perturbed by increments of +1 and +2 standard deviation (s.d.) above its country-specific mean.

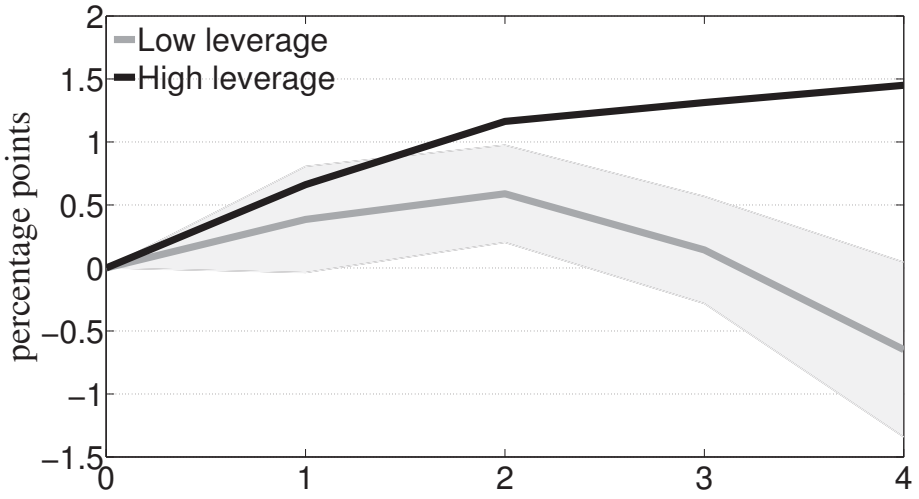
private credit to GDP ($\phi_{i,t}$) during the expansionary phase before the contraction from its country-specific historical mean:

$$\Delta_h U_{i,t+h} = \alpha_i^h + \sum_{j=0}^{1} \beta_j^h \Delta U_{i,t-j} + \gamma_h C_{i,t} + \lambda_h (\phi_{i,t} - \bar{\phi}_i) C_{i,t} + \delta_h L_{i,t} + \sum_{j=0}^{1} \theta_j' \mathbf{X_{i,t-j}} + \epsilon_{i,t}^h, \quad (5)$$

where the continuous treatment $(\phi_{i,t} - \bar{\phi}_i)$ denotes the excess rate of credit in the preceding expansion, that is, the intensity of the boom.[27] The new coefficient of interest λ_h captures the marginal effect of a perturbation applied to the excess rate of credit. Namely, the excess credit treatment is perturbed by increments of +1 and +2 standard deviation (s.d.) above its mean. The advantage of this exercise is that the build-up of credit is predetermined at the start of each contraction. Thus, conditional on a rich set of controls and their lags to cleanse the effect of a decline in credit, the 'experiment' provides a good approximation of how differently unemployment would respond to increases in the financial leverage of the economy, all else equal. The impulse response of total unemployment along with the perturbed paths are shown in Figure 9. Clearly, unemployment suffers

[27] The leverage variable represented by $\phi_{i,t}$ refers to the rate of change per year in private credit relative to GDP in the expansion phase preceding the onset of the credit contraction at time period t.

Figure 10: The impact of credit contractions on unemployment: low vs. high leverage



Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total unemployment rate to the onset of a private credit contraction (at period 0) with low (gray) and high (black) financial leverage, separately (in levels, in percentages). The shaded area corresponds to the 95% confidence band of the impulse response to a low leveraged private credit contraction. Credit contractions are classified as highly (low) leveraged if the excess rate of change per year in the private credit to GDP ratio during the preceding expansionary phase was above (below) its full sample mean.

more when the preceding expansion has been associated with higher rates of change in private credit to GDP. Irrespective of the size of the deviation considered, the marginal impact of an increase in excess credit is positive, and becomes statistically significant after two years, confirming the initial conjecture that the financial leverage prior to the credit bust matters for the subsequent changes in joblessness.

Recall from Section 3.3 that a credit contraction is classified as highly leveraged if the excess rate of change per year in the private credit to GDP ratio during the expansion prior to the peak was above its full sample mean, and low leveraged otherwise. As an additional exercise, cumulated responses to credit contractions with low and high financial leverage are estimated as follows:

$$\Delta_h U_{i,t+h} = \alpha_i^h + \sum_{j=0}^{1} \beta_j^h \Delta U_{i,t-j} + \gamma_h^L C_{i,t}^L + \gamma_h^H C_{i,t}^H + \delta_h L_{i,t} + \sum_{j=0}^{1} \theta_j' \mathbf{X_{i,t-j}} + \epsilon_{i,t}^h, \quad (6)$$

where γ_h^L and γ_h^H measure the average response to credit contractions with low ($C_{i,t}^L = 1$) and high ($C_{i,t}^H = 1$) leverage, respectively. Impulse responses to both types of treatments

are depicted in Figure 10. By dividing the sample based on the intensity of the credit build-up of the expansionary phase preceding each credit contraction, the resulting trajectories are considerably different. It appears that a subsequent rise in total unemployment is up to five times greater when the expansion was highly leveraged. Labor markets recover relatively quickly, about three years after the beginning of a low leveraged credit contraction, while unemployment persists and remains more than 1% above its pre-peak level following a contraction with high leverage, even after 4 years. Qualitatively similar predictions are obtained by Pagano and Pica (2012) and Boeri et al. (2012, 2013), who show that sectors that rely heavily on external funding are more vulnerable to adverse financial shocks, characterized by greater job destruction rates than low leveraged sectors.

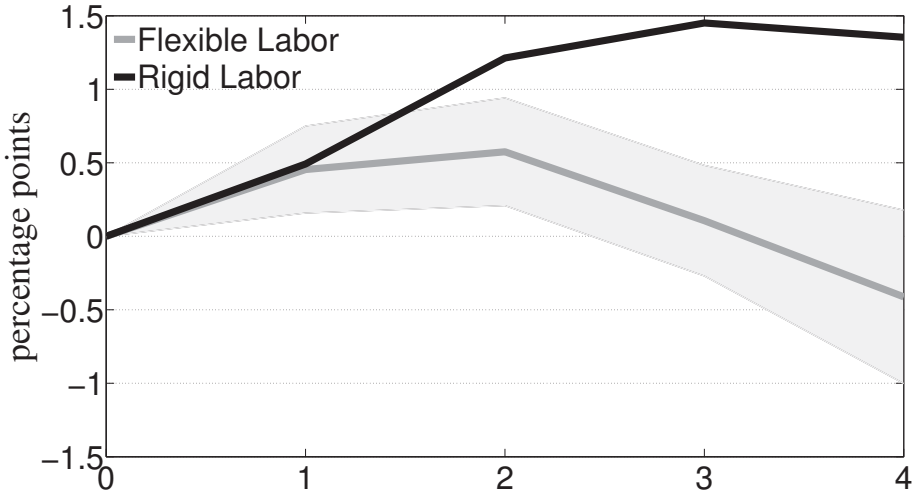
4.6 The role of labor market institutions

Unemployment dynamics cannot be investigated in isolation from labor market institutions. While credit contractions can potentially explain much of the increase in joblessness, the average response of unemployment may vary due to differences in the flexibility of labor market regulations. Hence, this final subsection compares the impact of credit downturns on unemployment in episodes characterized by flexible and rigid labor markets. Impulse response functions are calculated as follows:

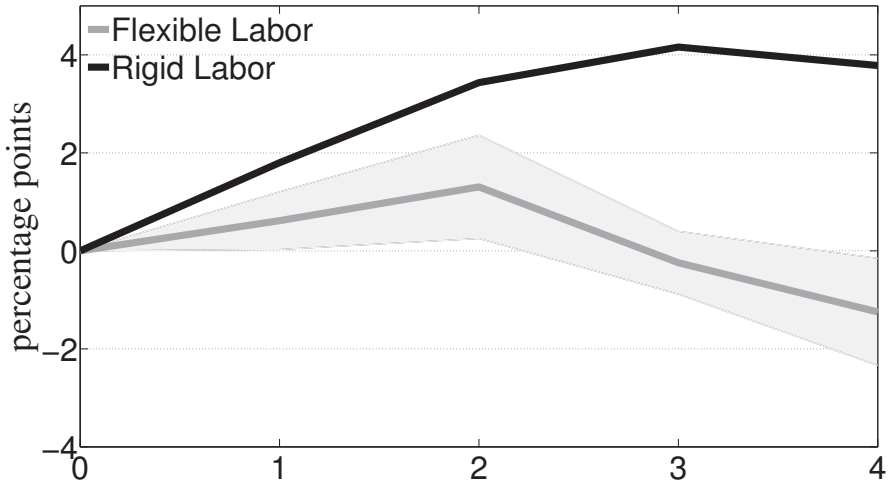
$$\Delta_h U_{i,t+h} = \alpha_i^h + \sum_{j=0}^{1} \beta_j^h \Delta U_{i,t-j} + \gamma_h^F C_{i,t}^F + \gamma_h^R C_{i,t}^R + \delta_h L_{i,t} + \sum_{j=0}^{1} \theta_j' \mathbf{X_{i,t-j}} + \epsilon_{i,t}^h, \quad (7)$$

where γ_h^F and γ_h^R capture the effect of credit contractions with flexible ($C_{i,t}^F = 1$) and rigid ($C_{i,t}^R = 1$) labor markets, respectively. Figure 11 presents the response of total and youth unemployment to credit contractions interacted with different levels of labor market regulations. The average path of unemployment peaks two years after the beginning of a downturn in countries with flexible labor market institutions. In contrast, unemployment rates in rigid labor markets increase sharply in the first three years and remain relatively high afterwards. Thus, labor market rigidities significantly amplify the impact of a fall in private credit. Besides, one should notice that the resulting trajectories differ substantially more for youth unemployment. This may be attributed to hiring and firing

Figure 11: The impact of credit contractions on unemployment: flexible vs. rigid labor market institutions



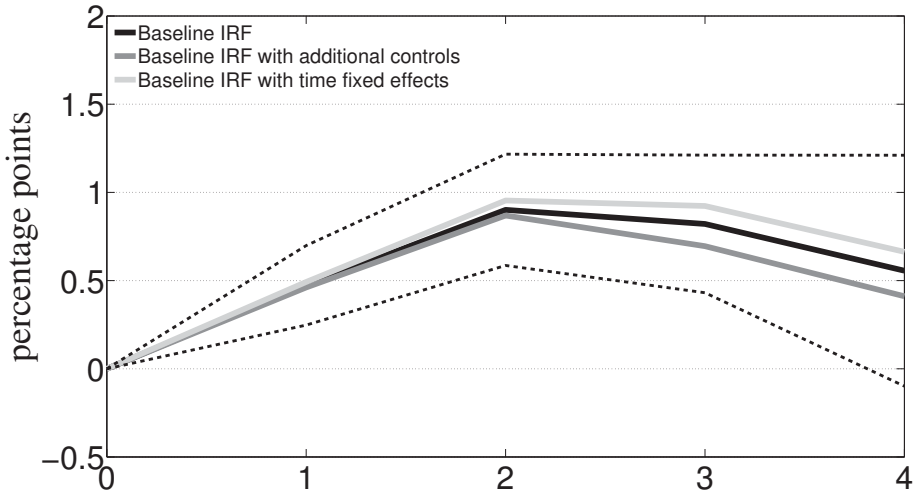
(a) Total unemployment



(b) Youth unemployment

Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of (a) total and (b) youth unemployment rates to the onset of a private credit contraction (at period 0) with flexible (gray) and rigid (black) labor market institutions, separately (in levels, in percentages). The shaded areas correspond to the 95% confidence bands of the impulse responses to a private credit contraction in flexible labor markets. Credit downturns are characterized by flexible (rigid) labor market institutions if the composite indicator of labor market flexibility was above (below) the full sample historical mean at the beginning of the contraction.

Figure 12: The impact of credit contractions on unemployment: alternative specifications



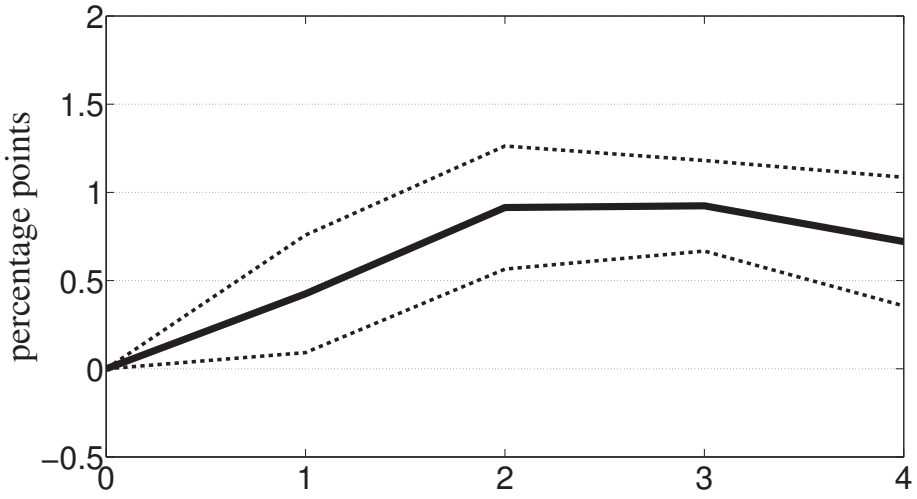
Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total unemployment rate to the onset of a private credit contraction (at period 0), for three different specifications (in levels, in percentages): (i) baseline (black); (ii) baseline expanded with additional controls (dark gray); (iii) baseline with time fixed effects (light gray). Dashed lines correspond to the 95% confidence band of the baseline impulse response function.

regulations that affect young people disproportionately harder (see, e.g., Kawaguchi and Murao, 2012). An in-depth analysis of the underlying reasons is, however, beyond the scope of this article, and would provide one fruitful avenue for future research.

5 Robustness checks

In order to assess the robustness of the results, Equation 2 is first re-estimated by including an extensive set of controls that can potentially shape the evolution of unemployment over time. These variables are: (1) GDP per capita growth; (2) current account to GDP; (3) general government final consumption expenditure (in percent of GDP); (4) total investment (in percent of GDP); (5) private credit to GDP gap measured by the deviation of private credit to GDP from its trend using the Hodrick and Prescott (1997) filter; and (6) change in real exchange rates, to account for the competitiveness of the economies. The estimated coefficients for credit contractions using additional control variables remain significant in statistical terms, and the point estimates are nearly identical to those of the baseline specification. In addition, the outcomes are robust to the inclusion of time fixed

Figure 13: The impact of credit contractions on unemployment: subsample analysis



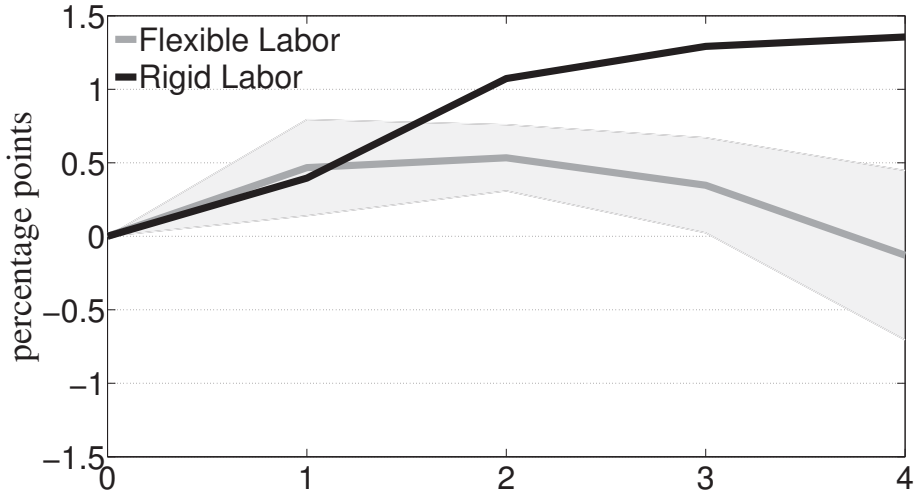
Note: Impulse response function estimated by local projections for a panel of 20 OECD countries between 1980-2006 (excluding the Great Recession). The solid line represents the average response of total unemployment rate to the onset of a private credit contraction at period 0 (in levels, in percentages). Dashed lines correspond to the 95% confidence band.

effects. Impulse responses for each specification together with the baseline estimates are reported in Figure 12.

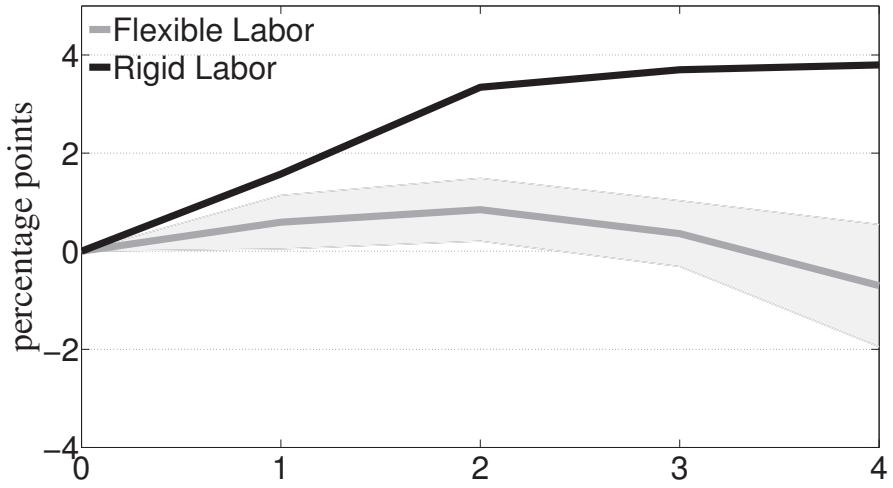
Another question that may arise is whether the findings are driven by the financial crisis of 2007-2008. To address this issue, the baseline estimation is repeated for a subsample of the 20 OECD economies over the years 1980 to 2006. The sample falls to 33 contractionary episodes; still, the results obtained are robust to the exclusion of the Great Recession. Figure 13 shows that the cumulated response of unemployment to a credit downturn remains statistically significant and quantitatively unchanged, displaying an increase of about 1% at the peak. Overall, the coefficients are remarkably stable across the different specifications, confirming the adverse impact of credit contractions on unemployment dynamics.

One may also be concerned about the choice of the measure of labor market flexibility. For this reason, Equation 7 has been re-estimated for both total and youth unemployment by employing the OECD's employment protection legislation index. This widely used indicator of labor market institutions is most closely associated with the EFW sub-component 'hiring and firing regulations', and measures the strictness of protection against individual

Figure 14: The impact of credit contractions on unemployment: flexible vs. rigid labor markets measured by the OECD's employment protection legislation (EPL) index



(a) Total unemployment



(b) Youth unemployment

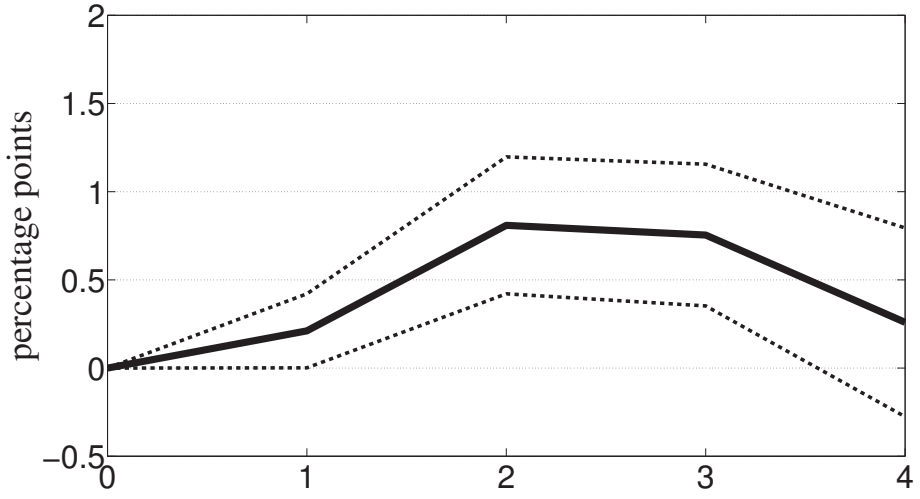
Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of (a) total and (b) youth unemployment rates to the onset of a private credit contraction (at period 0) with flexible (gray) and rigid (black) labor market institutions, separately (in levels, in percentages). The shaded areas correspond to the 95% confidence bands of the impulse responses to a private credit contraction in flexible labor markets. Credit downturns are characterized by flexible (rigid) labor market institutions if the OECD's employment protection legislation (EPL) indicator was below (above) the full sample historical mean at the beginning of the contraction.

dismissal of employees with regular contracts and the strictness of regulation of temporary employment. The resulting coefficients of interest presented in Figure 14 are very similar to those obtained from the baseline specification using the EFW's composite measure of labor market flexibility (see Figure 11), which corroborates the previous finding that unemployment rates increase significantly more in contractionary episodes that are characterized by rigid labor market institutions.

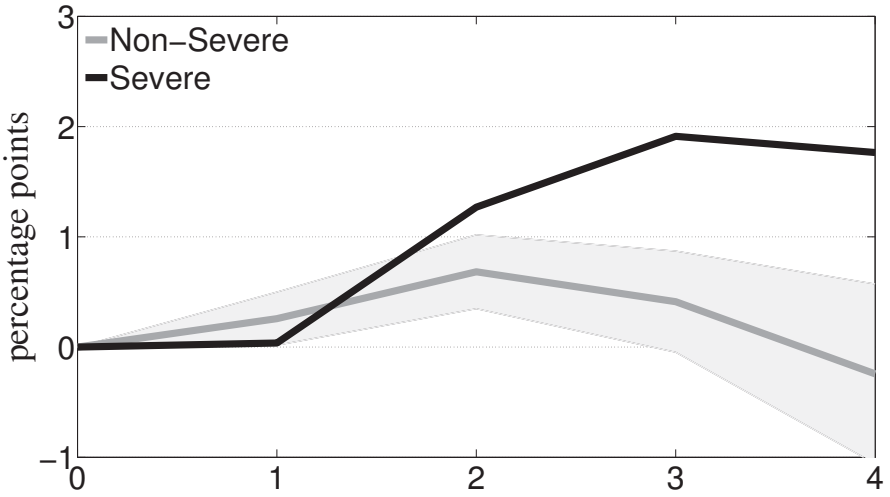
The paper has so far provided ample evidence that credit markets play a crucial role in shaping labor market outcomes. The recent literature on financial cycles points out, however, that besides credit, other variables should also be considered in order to unravel the linkages between disruptions in the financial sector and the real economy. While there exists no consensus on the definition of the financial cycle, Drehmann et al. (2012) and Borio (2014), among others, argue that boom-bust patterns in financial markets may be best described in terms of credit and property prices, whereas equity prices are not as reliable, since they exhibit a comparatively higher volatility at short-term frequencies and therefore co-vary with the other two series far less. The close association between credit, property prices, and economic downturns has been documented in a number of works, including Mian and Sufi (2011), Agnello and Schuknecht (2011), and Jordà, Schularick, and Taylor (2015a), and moreover, Branch, Petrosky-Nadeau, and Rocheteau (2016) show that changes in household finance impacts house prices as well as unemployment. In what follows, given the empirical evidence that credit and property prices tend to co-move rather closely with each other, impulse responses of total unemployment are estimated for four years after a house price peak, where turning points in the property price series are identified using the Bry and Boschan (1971) algorithm.[28] In addition to computing the unemployment paths encompassing all 74 house price peaks detected in the panel, average responses are obtained following the start of non-severe and severe property price busts separately, and the results are displayed in Figure 15. The outcome in Figure 15/(a) closely resembles the response of unemployment to the onset of private credit contractions, suggesting that several contractionary episodes in the sample are strongly connected to the fall in property prices. Moreover, the lagged response of unemployment to severe house price declines in Figure 15/(b) hints at property price busts starting already before credit

[28] Nominal house prices are taken from the BIS Residential Property Price Statistics and are deflated using the CPI series.

Figure 15: The impact of property price busts on unemployment



(a) All property price busts



(b) Non-severe vs. severe property price busts

Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total unemployment rate to the onset of a property price bust (at period 0) considering (a) all housing busts and (b) non-severe (gray) and severe housing busts (black), separately (in levels, in percentages). Dashed lines and the shaded area correspond to the 95% confidence bands of the impulse responses to (a) all property price busts and (b) non-severe property price busts, respectively. Severe housing busts are defined as peak-to-trough declines in property prices that fall within the top quartile of all property price busts.

contractions. Although 29 out of the 52 credit peaks in the panel indeed either coincide with house price peaks or occur in the preceding one or two years, the identification strategy employed here does not allow to make causal claims.

The purpose of this study is to analyze the response of unemployment to different types of private credit contractions. Nevertheless, for the sake of completeness, a final exercise replicates the entire analysis for total employment and the labor force participation rate. The estimates for the average response of employment as well as for each of the dimensions previously considered (i.e., severity, financial leverage, labor flexibility) are qualitatively as well as quantitatively comparable to the findings obtained for unemployment. As expected, the labor force participation rate likewise declines in the years following the onset of a credit downturn, and a greater share of the working-age population leaves the labor force in rigid labor markets, on average. Interestingly, however, the differences in the impact based on the severity of the contraction and the build-up of credit are not as marked. To save space, results for both variables and all specifications are reported in Appendix C.

6 Conclusion

This paper investigates the linkages between credit markets and unemployment dynamics in a cross-country analysis. The study uses a dataset covering 20 OECD economies spanning from 1980 to 2013 and analyzes the effect of contractions in private credit on labor market performance. Specifically, the Bry and Boschan (1971) dating algorithm is applied to identify credit peaks, i.e., turning points in credit cycles to estimate the impact of credit contractions on unemployment fluctuations. Impulse responses of total, youth, and long-term unemployment are then obtained using the local projections method introduced by Jordà (2005). Moreover, the intensity of the countries' financial leverage during the preceding expansion and the role of labor market institutions are also considered.

The results shed new light on the empirical relationship between private credit and aggregate unemployment, and a battery of robustness checks strengthen the findings. In particular, evidence in the paper suggests that disturbances in the credit market affect both the level and persistence of unemployment, with more severe declines in credit

followed by greater increases in joblessness. Regarding the estimates for youth unemployment, the impact is even more pronounced. Lasting effects on long-term unemployment point toward high persistence and sluggish recovery of labor markets following a credit downturn. To understand the quantitative significance of the impact, credit tightening accounts for, on average, between one-quarter and one-half of the increase in unemployment in the sample in the four years after the onset of a contraction, which accords with the ranges found in previous studies that explore the effects of credit supply shocks on employment around the Great Recession (e.g., Bentolila et al., 2013; Chodorow-Reich, 2014).[29] Perhaps not surprisingly, real wages display only a moderately negative response to the fall of credit during the same period of time. In addition, the results reveal that the credit build-up of an economy prior to the contraction matters for the subsequent changes in joblessness. Excessive leverage during the credit expansion preceding a contractionary phase triggers, on average, relatively higher unemployment in the following downturn. Finally, the detrimental effect of credit busts depends heavily on the flexibility of labor markets, with tighter regulations leading to greater increases in unemployment.

The findings of the paper highlight the empirical relevance of the credit transmission channel for joblessness, yet, further theoretical research at the micro-level is necessary for the better understanding of the fundamental mechanisms. Nonetheless, the observed pattern between credit contractions and the subsequent increases in unemployment rates in industrialized economies over the last decades suggests that the variable private credit could play a significant role in predicting unemployment dynamics, and therefore future work aims to validate this study by performing a forecast analysis based on the established connections. In terms of practical implications, the evidence that credit contractions translate to the labor market calls for policies directed to improved financial regulation and macro-prudential supervision, which would be capable of mitigating the negative consequences that credit disruptions bring about. Furthermore, labor market policies should be targeted at preventing that the youth and long-term unemployed exit from the labor force, an existing concern in several OECD economies in the aftermath of the most recent global financial crisis.

[29] Results obtained for changes in total employment after the onset of credit contractions yield consistent estimates that are more comparable to the above works.

A List of variables

Table A1: Definition and sources of variables

Variable	Variable definition	Source
Private credit	Nominal credit to the non-financial private sector by domestic banks, adjusted for breaks (in millions of national currency).	BIS Total Credit statistics
Property Prices	Nominal residential property prices, index (2010=100).	BIS Residential Property Price statistics
Total employment rate	Percentage of the total labor force that is currently employed.	WEO
Total unemployment rate	Percentage of the total labor force that is currently unemployed.	WEO
Youth unemployment rate	Percentage of the total labor force of ages 15-24 that is currently unemployed.	Eurostat, OECD, WDI
Long-term unemployment rate	Number of people with continuous periods of unemployment extending for a year or longer, as a fraction of total unemployment (in percentages).	Eurostat, WDI
Labor force participation rate	Total labor force as a fraction of the total working-age population (in percentages)	OECD
Wages	Average annual wages in current prices (in local currency).	OECD
Labor market regulations indicators	Composite measure of labor market flexibility. Scaled to take values between 0 and 10, with higher values indicating more flexible regulation.	EFW
	Employment Protection Legislation (EPL) indicator. Scaled to take values between 0 and 6, with lower values indicating more flexible regulation.	OECD
Nominal GDP	Gross domestic product in current prices (in billions of local currency).	WEO
Real GDP	Gross domestic product per capita in constant prices (in 2005 US Dollars).	WDI
Consumer price index	Consumer prices, all items, index (2005 = 100).	WDI
Real exchange rate	Real effective exchange rates, index (2005 = 100).	WDI
Population	Total population (in thousands).	WDI
Public debt	Gross general government debt (in percent of GDP).	IMF, WEO
Trade openness	Sum of exports and imports of goods and services (in percent of GDP).	WDI
Total investment	Total value of the gross fixed capital formation (in percent of GDP).	WEO
Current account balance	Sum of net exports of goods and services, net primary income, and net secondary income (in percent of GDP).	WEO
Government consumption	General government final consumption expenditure (in percent of GDP).	WDI

B Credit cycle peaks

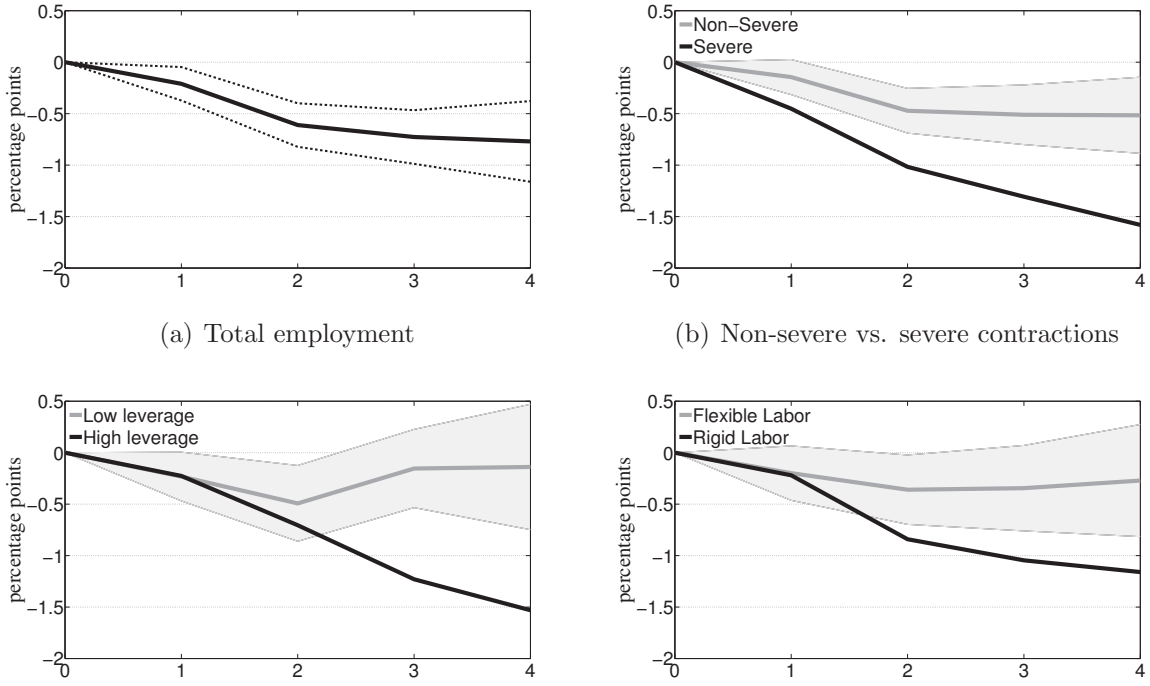
Table B1: Credit cycle peaks

Country	Credit peak
Australia	-
Austria	2002, 2010
Belgium	1980, 1993, 2000, 2007, 2011
Canada	1982, 1990, 2008
Denmark	1991, 1994, 2009
Finland	1989
France	1991
Germany	2001
Greece	1982, 1985, 1989, 2009
Ireland	1981, 1985, 2008
Italy	1993, 2011
Japan	1992, 1996, 1998, 2007, 2009
Netherlands	1981, 2008, 2011
Norway	1990, 2008, 2011
Portugal	1982, 1988, 2010
Spain	1983, 1992, 2009
Sweden	1990, 1992
Switzerland	1981, 1990, 2001
United Kingdom	1990, 2008, 2010
United States	1989, 2008

Note: The dates refer to peaks in the private credit series for each country in the sample (1980-2013). Credit peaks are identified using the Bry and Boschan (1971) dating algorithm.

C Credit contractions and labor force activity

Figure C1: The impact of credit contractions on employment



(a) Total employment

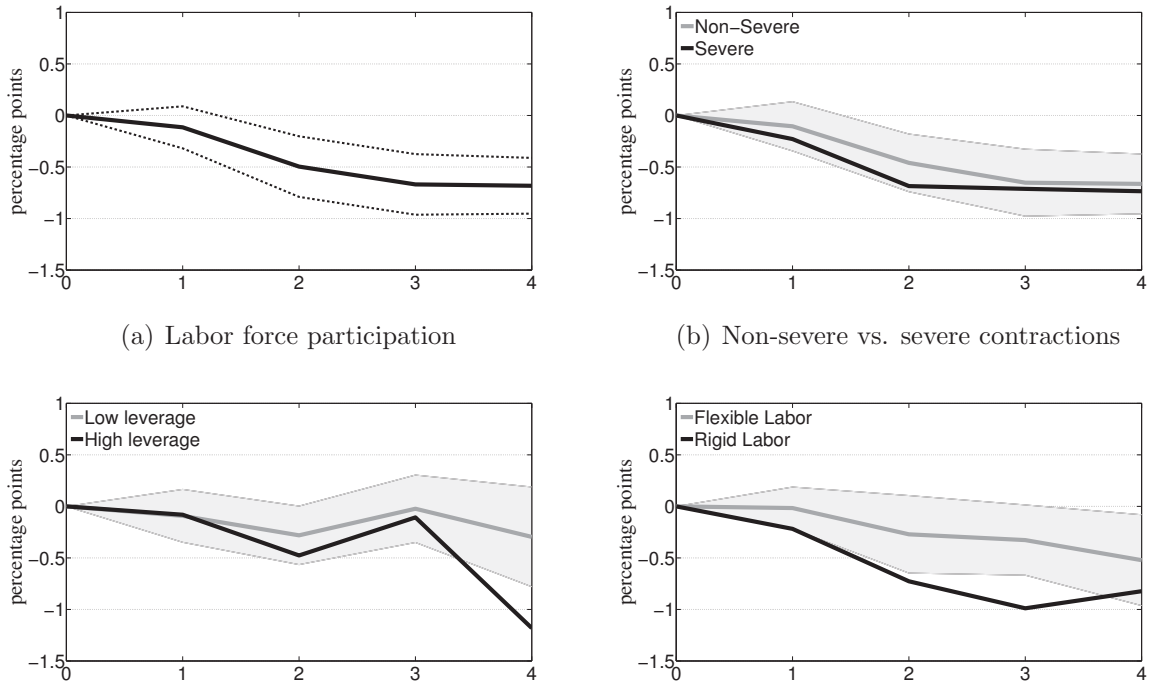
(b) Non-severe vs. severe contractions

(c) Low vs. high financial leverage

(d) Flexible vs. rigid labor market institutions

Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of total employment rate to the onset of different types of private credit contractions at period 0 (in levels, in percentages). Dashed lines and shaded areas correspond to the 95% confidence bands of the respective impulse responses. See text for details.

Figure C2: The impact of credit contractions on labor force participation



(a) Labor force participation

(b) Non-severe vs. severe contractions

(c) Low vs. high financial leverage

(d) Flexible vs. rigid labor market institutions

Note: Impulse response functions estimated by local projections for a panel of 20 OECD countries between 1980-2013. Solid lines represent the average response of labor force participation rate to the onset of different types of private credit contractions at period 0 (in levels, in percentages). Dashed lines and shaded areas correspond to the 95% confidence bands of the respective impulse responses. See text for details.

References

Acemoglu, D. (2001). Credit market imperfections and persistent unemployment. *European Economic Review 45*(4-6), 665–679.

Agnello, L. and L. Schuknecht (2011). Booms and busts in housing markets: Determinants and implications. *Journal of Housing Economics 20*(3), 171–190.

Akerlof, G. A. and R. J. Shiller (2009). *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism.* Princeton, NJ: Princeton University Press.

Ball, L. M. (2009). Hysteresis in unemployment: Old and new evidence. NBER Working Papers 14818, National Bureau of Economic Research, Inc.

Bassanini, A. and R. Duval (2009). Unemployment, institutions, and reform complementarities: re-assessing the aggregate evidence for OECD countries. *Oxford Review of Economic Policy 25*(1), 40–59.

Bell, D. N. F. and D. G. Blanchflower (2011). Young people and the Great Recession. *Oxford Review of Economic Policy 27*(2), 241–267.

Benk, S., M. Gillman, and M. Kejak (2005). Credit shocks in the financial deregulatory era: Not the usual suspects. *Review of Economic Dynamics 8*(3), 668–687.

Bentolila, S., M. Jansen, G. Jiménez, and S. Ruano (2013). When credit dries up: Job losses in the Great Recession. IZA Discussion Papers 7807, Institute for the Study of Labor (IZA).

Bernal-Verdugo, L. E., D. Furceri, and D. Guillaume (2013). Banking crises, labor reforms, and unemployment. *Journal of Comparative Economics 41*(4), 1202 – 1219.

Bernanke, B. and M. Gertler (1989). Agency costs, net worth, and business fluctuations. *American Economic Review 79*(1), 14–31.

Bernanke, B., M. Gertler, and S. Gilchrist (1996). The financial accelerator and the flight to quality. *The Review of Economics and Statistics 78*(1), 1–15.

Bernanke, B. S., M. Gertler, and S. Gilchrist (1999). The financial accelerator in a quantitative business cycle framework. In J. B. Taylor and M. Woodford (Eds.), *Handbook of Macroeconomics*, Volume 1 of *Handbook of Macroeconomics*, Chapter 21, pp. 1341–1393. Elsevier.

Blanchard, O. and J. Wolfers (2000). The role of shocks and institutions in the rise of European unemployment: The aggregate evidence. *Economic Journal 110*(462), 1–33.

Boeri, T., P. Garibaldi, and E. R. Moen (2012). The labor market consequences of adverse financial shocks. IZA Discussion Papers, Institute for the Study of Labor (IZA).

Boeri, T., P. Garibaldi, and E. R. Moen (2013). Financial shocks and labor: Facts and theories. *IMF Economic Review 61*(4), 631–663.

Borio, C. (2014). The financial cycle and macroeconomics: What have we learnt? *Journal of Banking and Finance 45*(0), 182 – 198.

Botero, J. C., S. Djankov, R. L. Porta, F. Lopez-de Silanes, and A. Shleifer (2004). The regulation of labor. *The Quarterly Journal of Economics 119*(4), 1339–1382.

Branch, W. A., N. Petrosky-Nadeau, and G. Rocheteau (2016). Financial frictions, the housing market, and unemployment. *Journal of Economic Theory 164*, 101 – 135.

Bry, G. and C. Boschan (1971). Cyclical analysis of time series: Selected procedures and computer programs. NBER Chapters, National Bureau of Economic Research, Inc.

Calvo, G. A., F. Coricelli, and P. Ottonello (2012). The labor market consequences of financial crises with or without inflation: Jobless and wageless recoveries. NBER Working Papers 18480, National Bureau of Economic Research, Inc.

Chodorow-Reich, G. (2014). The employment effects of credit market disruptions: Firm-level evidence from the 2008-9 financial crisis. *The Quarterly Journal of Economics 129*(1), 1–59.

Claessens, S. and A. Kose (2013). Financial crises: Explanations, types, and implications. CEPR Discussion Papers 9329, C.E.P.R.

Claessens, S., M. A. Kose, and M. E. Terrones (2009). What happens during recessions, crunches and busts? *Economic Policy 24*, 653–700.

Claessens, S., M. A. Kose, and M. E. Terrones (2012). How do business and financial cycles interact? *Journal of International Economics 87*(1), 178–190.

Drehmann, M., C. Borio, and K. Tsatsaronis (2012). Characterising the financial cycle: don't lose sight of the medium term! BIS Working Papers 380, Bank for International Settlements.

Driscoll, J. C. and A. C. Kraay (1998). Consistent covariance matrix estimation with spatially dependent panel data. *The Review of Economics and Statistics 80*(4), 549–560.

Dromel, N. L., E. Kolakez, and E. Lehmann (2010). Credit constraints and the persistence of unemployment. *Labour Economics 17*(5), 823–834.

Duygan-Bump, B., A. Levkov, and J. Montoriol-Garriga (2015). Financing constraints and unemployment: Evidence from the Great Recession. *Journal of Monetary Economics 75*(C), 89–105.

Eichengreen, B. and K. Mitchener (2003). The Great Depression as a credit boom gone wrong. BIS Working Papers 137, Bank for International Settlements.

Feldmann, H. (2009). The unemployment effects of labor regulation around the world. *Journal of Comparative Economics 37*(1), 76–90.

Gadea Rivas, M. D. and G. Perez-Quiros (2015). The failure to predict the Great Recession – A view through the role of credit. *Journal of the European Economic Association 13*(3), 534–559.

Gatti, D., C. Rault, and A.-G. Vaubourg (2012). Unemployment and finance: how do financial and labour market factors interact? *Oxford Economic Papers 64*(3), 464–489.

Gertler, M. and P. Karadi (2011). A model of unconventional monetary policy. *Journal of Monetary Economics 58*(1), 17–34.

Gilchrist, S. and E. Zakrajsek (2012). Credit spreads and business cycle fluctuations. *American Economic Review 102*(4), 1692–1720.

Gorton, G. and G. Ordonez (2014). Collateral crises. *American Economic Review 104*(2), 343–78.

Guichard, S. and E. Rusticelli (2011). Reassessing the NAIRUs after the crisis. OECD Economics Department Working Papers 918, OECD Publishing.

Gwartney, J., R. Lawson, and J. Hall (2013). Economic Freedom of the World: 2013 Annual Report. Fraser Institute, Vancouver, BC.

Harding, D. and A. Pagan (2002). Dissecting the cycle: a methodological investigation. *Journal of Monetary Economics 49*(2), 365–381.

Helbling, T., R. Huidrom, M. A. Kose, and C. Otrok (2011). Do credit shocks matter? A global perspective. *European Economic Review 55*(3), 340–353.

Hodrick, R. J. and E. C. Prescott (1997). Postwar U.S. business cycles: An empirical investigation. *Journal of Money, Credit and Banking 29*, 1–16.

Hume, M. and A. Sentance (2009). The global credit boom: Challenges for macroeconomics and policy. *Journal of International Money and Finance 28*(8), 1426–1461.

ILO (2014). The risk of a jobless recovery. Global employment trends 2014, International Labour Office, Geneva.

Jermann, U. and V. Quadrini (2012). Macroeconomic effects of financial shocks. *American Economic Review 102*(1), 238–71.

Jordà, Ó. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review 95*(1), 161–182.

Jordà, Ó., M. Schularick, and A. M. Taylor (2011). Financial crises, credit booms, and external imbalances: 140 years of lessons. *IMF Economic Review 59*(2), 340–378.

Jordà, Ó., M. Schularick, and A. M. Taylor (2013). When credit bites back. *Journal of Money, Credit and Banking 45*(s2), 3–28.

Jordà, Ó., M. Schularick, and A. M. Taylor (2015a). Leveraged bubbles. *Journal of Monetary Economics 76, Supplement*, S1 – S20. Supplement Issue: November 7-8, 2014 Research Conference on "Asset Price Fluctuations and Economic Policy".

Jordà, Ó., M. Schularick, and A. M. Taylor (2015b). Sovereigns versus banks: Credit, crises, and consequences. *Journal of the European Economic Association 14*(1), 45–79.

Kawaguchi, D. and T. Murao (2012). Who bears the cost of the business cycle? Labor-market institutions and volatility of the youth unemployment rate. *IZA Journal of Labor Policy 1*(1), 1–22.

Kindleberger, C. P. (1978). *Manias, Panics and Crashes. A History of Financial Crisis*. John Wiley, New York.

Kiyotaki, N. and J. Moore (1997). Credit cycles. *Journal of Political Economy 105*(2), 211–48.

Kiyotaki, N. and J. Moore (2012). Liquidity, business cycles, and monetary policy. NBER Working Papers 17934, National Bureau of Economic Research, Inc.

Krueger, A. B. and A. I. Mueller (2011). Job search and job finding in a period of mass unemployment: Evidence from high-frequency longitudinal data. IZA Discussion Papers 5450, Institute for the Study of Labor (IZA).

Matsumoto, M., M. Hengge, and I. Islam (2012). Tackling the youth employment crisis: a macroeconomic perspective. ILO Working Papers 470297, International Labour Organization.

McKinnon, R. I. and H. Pill (1997). Credible economic liberalizations and overborrowing. *American Economic Review 87*(2), 189–93.

Meeks, R. (2012). Do credit market shocks drive output fluctuations? Evidence from corporate spreads and defaults. *Journal of Economic Dynamics and Control 36*(4), 568–584.

Mendoza, E. G. and M. E. Terrones (2012). An anatomy of credit booms and their demise. NBER Working Papers 18379, National Bureau of Economic Research, Inc.

Mian, A. and A. Sufi (2011). House prices, home equity-based borrowing, and the US household leverage crisis. *American Economic Review 101*(5), 2132–56.

Monacelli, T., V. Quadrini, and A. Trigari (2011). Financial markets and unemployment. NBER Working Papers 17389, National Bureau of Economic Research, Inc.

Nickell, S. (1997). Unemployment and labor market rigidities: Europe versus North America. *Journal of Economic Perspectives 11*(3), 55–74.

Nickell, S., L. Nunziata, and W. Ochel (2005). Unemployment in the OECD since the 1960s. What do we know? *Economic Journal 115*(500), 1–27.

Pagan, A. R. and K. A. Sossounov (2003). A simple framework for analysing bull and bear markets. *Journal of Applied Econometrics 18*(1), 23–46.

Pagano, M. and G. Pica (2012). Finance and employment. *Economic Policy 27*(69), 5–55.

Petrosky-Nadeau, N. (2014). Credit, vacancies and unemployment fluctuations. *Review of Economic Dynamics 17*(2), 191–205.

Petrosky-Nadeau, N. and E. Wasmer (2013). The cyclical volatility of labor markets under frictional financial markets. *American Economic Journal: Macroeconomics 5*(1), 193–221.

Quadrini, V. (2011). Financial frictions in macroeconomic fluctations. *Economic Quarterly 97*(3), 209–254.

Rajan, R. G. (2005). Has financial development made the world riskier? NBER Working Papers 11728, National Bureau of Economic Research, Inc.

Ramey, V. (2012). Comment on "Roads to prosperity or bridges to nowhere? Theory and evidence on the impact of public infrastructure investment". In *NBER Macroeconomics Annual 2012, Volume 27*, NBER Chapters, pp. 147–153. National Bureau of Economic Research, Inc.

Reinhart, C. M. and G. L. Kaminsky (1999). The twin crises: The causes of banking and balance-of-payments problems. *American Economic Review 89*(3), 473–500.

Reinhart, C. M. and K. S. Rogoff (2009a). The aftermath of financial crises. *American Economic Review 99*(2), 466–72.

Reinhart, C. M. and K. S. Rogoff (2009b). *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.

Scarpetta, S. (1996). Assessing the role of labour market policies and institutional settings on unemployment: a cross-country study. *OECD journal: Economic Studies 1996/I*(26), 43–98.

Schularick, M. and A. M. Taylor (2012). Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008. *American Economic Review 102*(2), 1029–61.

Sharpe, S. A. (1994). Financial market imperfections, firm leverage, and the cyclicality of employment. *American Economic Review 84*(4), 1060–74.

Taylor, A. M. (2012a). External imbalances and financial crises. NBER Working Papers 18606, National Bureau of Economic Research, Inc.

Taylor, A. M. (2012b). The great leveraging. NBER Working Papers 18290, National Bureau of Economic Research, Inc.

Verick, S. (2009). Who is hit hardest during a financial crisis? The vulnerability of young men and women to unemployment in an economic downturn. IZA Discussion Papers 4359, Institute for the Study of Labor (IZA).

Wasmer, E. and P. Weil (2004). The macroeconomics of labor and credit market imperfections. *American Economic Review 94*(4), 944–963.

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